MASTER OF COMPUTER APPLICATIONS

SYLLABUS

(Under Choice Based Credit System)
Applicable for the students admitted
from 2022 – 2023 onwards

PG DEPARTMENT OF COMPUTER APPLICATIONS

Bishop Heber College (Autonomous)
(Nationally Reaccredited at the A+ Level by NAAC)
(Recognized by UGC as "College with Potential for Excellence")
Tiruchirappalli-620 017

Name of the Department: **PG Department of Computer Applications**
Name of the Programme: **Master of Computer Applications (MCA)**

<div align="center">

MCA OUTCOME BASED EDUCATION
2022 -2023 ONWARDS BISHOP HEBER COLLEGE

</div>

VISION

Develop next generation software professionals of high calibre to cater to the various needs of the IT Industry through effective teaching and learning process and to involve in advanced research by imbibing ethical values in order to provide solutions to the problems of our society.

MISSION

1. Enrich the students with a deep insight on the latest technologies by providing globally competent curriculum.

2. Develop, evaluate, synthesize and apply the acquired computing knowledge to cater to the needs of the society by collaborating with industries and corporate sectors.

3. Enable the students to become experts, researchers, academicians, entrepreneurs in the field of computer applications with a commitment to lifelong learning.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

1. Graduates shall become a successful professional in the field of computer applications and in various multi-disciplinary industries either as an employee or an entrepreneur.

   Related to M1 & M2

2. Graduates shall become effective researchers and academicians, leading or participating in efforts to address social, technical and business challenges in an ethical manner.

   Related to M2 & M3

3. Graduates shall be engaged in lifelong learning and professional development through self-study and by updating new technologies.

   Related to M1,M2 &M3

PROGRAMME OUTCOMES (POs)

On completion of Masters in Computer Applications, students would have acquired the following competencies to:

- **PO1**: **Computational Knowledge:** Apply the knowledge of computer applications to design, develop, test and maintain the software using the latest technologies.

- **PO2: Problem Analysis**: Identify and analyze complex problems and formulate appropriate solutions.

- **PO3: Design and Development of Solutions:** Design and develop customized frameworks for small to large enterprises.

- **PO4: Conduct Investigations of Complex Computing problems:** Utilize the research-based knowledge and research methods for the analysis and interpretation of data to provide valid conclusions in real-time applications.

- **PO5: Modern Tool Usage**: Identify and apply the appropriate techniques necessary for innovative software solutions, resources and modern computing tools to perform complex computing activities.

- **PO6: Project Management and Finance:** Manage multidisciplinary projects and assess societal, environmental, health, safety, legal and cultural issues.

- **PO7: Professional Ethics:** Function efficiently both as a member and team leader exhibiting professional skills with human values and ethics.

- **PO8: Communication Efficacy:** Communicate effectively with the computing community Covered and the society to enhance documentations, presentations and to use appropriate opportunity Covered according to their intelligence.

- **PO9: Life-long Learning:** Engage in independent and continuous learning as a computing professional and able to upgrade the skill sets for the lifelong betterment of the individual and society at large.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

On successful completion of the program learners would have acquired the following competencies:

- **PSO1**: Apply the acquired knowledge to design Graphical User Interfaces, develop websites, design new operating systems and manage databases.

- **PSO2**: Analyze the real-time data and predict the future outcome by using Machine Learning, Deep learning and Analytical tools.

- **PSO3**: Exhibit the programming skills to provide solutions to meet the needs of the industry.

- **PSO4**: Use the managerial skills and financial knowledge to become a successful entrepreneur and provide employability to the needed community Covered.

MCA COURSE STRUCTURE 2022 – 2023

(For the candidates admitted from the academic year 2022-2023 onwards)

Eligibility:

Passed BCA/ Bachelor Degree in Computer Science Engineering or equivalent Degree OR passed B.Sc./ B.Com./ B.A. with Mathematics at l0+2 Level or at Graduation Level (with additional bridge Courses as per the norms of the concerned University). Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination.

(Applicable to Candidates admitted from the Academic Year 2022-2023 onwards)

Computer Science Stream

Sem	Course	Course Title	Course Code	Hours / Week	Credits	Marks CIA	Marks ESE	Marks Total
I	Core I	Programming in .NET Technology	P22CA101	4	4	25	75	100
	Core II	Operating Systems	P22CA102	4	4	25	75	100
	Core III	Resource Management Techniques	P22CA103	4	3	25	75	100
	Core IV	Accounting and Financial Management	P22CA104	4	3	25	75	100
	Elective I	Software Engineering/ Microprocessor and Micro Controllers/ Computer Graphics	P22CA1:A/ P21CA1:B/ P22CA1:C	4	3	25	75	100
	Core Practical I	Programming in .NET Technology Lab	P22CA1P1	4	2	40	60	100
	Core Practical II	Operating System Programming Lab	P22CA1P2	4	2	40	60	100
	VLO	The Big Picture	P22VLO21	2	2	25	75	100
		Social Ethics	P22VLO22					
II	Core V	Programming in Java	P22CA205	4	4	25	75	100
	Core VI	Database Management Systems	P22CA206	4	4	25	75	100
	Core VII	Data Structures and Algorithms	P22CA207	4	4	25	75	100
	Elective II	Soft Computing Data Warehousing and Data Mining Artificial Intelligence	P22CA2:A/ P22CA2:B/ P22CA2:C	4	3	25	75	100
	Elective III	Customer Relationship Management Enterprise Resource Planning Management Information Systems	P22CA2:D/ P22CA2:E/ P22CA2:F	4	3	25	75	100
	Core Practical III	Programming in Java Lab	P22CA2P3	4	2	40	60	100
	Core Practical IV	Database Management Systems Lab	P22CA2P4	4	2	40	60	100
	SBC	Communication and Life Skills	P22CAPS1	2	1	---	100	100
	Core Project I	Summer Project	P22CA2PJ	---	2	---	100	100
III	Core VIII	Smart Devices Programming	P22CA308	4	4	25	75	100
	Core IX	Programming in Python	P22CA309	5	4	25	75	100
	Core X	Computer Network and Network Security	P22CA310	5	4	25	75	100
	Elective IV	Organizational Behavior/ Decision Support and Business Intelligence/ Human Resource Management	P22CA3:A/ P22CA3:B/ P22CA3:C	4	3	25	75	100
	Elective V	Big Data Analytics Cloud Computing/ Block Chain and Crypto-Currencies/ Parallel Computing	P21CA3:D/ P22CA3:E/ P22CA3:F	4	3	25	75	100
	Core Practical V	Smart Devices Programming Lab	P22CA3P5	4	2	40	60	100
	Core Practical VI	Programming in Python Lab	P22CA3P6	4	2	40	60	100
	Generic Course	Project Preparation and Research Ethics	P22CA3G1	1	1	100	---	100
IV	Core XI	Machine Learning for Data Science	P22CA411	4	4	25	75	100
	Core XII	Internet of Things	P22CA412	4	4	25	75	100
	Core Practical VII	Machine Learning for Data Science Lab	P22CA4P7	4	3	40	60	100
	Core Project II	Project - II	P22CA4PJ	18	8	20	80	100
	Compulsory	NPTEL			1/2	---	---	---
			Total Credits		91/ 92	930	1770	2770

MCA COURSE STRUCTURE 2022 – 2023

(For the candidates admitted from the academic year 2022-2023 onwards)

Eligibility:

Passed BCA/ Bachelor Degree in Computer Science Engineering or equivalent Degree OR passed B.Sc./ B.Com./ B.A. with Mathematics at l0+2 Level or at Graduation Level (with additional bridge Courses as per the norms of the concerned University). Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination.

(Applicable to Candidates admitted from the Academic Year 2022-2023 onwards)

Non-Computer Science Stream

Sem	Course	Course Title	Course Code	Hours / Week	Credits	Marks CIA	Marks ESE	Marks Total
I	Core I	Programming in .NET Technology	P22CA101	4	4	25	75	100
	Core II	Operating Systems	P22CA102	4	4	25	75	100
	Core III	Resource Management Techniques	P22CA103	4	3	25	75	100
	Core IV	Accounting and Financial Management	P22CA104	4	3	25	75	100
	Elective I	Software Engineering/ Microprocessor and Micro Controllers/ Computer Graphics	P22CA1:A/ P21CA1:B/ P22CA1:C	4	3	25	75	100
	Core Practical I	Programming in .NET Technology Lab	P22CA1P1	4	2	40	60	100
	Core Practical II	Operating System Programming Lab	P22CA1P2	4	2	40	60	100
	VLO	The Big Picture	P22VLO21	2	2	25	75	100
		Social Ethics	P22VLO22					
	Bridge Course I	Object Oriented Programming	PB22CA11	---	4	25	75	100
	Bridge Course II	Information Technology	PB22CA12	---	4	25	75	100
	Bridge Course III	Object Oriented Programming Lab	PB22CA1P	---	2	40	60	100
II	Core V	Programming in Java	P22CA205	4	4	25	75	100
	Core VI	Database Management Systems	P22CA206	4	4	25	75	100
	Core VII	Data Structures and Algorithms	P22CA207	4	4	25	75	100
	Elective II	Soft Computing Data Warehousing and Data Mining Artificial Intelligence	P22CA2:A/ P22CA2:B/ P22CA2:C	4	3	25	75	100
	Elective III	Customer Relationship Management Enterprise Resource Planning Management Information Systems	P22CA2:D/ P22CA2:E/ P22CA2:F	4	3	25	75	100
	Core Practical III	Programming in Java Lab	P22CA2P3	4	2	40	60	100
	Core Practical IV	Database Management Systems Lab	P22CA2P4	4	2	40	60	100
	SBC	Communication and Life Skills	P22CAPS1	2	1	---	100	100
	Core Project I	Summer Project	P22CA2PJ	---	2	---	100	100
	Bridge Course IV	Internet Programming	PB22CA24	---	4	25	75	100
	Bridge Course V	Linux Programming	PB22CA25	---	4	25	75	100
	Bridge Course VI	Internet Programming Lab	PB22CA2P	---	2	40	60	100

	Core VIII	Smart Devices Programming	P22CA308	4	4	25	75	100
	Core IX	Programming in Python	P22CA309	5	4	25	75	100
	Core X	Computer Network and Network Security	P22CA310	5	4	25	75	100
III	Elective IV	Organizational Behavior/ Decision Support and Business Intelligence/ Human Resource Management	P22CA3:A/ P22CA3:B/ P22CA3:C	4	3	25	75	100
	Elective V	Big Data Analytics Cloud Computing/ Block Chain and Crypto-Currencies/ Parallel Computing	P21CA3:D/ P22CA3:E/ P22CA3:F	4	3	25	75	100
	Core Practical V	Smart Devices Programming Lab	P22CA3P5	4	2	40	60	100
	Core Practical VI	Programming in Python Lab	P22CA3P6	4	2	40	60	100
	Generic Course	Project Preparation and Research Ethics	P22CA3G1	1	1	100	---	100
	Bridge Course VII	Digital Computer Fundamentals and Architecture	PB20CA37	---	4	25	75	100
	Bridge Course VIII	PHP and MySQL	PB22CA38	---	4	25	75	100
	Bridge Course IX	PHP and MySQL Lab	PB22CA3P	---	2	40	60	100
2								
	Core XI	Machine Learning for Data Science	P22CA411	4	4	25	75	100
	Core XII	Internet of Things	P22CA412	4	4	25	75	100
	Core Practical VII	Machine Learning for Data Science Lab	P22CA4P7	4	3	40	60	100
IV	Core Project II	Project - II	P22CA4PJ	18	8	20	80	100
	Compulsory	NPTEL			1/2	---	---	---
			Total Credits		**123/ 124**	**1125**	**2175**	**3370**

Self-Study Courses

Course	Course Title	Course Code	Credits	Marks		
				CIA	ESE	Total
Self-Study Course I	Information Retrieval Techniques	PX2CAISA	3	--	100	100
Self-Study Course II	Social Network Analytics	PX2CAISB	3	--	100	100
Self-Study Course III	Principles Of Multi Media	PX2CAISC	3	--	100	100
Self-Study Course IV	Software Quality Management	PX2CAISD	3	--	100	100
Self-Study Course V	Deep Learning	PX2CAISE	3	--	100	100

Note: Students are permitted to choose any two Self-Study Courses in either II, III or IV Semesters.

Core I: PROGRAMMING IN .NET TECHNOLOGY

SEMESTER: I   **CODE: P22CA101**
CREDITS: 4   **HOURS/WEEK: 4**

1. COURSE OUTCOMES

After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Develop console applications using Visual Studio 2022	K6	I
CO2	Design web applications using object-oriented programming concepts	K6	II
CO3	Categorize common .Net types to create .Net applications	K4	III
CO4	Create applications using EF Core models	K6	III
CO5	Combine Models with Views using model binding	K6	IV
CO6	Build components using Blazor web assembly	K6	V

2 A. Syllabus

UNIT I   **12 Hours**
Understanding .NET: .NET Framework - Architecture & Components - Building console apps using Visual Studio 2022 - Understanding C# grammar and Vocabulary- Working with Variables - Exploring more about console applications - Controlling Flow, Converting Types and Handling Exceptions- **Writing, Debugging and Testing Functions:** Writing Functions – Unit Testing – Throwing and catching exceptions in functions.

UNIT II   **12 Hours**
Building your own Types with Object Oriented Programming: Building class libraries -Storing data within fields – Storing multiple values using Collections – Working and calling methods – Controlling access with Properties and Indexes – Pattern matching with objects - Working with records. **Implementing Interfaces and Inheriting Classes:** More about methods – Raising and handling events – Implementing Interfaces – Managing memory with reference and value types – Working with null values – Inheriting from classes – Casting within inheritance hierarchies – Inheriting and extending .NET types.

UNIT III   **12 Hours**
Working with Common .NET Types: Pattern Matching with regular expressions – Storing multiple objects in collections – Working with spans, indexes and ranges – Working with network resources – Working with reflection and attributes - Working with images – Managing the file system. **Working with Data Using Entity Framework Core :** Understanding modern databases **–** Setting up EF Core – Defining EF Core models – Querying EF Core models.

UNIT IV   **12 Hours**
– **Building websites using ASP.NET Core Razor Pages :** Understanding Web development – Understanding ASP.NET Core – Exploring ASP.NET Core Razor Pages – Using Entity Framework Core with ASP.NET Core – Using Razor class libraries. **Building websites using the** *Model-View-Controller* **Pattern:** Setting up an ASP.NET Core MVC website – Exploring an ASP.NET Core MVC website – Customizing an ASP.NET Core MVC website.

UNIT V   **12 Hours**

Building and consuming web services: Buidling web services using ASP.NET Core Web API –
Documenting and testing web services. **Building User Interfaces Using Blazor:** Understanding
Blazor – Comparing Blazor project templates - Building components using Blazor server – Abstracting
a service for a Blazor component – Building components using Blazor WebAssembly

B. TOPICS FOR SELF-STUDY:

S.No.	Topics	Web Links
1	C# 10 and .Net 6- Framework	**https://docs.microsoft.com/en-us/dotnet/csharp/whats-new/csharp-10**
2	ASP.NET MVC in .NET 6	**https://docs.microsoft.com/en-us/dotnet/core/porting/upgrade-assistant-aspnetmvc**
3	Razor and Blazor	**https://docs.microsoft.com/en-us/aspnet/core/blazor/components/?view=aspnetcore-6.0**
4	Web Services	**https://docs.microsoft.com/en-us/dotnet/api/system.web.services?view=netframework-4.8**

C. Text Books:
  1. Mark J . Price, "C# 10 and .NET 6 – Modern Cross-Platform Development", Packt
     Publishing Ltd., 6th Edition, 2021.

D. Reference Books:
  1. Mathew MacDonald, "Beginning ASP.NET 3.5 in C# 2008: From Novice to   Professional",
     Apress Publications, Second Edition, 2008.
  2. Mahesh Chand, "Programming C# 5.0, C# Corner Publications, 2014.
  3. Freeman, Adam, "ProASP.NET MVC 5", Apress, 2013.

E. Web links:
  1. **https://docs.microsoft.com/en-us/aspnet/mvc/overview/getting-started/introduction/getting-started**
  2. **https://www.tutorialsteacher.com/mvc/asp.net-mvc-tutorials**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered / Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Understanding .Net**		
1.1	.NET Framework - Architecture & Components	Illustrate working of .Net framework	K2
1.2	Building console apps using Visual Studio 2022	Develop a console application using Visual Studio 2022	K6
1.3	Understanding C# grammar and Vocabulary	Explain working with C# grammar and vocabulary	K2
1.4	Working with Variables	Develop web applications using C# variables	K6
1.5	Exploring more about console applications	Explore the uses of console applications	K5

1.6	Writing functions and debugging	Build a console application using functions and debugging	K6
1.7	Throwing and catching exceptions in functions	Explain how will you throw and catch exceptions in functions	K3
II	**Building data types with Object Oriented Programming**		
2.1	Building class libraries	Decide the role of class libraries in web applications	K5
2.2	Storing data within fields	Analyze the process of storing data within fields	K4
2.3	Collections	Interpret the basics of collections into applications	K5
2.4	Methods	Design applications with methods	K6
2.5	Properties with indexes	Illustrate the uses of properties with indexes	K2
2.6	Working with records	Outline the concepts in working with records	K2
2.7	Implementing interfaces	Create an interface and implement in classes	K6
2.8	Inheriting classes	Summarize the importance of code reusability	K2
III	**Working with Common .NET Types**		
3.1	Pattern Matching with regular expressions	Simplify the role of pattern matching in regular expressions	K4
3.2	Storing multiple objects in collections	Examine the functions of multiple objects using collections	K4
3.3	Working with spans, indexes and ranges	Analyze the basics of spans, indexes and ranges	K4
3.4	Working with network resources	Categorize various network resources	K4
3.5	Working with reflection and attributes	Illustrate the use of reflection and attributes	K2
3.6	Working with images	Design a registration page with images	K6
3.7	Managing the file system	Outline the file system management	K2
3.8	Understanding modern databases	Improve UI with modern databases	K6
3.9	Defining and Querying EF Core models	Discuss how would you define and query EF Core models	K2
3.10	Loading Patterns and Manipulating data with EF Core	Explain how to load patterns and manipulating data with EF Core	K5
IV	**Building websites using MVC/ ASP.NET Core Razor Pages**		
4.1	Understanding .NET core	Compare .Net core and .Net framework	K2
4.2	Exploring razor pages	Modify designing of web pages with razor pages	K6
4.3	Entity framework with ASP.NET core	Examine entity framework with ASP.Net core	K4
4.4	Using razor class library	Classify razor class library	K4
4.5	Setting MVC websites	Design web applications with MVC settings	K6
4.6	Exploring MVC websites	Elaborate on MVC web sites	K6

4.7	Customizing MVC websites	Interpret the customization of MVC web sites	K5
V	**Understanding Blazor**		
5.1	Building web services using ASP.NET Core Web API	Explain the process to build a web service with ASP.Net core web API	K2
5.2	Documenting and testing web services	Analyze the steps in testing web services	K4
5.3	Understanding Blazor	Outline the components of Blazor	K2
5.4	Comparing Blazor project templates	Compare Blazor project plates	K2
5.5	Building components using Blazor server	Assess the components using Blazor server	K5
5.6	Abstracting a service for a Blazor component	Develop a service for a Blazor component	K6
5.7	Building components using Blazor Web Assembly	Build components using Blazor Web Assembly	K6
5.8	Blazor Web assembly	Construct Web assembly applications	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	-	-	M	L	-	M	H	H	L	-	M	-
CO2	H	-	L	-	M	L	H	M	H	H	-	H	-
CO3	H	-	M	-	H	H	H	M	L	H	-	M	-
CO4	H	M	H	L	H	M	H	H	H	H	-	H	M
CO5	M	-	H	M	H	H	M	H	M	L	-	H	H
CO6	H	-	H	M	H	H	M	H	H	M	-	H	H

L-Low   **M-Moderate**   **H- High**

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Discussion, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

Core I: OPERATING SYSTEMS

SEMESTER: I   **CODE: P22CA102**
CREDITS: 4   **HOURS/WEEK: 4**

1. COURSE OUTCOMES
After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Summarize the basic concepts and functionalities of operating systems	K2	I
CO2	Determine the situations that lead to deadlock and starvation by recognizing the state of the process	K5	II
CO3	Analyze and apply effective memory management techniques	K4	III
CO4	Compare the various scheduling algorithms for uniprocessors and multiprocessors	K5	IV
CO5	Make use of the various I/O management and disk scheduling techniques	K3	V
CO6	Discuss secondary storage and file management techniques	K6	V

2 A. Syllabus

UNIT I - Operating System Overview   **12 Hours**
Operating System Objectives and Functions – The Evolution of Operating Systems – Major Achievements – Developments Leading to Modern Operating Systems – Virtual Machines – OS Design Considerations for Multiprocessor and Multicore – Microsoft Windows Overview – Traditional UNIX Systems – Modern UNIX Systems.

UNIT II - Process & Threads   **12 Hours**
Process Descriptions & Control: What is a Process? Process States – Process Description – Process Control – Execution of the Operating System. **Threads:** Processes and Threads – Types of Threads – Multicore and Multithreading. **Concurrency: Mutual Exclusion and Synchronization** – **Concurrency: Deadlock and Starvation.**

UNIT III - Memory Management   **12 Hours**
Memory: Memory Management: Memory Management Requirements – Memory Partitioning – Paging – Segmentation – Security Issues. **Virtual Memory:** Hardware and Control Structures – Operating System Software.

UNIT IV - Uniprocessor, Multiprocessor and Real Time Scheduling   **12 Hours**
Scheduling: Uniprocessor Scheduling: Types of Scheduling – Scheduling Algorithms. **Multiprocessor and Real Time Scheduling:** Multiprocessor Scheduling – Real time scheduling – Linux Scheduling – Windows Scheduling.

UNIT V - Input/ Output and File Management   **12 Hours**
Input/Output and Files: I/O Management and Disk Scheduling: I/O Devices – Organization of the I/O Function – Operating System Design Issues – I/O Buffering – Disk Scheduling – RAID – Disk Cache – Linux I/O – Windows I/O. **File Management**: Overview – File Organization and Access – File Directories – File Sharing – Record Blocking – Secondary Storage Management – File System Security – Linux Virtual File Management – Windows File System.

B. TOPICS FOR SELF-STUDY

S.No.	Topics	Web Links
1	Virtualization	**https://opensource.com/resources/virtualization#:~:text=Virtualization%20is%20the%20process%20of,on%20a%20computer%20system%20simultaneously**
2	The design and implementation of a Log – Structured File System	**ftp://ftp.cs.berkeley.edu/ucb/sprite/papers/lfsSOSP91.ps**
3	The HPAutoRAID Hierarchical Storage System	**ftp://ftp.hpl.hp.com/wilkes/AutoRAID.TOCS.ps.Z**
4	Serverless Network File System	**ftp://ftp.cs.berkeley.edu/ucb/sprite/papers/lfsSOSP91.ps**

C. Text Book:

1. Willam Stallings, Operating Systems, Pearson Education, Seventh Edition, 2003.

D. Reference Books:

1. Deital H.M, An Introduction to Operating Systems, Addison Wesley Publishing Co., 1984.
2. Silberschartz A, Peterson J.L., Galvin P, Operating System Concepts, Addison Wesley publishing co., 1998.

E. Web links:

1. **https://swayam.gov.in/nd1_noc19_cs51**
2. **https://nptel.ac.in/courses/106106144**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Operating System Overview**		
1.1	Objectives and Functions	Recall the basic concepts of Operating Systems.	K1
1.2	Evolution of OS	Summarize the evolution of OS	K2
1.3	Major Achievements	Discuss the major achievements of Operating Systems.	K6
1.4	Developments Leading to Modern Operating Systems	Outline the developments in the modern Operating Systems	K2
	Design Considerations for Multiprocessor and Multicore		
1.5	Windows Overview	Explain about Windows	K2
1.6	Traditional UNIX Systems	Illustrate traditional UNIX Systems	K2
1.7	Modern UNIX Systems	Elaborate on modern UNIX Systems	K6
II	**Process Description and Control**		
2.1	Process States	Identify the state of a process	K3
2.2	Process Description	Explain process description	K2
2.3	Process Control	Build a Process Control block	K6
	Threads		
2.4	Processes and Threads	Discuss processes and threads	K6

2.5	Types of Threads	List the types of threads	K1
2.6	Multi core and multi-threading	Discuss multi core and multi-threading.	K6
2.7	Parallel algorithm models	Compare the parallel models	K4
	Concurrency: Mutual Exclusion and Synchronization		
2.8	Principles of Concurrency	Explain the principles of concurrency	K2
2.9	Deadlock and Starvation	Deduct the conditions that lead to deadlock and starvation.	K5
III	**Memory**		
3.1	Memory Management Requirements	List out the requirements for memory management	K1
3.2	Partitioning	Construct memory partitioning	K6
3.3	Paging	Develop paging	K6
3.4	Segmentation	Construct segmentation	K6
	Virtual Memory		
3.5	Hardware and control structures	Inspect hardware and control structures	K4
3.6	Operating System Software	Develop Operating System software	K3
IV	**Uniprocessor Scheduling**		
4.1	Types of Processor Scheduling	Choose the type of scheduling algorithm.	K5
4.2	Scheduling Algorithms	Compare the scheduling algorithms.	K5
	Multiprocessor and Real Time Scheduling		
4.3	Multiprocessor Scheduling	Design multiprocessor scheduling	K6
4.4	Real time Scheduling	Formulate Real time scheduling	K6
4.5	Linux Scheduling	Apply Linux scheduling	K3
4.6	Windows Scheduling	Design Windows scheduling	K6
V	**I/O Management and Disk Scheduling**		
5.1	I/O Devices	Categorize I/O devices	K4
5.2	Organization of the I/O Function	Summarize I/O functions	K2
5.3	Operating System Design Issues	List out the design issues in Operating Systems	K1
5.4	I/O Buffering	Discuss the approaches of I/O buffering	K6
5.5	Disk Scheduling	Compare disk scheduling	K4
5.6	RAID	Categorize RAID	K4
5.7	Disk Cache	Summarize cache memory	K2
	File Management		
5.8	File Organization and Access	Choose the organization of file	K5
5.9	File Directories	Explain file directories	K5
5.10	File Sharing	Importance of secondary storage management	K5
5.11	Record Blocking	Classify blocking techniques	K4
5.12	Secondary Storage Management	Choose the appropriate file management technique	K5
5.13	File System Security	Explain about security in file system	K5
5.14	Linux Virtual File System	Design Linux File Management	K6
5.15	Windows File System	Propose the features of the file system	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	-	L	-	-	-	M	H	L	M	-	-	M
CO2	H	H	M	H	M	H	M	L	H	H	H	M	-
CO3	H	H	M	H	H	H	M	H	H	L	L	L
CO4	H	H	H	H	H	M	M	H	H	H	H	M	M
CO5	H	H	M	H	M	H	M	L	H	M	M	L	L
CO6	H	H	H	H	H	M	H	M	M	H	H	H	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

2. Course end survey (Feedback)

****

Core III : RESOURCE MANAGEMENT TECHNIQUES

SEMESTER : I
CREDITS:3

CODE: P22CA103
HOURS/WEEK: 4

1. COURSE OUTCOMES
After the successful completion of this course the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Explain linear programming problems	K2	I
CO2	Solve the Transportation problem and assignment problem	K3	II
CO3	Construct Queuing models for real life problems	K3	III
CO4	Analyze the various queuing models	K4	III
CO5	Analyze the various Inventory models and solve Inventory control problems	K4	IV
CO6	Develop network scheduling by PERT and CPM	K6	V

2A. Syllabus

UNIT I - The Linear Programming Problem   **12 Hours**
    The Linear Programming Problem – Mathematical Formulation of the Problem –Graphical Solution Method – **The Simplex Method – Artificial Variable Techniques – Dual Simplex method**.

UNIT II - The Transportation Problem   **12 Hours**
    The Transportation Problem – Matrix Form – The Transportation Table – The Initial Basic Feasible Solution – Degeneracy in Transportation Problems – Optimum Solution – The Assignment and Routing Problems.

UNIT III - Queueing Theory   **12 Hours**
    Queueing Theory – Queueing System – Characteristics of Queueing System – Poisson Process and Exponential Distribution – Classification of Queues – Transient and Steady States – Poisson Queues – Non – Poisson Queueing Systems – Non – Markovian Queues – Probabilistic models.

UNIT IV - Inventory Control   **12 Hours**
    Inventory Control – ABC Analysis – Economic Lot Size Problems – EOQ with Shortage – Multi–Item Deterministic Problem – Uncertain Demand – Inventory Control with Price Breaks. Replacement Problem – Replacement of Items that Deteriorate with time – Replacement of Items that Fail Completely – other Replacement Problems.

UNIT V - Network Scheduling by PERT/CPM   **12 Hours**
Network Scheduling by PERT/CPM – Basic Concepts – Constraints in Network – Construction of the Network – Time Calculations in Networks – Critical Path Method (CPM) – PERT – PERT Calculations.

B. TOPICS FOR SELF-STUDY:

S.No.	Topics	Web Links
1	Methods of solving a Linear Programming Problem	1.https://courses.lumenlearning.com/sanjacinto-finitemath1/chapter/reading-meeting-demands-with-linear-programming/ 2.https://courses.lumenlearning.com/sanjacinto-finitemath1/chapter/reading-solving-standard-maximization-problems-using-the-simplex-method/ 3.https://courses.lumenlearning.com/sanjacinto-finitemath1/chapter/reading-standard-minimization-with-the-dual/
2	The Transportation Problem	https://www.geeksforgeeks.org/transportation-problem-set-1-introduction/
3	Queueing Theory	https://www.geeksforgeeks.org/packet-queuing-and-dropping-in-routers/
4	Inventory Control	1. https://www.wisdomjobs.com/e-university/production-and-operations-management-tutorial-295/inventory-control-or-management-9599.html 2. https://www.unleashedsoftware.com/inventory-management-guide
5	Network	https://www.interventions.org/pertcpm/

C. Text Book:
1. Kanti Swarup, P.K. Gupta and Man Mohan,"Operations Research", Sultan Chand and Sons, 1992.

D. Reference Books:
1. Hamdy A Taha, "Operations Research – An Introduction", Macmillan Publishing Company, 1982.
2. Don.T. Phillips, A.Ravindran, James.J.Solberg, "Operations Research – Principles and Practice",John Wiley & Sons, 1976.

E. Web links:
1. https://swayam.gov.in/explorer?searchText=operations%20research
2. https://nptel.ac.in/courses/111/107/111107128/

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**The Linear Programming Problem**		
1.1	The Linear Programming Problem	Explain and discuss about aLinear Programming Problem	K2
1.2	Mathematical Formulation of the Problem	Describe the mathematical formulation of aLinear Programming Problem	K2

1.3	Graphical Solution Method	Estimate the solution of aLinear Programming Problem by Graphical solution method	K2
1.4	The Simplex Method	Determine the solution of a Linear Programming Problem by using Simplex method	K2
1.5	Artificial Variable Techniques	Apply Artificial Variables to find a solution for a Linear Programming Problem	K3
1.6	Dual Simplex method	Examine the solution of a Linear Programming Problem by using Simplex method	K3
II	**The Transportation Problem**		
2.1	The Transportation Problem	Describe Transportation Problem	K1
2.2	Matrix form of Transportation Table	Describe matrix form of transportation problem	K1
2.3	The Initial Basic Feasible Solution	Estimates the Initial Basic Feasible Solution	K2
2.4	Degeneracy in Transportation Problems	Identify the degeneracy in transportation problem	K4
2.5	Optimum Solution	Computes optimum solution of a transportation problem	K3
2.6	The Assignment	Describe the assignment problem and computes the optimum solution	K3
2.7	Routing Problems	Solve the routing problems	K3
III	**Queueing Theory**		
3.1	Queueing Theory	Illustrate Queueing theory	K3
3.2	Queueing System	Explain the Queueing system.	K4
3.3	3.3 Characteristics of Queueing System	Construct the queueing system.	K5
3.4	Poisson Process and Exponential Distribution	Solve the queueing problem.	K3
3.5	Classification of Queues	Compare the properties of Queueing models.	K4
3.6	Transient and Steady States	Distinguish the state of a queueing system.	K4
3.7	Poisson Queues	Identify the Poisson queue.	K4
3.8	Non – Poisson Queueing Systems	Examine the solution of Non-Poisson Queueing system.	K4
3.9	Non – Markovian Queues	Describe a Non-Markovian Queue.	K1
IV	**Inventory control**		
4.1	Inventory control	Discuss in details about inventories and their types	K6
4.2	ABC Analysis	Explain about ABC analysis	K6
4.3	Economic Lot Size problems	Discuss in detailabout Economic Lot size	K6
		Solve corresponding problems	K4
4.4	EOQ with shortage	Discuss in detail about EOQ with shortage	K6

		Solving problems	K4
4.5	Multi-Item deterministic Problem	Solving Multi-Item deterministic Problems	K4
4.6	Uncertain Demand	Discuss in detail about Uncertain Demand	K6
		Solving corresponding problems	K4
4.7	Inventory Control with Price Breaks	Recalling price breaks	K1
		Solving corresponding problems	K4
4.8	Replacement Problems	Discuss in detail about Replacement problems	K6
		Apply it on a solving problems	K3
4.9	Replacement of Items that Deteriorate with time	Discuss in detail about Replacement of Items that Deteriorate with time	K6
4.10	Replacement of Items that Fail Completely	Discuss in detail Replacement of Items that Fail Completely	K6
4.11	Other Replacement Problems	Evaluate other replacement problems	K4
V	**Network Scheduling by PERT/CPM**		
5.1	Introduction	Use network scheduling and utilize network pre-determined schedule PERT and CPM	K3
5.2	Network and basic components	Discuss basic components of networks Activity and Event .	K6
5.3	Logical Sequencing	Illustrate Looping and Dangling.	K3
5.4	Rules of network Construction	Identify rules for drawing network.	K4
5.5	Concurrent activities	Discuss activity in discrete nature	K6
5.6	Critical Path Analysis	Determine Forward and backward pass calculation.	K6
		Discuss different kinds of floats namely total float and free float and independent float.	K6
		Determine total float and free float and independent float.	K6
5.7	Probability considerations in PERT	Discuss optimistic time and pessimistic time and most likely time.	K6
		Determine optimistic time and pessimistic time and most likely time.	K6
		Determine Probability of meeting the schedule time.	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	H	M	M	L	L	-	-	-	M	M	H	--
CO2	M	H	M	L	L	-	-	-	-	L	M	H	--
CO3	L	H	H	M	-	M	H	H	M	-	M	H	M
CO4	-	H	H	-	M	M	M	H	H	-	H	H	M
CO5	H	H	M	-	-	L	M	L	M	L	H	M	M
CO6	H	-	H	H	H	L	-	H	M	H	H	H	-

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

Core IV: ACOUNTING AND FINANCIAL MANAGEMENT

SEMESTER: I

CREDITS: 3

CODE: P22CA104

HOURS/WEEK: 4

1. COURSE OUTCOMES

After the successful completion of this course, the students will be able to:

S.No	Course Outcomes	Level	Unit Covered
CO1	Examine the basic concepts of accounting and its principles	K4	I
CO2	Construct the financial statements with suitable standards	K5	I
CO3	Identify the major elements of long-term and short-term ratio analysis	K3	II
CO4	Estimate cost per Unit Covered on various technique	K5	III
CO5	Distinguish shares and debentures of a company	K4	IV
CO6	Predict the marketing strategies to understand the consumer behavior and buying motives	K6	V

2A. Syllabus

UNIT I - Basic Accounting Concepts and Methods **12 Hours**

Financial Statements: Accounting Concepts and Conventions - System of Book Keeping – Journal - Ledger - Trail Balance - Preparation of Trading A/c, Profit and Loss A/c and Balance Sheet without Adjustments.

UNIT II - Ratio Analysis **12 Hours**

Ratio analysis ratios Introduction - Significance - Limitations - Classification According to Statement: Short-Term Solvency - Current Ratio - Liquidity Ratio - Classification According to Function: Long-Term Solvency - Debt-Equity Ratio - Proprietary Ratio - Profitability Ratio - Gross-Profit Ratio - Net-Profit Ratio - Operating Ratio.

UNITIII - Cost Management **12Hours**

Cost Concepts and cost classifications: Cost concepts and various types of cost classifications -Determination of costs -Marginal costing -Break Even Analysis - Contribution approach - Direct costing

UNIT IV - Company Accounts –Shares Capital **12Hours**

Company Accounts - Introduction to company accounts - Types of shares - Issue of shares at par, at premium, at discount

UNITV - Marketing **12 Hours**

Introduction to Marketing: Meaning – Objectives - Classification of markets -Recent trends in marketing - Customer relationship Marketing - E-Marketing - Online Marketing - Tele Marketing

B. TOPICS FOR SELF-STUDY

S.No	Topics	Web Links
1	Depreciation Accounting	https://www.tutorialspoint.com/accounting_basics/financial_accounting_depreciation.htm
2	Subsidiary Books	https://www.wisdomjobs.com/e-university/accounting-basics-tutorial-2266/financial-accounting-subsidiary-books-25196.html
3	Budgeting and Planning Control	https://i.investopedia.com/inv/pdf/tutorials/budgeting-basics.pdf
4	Advance Digital Marketing	https://www.edureka.co/blog/digital-marketing-tutorial/

C. Text Book(s):

1. T.S. Reddy and A. Murthy, "Financial Accounting", 6th revised edition, Margam Publications, 2016.
2. M.Sheik Mohamed, E.Mubarak Ali and M.AbdulHakkem, "Management Accounting", Raja Publications, 2012.
3. R.Ramachandran, R.Srinivasan, "Financial Management", 12th Edition, Sriram Publications, 2012.
4. R.S.N Pillai, Bagavathi and S.Kala, "Marketing Management", S.Chand& Co Publications, 1st Edition, 2010.

D. Reference Books:

1. R.L. Gupta and V.K. Gupta, "Principles and practice of Accountancy", Eleventh Edition, 2005, Sultan Chand Sons, New Delhi.
2. N. Vinayagam& B. Charumathi, "Financial Accounting", Second Revised Edition, 2008, S.Chand& Company Ltd, New Delhi

E. Web links:

1. https://www.tutorialspoint.com/accounting_basics/index.htm
2. https://www.guru99.com/accounting.html

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Accounting Concepts and Conventions**		
1.1	Definition and Objective of Accounting	Illustrate the concepts and principles of accounting rules	K2
1.2	Advantages of Book Keeping	Outline the uses of Book-Keeping	K2
1.3	Basic terms used in Accountancy	List out the terms in Accountancy	K1
1.4	Methods and Types of Accounts	Classify accounting strategies	K4
	Journal &Ledger		
1.5	Double Entry Book Keeping	Explain the method of double entry system	K2

1.6	Journal-Meaning-Rules	Make use of the Golden rules for journal	K3
1.7	Posting into Ledger	Examine the journal to post into ledger	K4
	Final Accounts-Trading and Profit and Loss Account		
1.8	Preparing Trading and P&LA/c and Balance sheet	Estimate the financial position of a concern	K6
II	**Ratio Analysis**		
2.1	Significance of ratio analysis	Identify the efficiency of firm's management	K3
2.2	Limitations of ratio analysis	Interpret the challenges in ratio analysis	K2
2.3	Classification According to statement/Function	Distinguish between function and statement	K4
	Short-term Solvency		
2.4	Current Ratio	Asses the current ratio of a firm	K5
2.5	Liquidity Ratio	Evaluate the Liquidity ratio of a firm	K5
	Long-term Solvency		
2.6	Debt Equity Ratio	Estimate the Equity ratio of share holders	K5
2.7	Proprietary Ratio/Profitability Ratio	Determine the profitability ratio	K5
2.8	Gross profit and Net Profit Ratio	Compare the gross and net profit ratio	K5
2.9	Operating Ratio	Evaluate the operating ratio	K5
III	**Cost Accountancy**		
3.1	Definition	Explain the cost account	K1
3.2	Various types of cost classification	Identify the specifics of different costing methods	K6
3.3	Illustration-Calculate Direct, Indirect and Variable cost	Analyze cost-volume-profit techniques to determine optimal managerial decisions.	K4
3.4	Determination of Marginal cost	Estimate of schedule costs per Unit Covered of production	K5
	Break Even Analysis		
3.5	Determination of Marginal cost	Explain the breakeven sales and cost-volume analysis	K2
3.6	Contribution approach-Problems	Interpret the impact of the selected costs method	K5
IV	**Company Accounts**		
4.1	Introduction to Company Accounts	Explain about the meaning of companies and working style of companies.	K2
4.2	Types of Shares	Explain the relationship between company and debenture holders	K2
	Issues of Shares-Journal Entries		
4.3	Shares issued at Par	Apply journal for issue of share at par	K3
4.4	Shares issued at premium	Apply journal for issue of share at premium	K3
4.5	Shares issued at discount	Apply journal for issue of share at discount	K3
V	**Marketing**		

5.1	Meaning and Objectives	Explain the fundamental of marketing	K2
5.2	Classification of markets	Classify different methods of sales promotion	K2
5.3	Recent Trends in marketing	Identify the trends in marketing	K3
5.4	Customer relationship marketing	Build effective relationship with customers	K3
5.5	E-Business	Demonstrate legal issues and privacy in E-Commerce	K2
5.6	Tele marketing/Online marketing	Assess the effect of changing technology on traditional business models and strategy	K5

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	-	H	M	L	M	H	L	L	M	-	L	M	H
CO2	M	H	L	M	H	H	-	M	M	-	L	-	H
CO3	M	M	H	-	H	M	-	-	L	-	-	-	M
CO4	M	H	M	-	M	L	-	L	L	-	M	H	H
CO5	-	M	-	-	L	M	-	L	-	-	L	-	M
CO6	H	M	M	L	M	H	-	H	M	M	L	-	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book

2. Open Book Test.

3. Assignment, Group Presentation, Group Discussion, Presentation, Seminar, Quiz (written).

4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

Elective I: SOFTWARE ENGINEERING

1. COURSE OUTCOMES

After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Summarize the basic concepts and the functionalities of Software Engineering	K2	I
CO2	Identify the various software requirements in designing processes	K3	II
CO3	Examine the quality of the software	K4	III
CO4	Apply the various software management techniques to maintain the software	K3	IV
CO5	Assess the software using metric techniques	K5	V
CO6	Develop software and apply strategies of project management	K6	V

2 A. Syllabus

UNIT I - Software Process Model   **12 Hours**

The Nature of Software: The Nature of Software – The Changing Nature of Software – **Software Engineering**: The Software Process – Software Engineering Practice – Software Development Myths. **The Software Process: Software Process Structure:** A Generic Process Model – Process Assessment and Improvement – **Process Models:** Prescriptive Process Models – Specialized Process Models – The Unified Process.

UNIT II - Requirements Modeling   **12 Hours**

Modeling: Principles that Guide Practice: Software Engineering Knowledge - Core Principles – Principles That Guide Each Framework Activity. **Understanding Requirements:** Requirements Engineering – Establishing the Groundwork – Eliciting Requirements – Developing UseCases – Building the Analysis Model – Negotiating Requirements – Validating Requirements. **Requirements Modeling: Scenarios based methods:**Requirements Analysis – Scenario–Based Modeling – UML Models That Supplement the Use Case- **Requirements Modeling: Class-based Methods:** Class–Based Modeling- Identifying Analysis Classes- Specifying Attributes- Defining Operations-Class Responsibility Collaborator Modeling

UNIT III - Software Design   **12 Hours**

Design Concepts: Design within the Context of Software Engineering - The Design Process - Design Concepts - The Design Model. **Architectural Design:** Software Architecture – Architectural Genres – Architectural Styles – Architectural Design - **User Interface Design:** The Golden Rules– Interface Design Steps - **Quality Management: Quality Concepts:** Software Quality – The Software Quality Dilemma – Achieving Software Quality.

UNIT IV - Software Quality Assurance and Testing   **12 Hours**

Software Quality Assurance: Background Issues – Elements of Software Quality Assurance – SQA Tasks, Goals and Metrics – Formal Approaches to SQA – Statistical Software Quality Assurance - **Software Testing Strategies:** AStrategic Approach to Software Testing –Strategic Issues – Test Strategies for Conventional Software – Validation Testing – System Testing – The Art of Debugging. **Testing Conventional Applications:** Software Testing Fundamentals –Internal and

External Views of Testing – White Box Testing – Basis Path Testing – Control Structure Testing – Black Box Testing.

UNIT V - Software Project and Risk Management **12 Hours**

Managing Software Projects: Project Management Concepts: The Management Spectrum – People – The Product – The Process – The Project. **Estimation For Software Projects:** Software Project Estimation – Decomposition Techniques – Empirical Estimation Models. **Project Scheduling:** Basic Concepts – Project Scheduling – Scheduling **- Risk Management:** Software Risks – Risk Identification – Risk Projection – Risk Refinement – Risk Mitigation, Monitoring and Management.

B. TOPICS FOR SELF-STUDY:

S.No.	Topics	Web Links
1	The Capability Maturity Model Integration (CMMI)	**http://dthomas-software.co.uk/resources/frequently-asked-questions/what-is-cmmi-2**
2	Business process reengineering	**https://www.geeksforgeeks.org/introduction-to-business-process-re-engineering**
3	Reverse engineering	**https://www.youtube.com/watch?v=eB4o0feXw7Q**
4	Component Based Software Engineering	**https://www.geeksforgeeks.org/component-based-software-engineering/**

C. Text Book:

1. Roger S. Pressman, "Software Engineering - A Practitioner's Approach", McGraw Hill, Eighth Edition, 2019.

D. Reference Books:

1. Ian Sommerville, "Software Engineering", Pearson Education Asia, Tenth Edition, 2016.
2. James F Peters and Witold Pedryez, "Software Engineering – An Engineering Approach", John Wiley and Sons, New Delhi, 2010.

E. Web links:

1. **https://swayam.gov.in/**
2. **https://nptel.ac.in/**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Software and Software Engineering**		
1.1	The Nature of Software	Recall the basic concepts of software engineering	K1
1.2	The Unique Nature of Web Apps	Identify the nature of web apps	K3
1.3	Software Engineering	Recall the characteristics of software engineering	K1
1.4	The Software Process	Illustrate software process	K2
1.5	Software Engineering Practice	Discuss the practices in software engineering	K6

1.6	Software Myths	Analyze the software myths	K4
	The Software Process: Process Models		
1.7	A Generic Process Model	Illustrate generic process model	K2
1.8	Process Assessment and Improvement	Assess a process and improve it	K5
1.9	Prescriptive Process Models	Build prescriptive process models	K6
1.10	Specialized Process Models	Construct specialized process models	K6
1.11	The Unified Process.	Design unified process model	K6
II	**Modeling: Principles that Guide Practice**		
2.1	Software Engineering Knowledge	Discuss about software engineering	K6
2.2	Core Principles	Explain the core principles in software engineering	K2
2.3	Principles That Guide Each Framework Activity	Illustrate the framework activity	K2
	Understanding Requirements		
2.4	Requirements Engineering	Discuss requirements engineering	K6
2.5	Establishing the Groundwork	Illustrate ground work activities	K2
2.6	Eliciting Requirements	Explain the requirements	K2
2.7	Developing Use Cases	Apply use case model in software process	K3
2.8	Building the Requirements Model	Discuss the concepts for building the requirement model	K6
2.9	Negotiating Requirements	Take part in negotiating requirements	K4
2.10	Validating Requirements	Utilize the validating techniques based on requirements	K3
	Requirements Modeling Scenarios, Information and Analysis Classes		
2.11	Requirements Analysis	Identify the elements of requirement models	K3
2.12	Scenario–Based Modeling	Explain scenario–based modeling	K2
2.13	UML Models That Supplement the Use Case	Develop a use case model for safe home security system	K6
2.14	Class–Based Modeling	Elaborate on class-based modeling	K6
III	**Design Concepts**		
3.1	Design within the Context of Software Engineering	Discuss the design concepts	K6
3.2	The Design Process	Outline the principles of design model	K2
3.3	Design Concepts	Apply the concepts in designing	K3
3.4	The Design Model	Construct a model	K6
	Architectural Design		

3.5	Software Architecture	Develop software	K6
3.6	Architectural Genres	Illustrate architectural genres	K2
3.7	Architectural Styles	List out the styles in architecture	K4
3.8	Architectural Design	Discuss the architectural design	K6
	User Interface Design		
3.9	The Golden Rules	Identify the golden rules for user interface	K3
3.10	Interface Design Steps	List out the steps involved in designing an interface	K4
	Quality Management: Quality Concepts		
3.11	Software Quality	Recall software quality	K1
3.12	The Software Quality Dilemma	Classify the software quality dilemma	K4
3.13	Achieving Software Quality	Assess the quality of software	K5
IV	**Software Quality Assurance**		
4.1	4.1 Background Issues	Recall background issues	K1
4.2	4.2 Elements of Software Quality Assurance	Classify the various elements insoftware quality assurance	K2
4.3	4.3 SQA Tasks, Goals and Metrics	Elaborate on SQA tasks, goals and metrics	K6
4.4	4.4 Formal Approaches to SQA	Summarize the formal approaches to SQA	K2
4.5	4.5 Statistical Software Quality Assurance	Elaborate the statistical software quality assurance	K6
4.6	4.6 Software Reliability	Define software reliability	K1
4.7	4.7 The ISO 9000 Quality Standards	Explain the ISO 9000 quality standards	K2
4.8	4.8 The SQA Plan	List out the SQA plan	K1
	Software Testing Strategies		
4.9	Strategic Approach to Software Testing	Categorize strategic approach to software testing	K4
4.10	Strategic Issues	List out the strategic issues	K1
4.11	Test Strategies for Conventional Software	Applytest strategies for conventional software	K3
4.12	Test strategies for Object–Oriented Software	Identify test strategies for object–oriented software	K3
4.13	Test Strategies for WebApps	Recall test strategies for WebApps	K1
4.14	Validation Testing	Test the software for validation	K6
4.15	System Testing	Categorize system testing	K4
4.16	The Art of Debugging	Illustrate the process of debugging	K2
	Testing Conventional Applications		
4.17	Software Testing Fundamentals	Recall testing fundamentals	K1

4.18	Internal and External Views of Testing	Distinguish internal and external views of testing	K4
4.19	White Box Testing	Test the software using White Box testing	K6
4.20	Basis Path Testing	Apply basis path testing	K3
4.21	Control Structure Testing	Develop control structure testing	K3
4.22	Black Box Testing	Apply Black Box testing	K3
4.23	Model Based Testing	Elaborate on model based testing	K6
V	**Managing Software Projects: Project Management Concepts**		
5.1	The Management Spectrum	Analyze the project management spectrum	K4
	Estimation For Software Projects		
5.2	Software Project Estimation	Assess project estimation	K5
5.3	Decomposition Techniques	Make use of decomposition techniques	K3
5.4	Empirical Estimation Models	Analyze empirical estimation models	K4
	Project Scheduling		
5.5	Basic Concepts	Outlinethe basic concepts in project scheduling	K2
5.6	Project Scheduling	Explain project scheduling	K5
5.7	Scheduling	Utilize scheduling techniques	K3
	Risk Management		
5.8	Software Risks	List out the types of risks	K1
5.9	Risk Identification	Identify the risks	K3
5.10	Risk Projection	Explain risk projection	K2
5.11	Risk Refinement	Discuss risk refinement	K6
5.12	Risk Mitigation, Monitoring and Management	Illustrate risk mitigation, monitoring and management	K4

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	-	L	-	-	M	M	M	L	H	M	M	-
CO2	M	H	M	M	L	L	M	L	M	H	H	M	L
CO3	H	H	M	M	H	M	H	M	H	H	M	H	M
CO4	H	M	M	M	M	M	M	M	M	M	M	M	M
CO5	H	IH	M	M	H	L	H	H	H	M	H	M	H
CO6	H	H	H	H	H	M	M	M	M	H	M	M	H

L-Low   **M-Moderate**   **H- High**

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

Elective I: MICROPROCESSOR AND MICROCONTROLLERS

SEMESTER : I   **CODE: P22CA1:B**
CREDITS: 3   **HOURS/WEEK: 4**

1. COURSE OUTCOMES

After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Outline Architecture of Different Microprocessor	K2	I
CO2	Apply Addressing modes in Program	K3	I
CO3	Develop Assembly Language Program 8086	K6	II
CO4	Outline Architecture of Pentium Microprocessor	K2	III
CO5	Adapt Peripherals Interface in Real time application	K6	IV
CO6	Develop program using 8051 instructions	K6	V

2 A Syllabus

UNIT I - Introduction: **9   Hours**

Evolution of Microprocessor – Intel 8085 Architecture – Instruction Set – Instruction and Data Formats – Addressing Modes – Status Flags – Intel 8085 Instructions – Simple 8085 Programs.

UNIT II - 8086 Microprocessor: **9   Hours**

Architecture of Intel 8086 Microprocessor – Addressing Modes–Instruction Set - Assembly Language Programming.

UNIT III   **9 Hours**

Salient Features of 80286– Internal Architecture of 80286– Signal Description of 80286 – Salient Feature of 80386 DX Architecture and Signal Description of 80386 – Register Organization of 80386– Addressing Modes – Data Types of 80386 – Salient Feature of 80586 (Pentium)– Few Relevant Concepts of Computer Architecture – System Architecture.

UNIT IV - Interfacing Concepts: **9   Hours**

Programmable Peripherals Interface (PPI) – Programmable Communication Interface (PCI) – DMA Controller– Interrupt Controller.

UNIT V   **9   Hours**

Architecture of 8051–Signal Descriptions of 8051–Register Set of 8051–Important Operational Features of 8051–Memory and I/O Addressing by 8051–Interrupts of 8051–Instruction Set of 8051–Design of a Micro Controller 8051 Based Length Measurement System for Continuously Rolling Cloth or Paper.

B. TOPICS FOR SELF-STUDY:

S.No.	Topics	Web Links
1	Assembly programming in 8086	https://www.tutorialspoint.com/assembly_programming/index.htm
2	Architecture of Pentium III	https://www.techopedia.com/definition/24424/pentium-iii

3	Programmable keyboard interface	**https://www.wisdomjobs.com/e-university/microprocessor-tutorial-2391/8279-programmable-keyboard-25914.html**
4	Function of TMOD and TCON Registers	**https://www.elprocus.com/8051-microcontroller-8-16-bit-timers-and-counters/**

C. Text Books:

1. Badriram, Fundamentals of Microprocessor and Microcomputers, Dhanpat Rai and Sons, Fourth Edition 1993.
2. Liu and Gibson, Microcomputer System The 8086/8088 Family, Prentice Hall of India Pvt. Ltd, 1991.
3. A.K.Ray and K.M.Bhurchandi, Advanced Microprocessors and Peripherals TMH 2000.

D. Reference Books:

1. Douglas.V.Hall Microprocessor and Interfacing– Programming and Hardware McGraw Hill, 1986.
2. R.S.Goankar, Microprocessor Architecture, Programming and Applications 8080/8085 A, Wiley Eastern Ltd, New Delhi, 1991.

E. Web links:

1. **https://www.tutorialspoint.com/microprocessor/index.htm**
2. **https://www.javatpoint.com/microprocessor-tutorial**
3. **https://www.geeksforgeeks.org/microprocessor-tutorials/**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Architecture of 8085**		
1.1	Evolution of Microprocessor	Classify the various Microprocessor	K4
1.2	Intel 8085 Architecture	Illustrate Architecture of 8085	K2
1.3	Instruction Set	Illustrate Instruction Set with example	K2
1.4	Instruction and Data Formats	Elaborate instruction and data Format	K6
1.5	Addressing Modes	Discuss four Addressing Modes	K6
1.6	Status Flags	Explain about status flag	K2
1.7	Intel 8085 Instructions	Classify the various instructions	K4
1.8	Simple 8085 Programs	Develop 8085 programs	K6
II	**Architecture of 8086**		
2.1	Architecture of Intel 8086 Microprocessor	Illustrate Architecture of 8086	K2
2.2	Addressing Modes	Discuss Addressing Modes of 8086	K6
2,3	Instruction Set	Illustrate Instruction Set with example	K2

2.4	Assembly Language Programming	Develop Assembly Language Programm	K6
III	**Architecture of 80286 and 80386**		
3..1	Salient Features of 80286	Elaborate Salient Features of 80286	K6
3.2	Internal Architecture of 80286	Illustrate Architecture of 80286	K2
3.3	Signal Description of 80286	Explain Signal Description of 80286	K2
3.4	Salient Feature of 80386 DX Architecture	Elaborate Salient Features of 80386	K6
3.5	Signal Description of 80386	Explain Signal Description of 80386	K2
3.6	Register Organization of 80386	Explain Register Organization of 80386	K2
3.7	Addressing Modes	Discuss about Addressing Modes	K6
3.8	Salient Feature of 80586 (Pentium)	Elaborate Salient Features of 80586	K6
3.9	Few Relevant Concepts of Computer Architecture	Explain about Computer Architecture	K2
IV	**Interfacing Concepts**		
4.1	Programmable Peripherals Interface (PPI)	Elaborate function of PPI	K6
4.2	Programmable Communication Interface (PCI)	Explain Programmable Communication Interface (PCI)	K2
4.3	DMA Controller	Illustrate Function of DMA controller	K2
4.4	Interrupt Controller	Illustrate Function of PIC	K2
V	**Architecture of 8051**		
5.1	Architecture of 8051	Illustrate Architecture of 8051	K2
5.2	Signal Descriptions of 8051	Explain Signal Description of 8051	K2
5.3	Register Set of 8051	Elaborate Register Set of 8051	K6
5.4	Operational Features of 8051	Elaborate Operational Features of 8051	K6
5.5	Memory and I/O Addressing by 8051	Illustrate Memory and I/O Addressing	K2
5.6	Interrupts of 8051	Discuss about Interrupts of 8051	K6
5..7	Instruction Set of 8051	Illustrate Instruction Set with example	K2
5.8	Design of a Micro Controller 8051 Based Length Measurement System for Continuously Rolling Cloth or Paper	Elaborate Length Measurement System	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	M	L	L	-	-	M	H	L	M	H	-	M
CO2	H	H	M	H	M	H	M	L	H	H	H	M	M
CO3	H	H	M	H	H	M	H	M	H	H	L	L	L
CO4	H	H	H	M	H	M	M	H	H	L	L	M	M
CO5	H	H	M	H	M	H	M	L	H	M	M	L	L
CO6	H	H	H	H	H	M	H	M	M	H	M	H	H

L-Low   **M-Moderate**   **H- High**

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

Elective I: COMPUTER GRAPHICS

SEMESTER : I   **CODE: P22CA1:C**
CREDITS : 3   **HOURS/WEEK: 4**

1. COURSE OUTCOMES:
After the completion of this course the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Summarize the basic concepts and features and mathematical applications of Computer Graphics	K2	1
CO2	Analyze the fundamentals of 2D and 3D Computer Graphics	K3	II
CO3	Apply the various concepts of viewing and interactive techniques	K4	III
CO4	Examine the three-dimensional techniques in Computer Graphics Application	K3	IV
CO5	Build the knowledge of Visible–Surface Detection Methods	K5	V
CO6	Develop the application using computer animation	K6	V

2 A. Syllabus

UNIT I   **10 Hours**
       Overview of Graphics Systems: Video Display Devices – Input Devices – Hard Copy Devices – Graphics Software – Introduction to OpenGL. **Graphics Output Primitives:** Line–Drawing Algorithms – Line Equations – DDA Algorithm – Bresenham's Algorithm – Circle – Generating Algorithms.

UNIT II   **10 Hours**
       Attributes of Graphics Primitives: Color and Gray Scale – Line Attributes – Fill–Area Attributes – Character Attributes – Antialiasing. – OpenGL Color Functions. **Geometric Transformations:** Basic Two Dimensional Geometric Transformations – Matrix Representations and Homogeneous Coordinates.

UNIT III   **10 Hours**
       Two–Dimensional Viewing: The Clipping Window – Clipping Algorithms – Two Dimensional Line Clipping – Polygon Fill – Area Clipping – Curve Clipping – Text Clipping. **Interactive Input Methods and Graphical User Interfaces:** Logical Classification of Input Devices – Interactive Picture Construction Techniques.

UNIT IV   **10 Hours**
       Three Dimensional Viewing: Three–Dimensional Viewing Pipeline – Three–Dimensional Viewing – Coordinate Parameters Transformation from World to Viewing Coordinates – Projection Transformations – Perspective Projections– OpenGL Three Dimensional Viewing Functions.

UNIT V   **10 Hours**
       Visible–Surface Detection Methods: Classification of Visible–Surface Detection Algorithms – Comparison of visibility – Detection Methods – Curved Surfaces – Wire–Frame Visibility Methods. **Computer Animation:** Design of Animation Sequences – Traditional Animation Techniques – General Computer–Animation Functions – Computer Animation Languages – Key-Frame Systems – Motion Specifications.

UNIT VI   **10 Hours**
       Hierarchical Modeling: Basic modeling concepts- System Representation Symbol Hierarchies-Modeling Package- **Graphics File Formats:** Image file configuration-Color Reduction Methods- Uniform Color Reduction-Popularity Color Reduction- Median cut Color Reduction

B. TOPICS FOR SELF STUDY:

S.No	Topics	Web Link
1	Hidden Surface Removal	**https://www.javatpoint.com/computer-graphics-hidden-surface-removal**
2	Pointing and Positioning Techniques	**https://www.javatpoint.com/computer-graphics-pointing-and-positioning-techniques**
3	Pointing and Positioning Techniques	**https://www.tutorialspoint.com/computer_graphics/computer_graphics_fractals.htm**
4	Data Explorer	**http://www.phys.ocean.dal.ca/docs/DX_tutorial.html**

C. Text Book:
       1. Donald Hearn, M. Pauline Baker, "*Computer Graphics with Open GL",* Pearson Education, Third Edition, 2009.

D. Reference Books:

       1. Newman William M., Sproull Robert F., "*Principles of Interactive Computer Graphics",* McGraw Hill, 2010.

E. Web links:

   1. **https://www.youtube.com/watch?v=AaPq489I8Y8**
   2. **https://www.youtube.com/watch?v=jGYFRPoiDBg**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Overview of Graphics Systems**		
1.1	Video Display Devices	Recall the basic concepts of Video Display Devices	K1
1.2	Input Devices	Summarize the Input Devices	K2
1.3	Hard Copy Devices	Explain Hard Copy Devices	K2
1.4	Graphics Software	Discuss Graphics Software	K6
1.5	Introduction to OpenGL	Illustrate OpenGL	K2
	Graphics Output Primitives		
1.6	Line Drawing Algorithms	Explain Line Drawing Algorithms	K2
1.7	Line Equations	Define Line Equations	K1

1.8	DDA Algorithm	Outline DDA Algorithm	K2
1.9	Bresenham's Algorithm	Develop Bresenham's Algorithm	K3
1.10	Circle – Generating Algorithms.	Illustrate Circle – Generating Algorithms.	K2
II	**Attributes of Graphics Primitives**		
2.1	Color and Gray Scale	Identify the basic concepts of Color and Gray Scale	K3
2.2	Line Attributes	Explain Line Attributes	K2
2.3	Fill–Area Attributes	Demonstrate Fill–Area Attributes	K2
2.4	Antialiasing	Discuss Antialiasing	K6
2.5	OpenGL Color Functions	Build OpenGL Color Functions	K3
	Geometric Transformations:		
2.6	Basic Two Dimensional Geometric Transformations	Discuss Basic Two Dimensional Geometric Transformations	K6
2.7	Matrix Representations and Homogeneous Coordinates.	Identify Matrix Representations and Homogeneous Coordinates.	K3
III	**Two–Dimensional Viewing**		
3.1	The Clipping Window	Define Clipping Window	K1
3.2	Clipping Algorithms	Discuss Clipping Algorithms	K6
3.3	Two Dimensional Line Clipping	Develop Two Dimensional Line Clipping	K3
3.4	Polygon Fill	Illustrate Polygon Fill	K2
3.5	Area Clipping	Elaborate Area Clipping	K6
3.6	Curve Clipping	Examine Curve Clipping	K4
3.7	Text Clipping	Demonstrate Text Clipping	K2
	Interactive Input Methods and Graphical User Interfaces		
3.8	Logical Classification of Input Devices	Classify Input Devices	K2
3.9	Interactive Picture Construction Techniques	Demonstrate Interactive Picture Construction Techniques	K2
IV	**Three Dimensional Viewing**		
4.1	The Three–Dimensional Viewing Pipeline	Discuss Three–Dimensional Viewing Pipeline	K6
4.2	Three–Dimensional Viewing	Explain Three–Dimensional Viewing	K2
4.3	Coordinate Parameters Transformation from World to Viewing Coordinates	Demonstrate Coordinate Parameters Transformation from World to Viewing Coordinates	K2

4.4	Projection Transformations	Illustrate Projection Transformations	K2
4.5	Perspective Projections	Identify Perspective Projections	K3
4.6	OpenGL Three Dimensional Viewing Functions.	Develop OpenGL Three Dimensional Viewing Functions.	K3
V	**Visible–Surface Detection Methods:**		
5.1	Classification of Visible – Surface Detection Algorithms	Classify Visible–Surface Detection Algorithms	K2
5.2	Comparison of visibility	Explain Comparison of visibility	K2
5.2	Detection Methods	Discuss Detection Methods	K6
5.4	Curved Surfaces	Evaluate Curved Surfaces	K5
5.5	Wire – Frame Visibility Methods.	Formulate Wire–Frame Visibility Methods.	K6
	Computer Animation		
5.6	Design of Animation Sequences	Discuss the Design of Animation Sequences	K6
5.7	Traditional Animation Techniques	Examine Traditional Animation Techniques	K4
5.8	General Computer	Explain General Computer	K2
5.9	Animation Functions	Demonstrate Animation Functions	K2
5.10	Computer Animation Languages	Apply Computer Animation Languages	K3
5.11	Key-Frame Systems	Illustrate Key-Frame Systems	K2
5.12	Motion Specifications	Explain Motion Specifications	K2

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	-	L	-	-	H	M	M	L	H	M	M	-
CO2	M	H	M	M	L	L	M	L	M	H	H	M	L
CO3	H	H	M	M	H	M	H	M	H	H	M	H	M
CO4	H	M	M	M	M	L	M	M	M	M	M	M	M
CO5	H	H	M	M	H	M	H	H	H	M	H	M	H
CO6	H	H	H	H	H	M	M	M	M	H	M	M	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:
1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book

2. Open Book Test.

---

3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).

4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

Core Practical I: PROGRAMMING IN .NET TECHNOLOGY LAB

SEMESTER: I   **CODE: P22CA1P1**
CREDITS: 2   **HOURS/WEEK: 4**

1. COURSE OUTCOMES
After the successful completion of this course the students will be able to:

S.No.	Course Outcomes	Level	Exercise
CO1	Design web applications using ASP.NET controls	K6	1
CO2	Create application using MVC Bootstrap	K6	2,3
CO3	Develop ASP .NET MVC Dashboard applications	K6	4
CO4	Create application using model class in ASP .NET MVC framework	K6	5,6
CO5	Design web applications with database connectivity	K6	7
CO6	Justify Code First methodology	K5	8

	Ex.No.	Exercises
1		**Simple Programs**
	1.	Write a c# program to use all types of variables
	2.	Write a console application to perform arithmetic operations on numbers
	3.	Write a c# program to pass arguments to the console application
	4.	Write a console application to perform all logical and bitwise operations
	5.	Write a console application to manipulate strings
	6.	Write a C# program to parse from strings to numbers or dates and times
2.		**Controlling flow**
	7.	Write console application to perform if statement
	8.	Write a console application to demonstrate while, do, for, and for each statement
	9.	Demonstrate the pattern matching with the switch statement
3.		**Handling Exceptions**
	10.	Create a c# program to catch all exceptions, specific exception and catching with filters
	11.	Write a c# application to check overflow
4.		**Writing , Debugging and Testing Functions**
	12.	Write functions in c# to return a value
	13.	Write a recursive function to calculate factorial
	14.	Write a c# program to implement functions using lambdas
	15.	Write unit test for Calculator class

5.			**Building your own types with Object-Oriented Programming**
		16.	Build class library in c#
		17.	Create your own types with object-oriented programming
		18.	Write a c# program to demonstrate the different ways of passing parameters to a method
		19.	Write a c# program to explain the concept of controlling access with properties and indexers
		20.	Write a c# program to demonstrate the use of records
6.			**Implementing interfaces and inheriting classes**
		21.	Write a c# program to call methods using delegates
		22.	Write a c# program to implement interface
		23.	Demonstrate the exception handling concepts(inheriting)
		24.	Write a C# program to demonstrate the inheritance concept(extending, hiding, overriding. abstract class, polymorphism)
7.			**Working with common .NET Types**
		25.	Write a c# program to work withs numbers, text, dates and times, pattern matching
		26.	Write a C# program to store multiple objects in collections (List, Dictionaries, Stacks, Queues)
		27.	Write a c# program to print the parts of the URL and to ping the given server
		28.	Write a c# program to display images
8.			**Working with files**
		29.	Write a C# program to read and write a text file
		30.	Create a CRUD application with EF Core (450)
9.			**Web Applications**
		31.	Design a web page to manipulate data using Razor Pages (596)
		32.	Asp .Net Core MVC Crud Using Entity Framework DB First approach
		33.	Design a MVC and Razor with database connection for CRUD application
		34.	Build a web service using ASP.NET Core Web API
		35.	Build an application with .NET Blazor

2. TOPICS FOR SELF STUDY:

S.No	Topics	Web Link
1	Timesheet Project	**https://www.c-sharpcorner.com/article/timesheet-project-process-using-mvc-5/**
2	Healthcare Portal	**https://dzone.com/articles/clinic-project-using-aspnet-mvc5**
3	Template download	**https://themeforest.net/**
4	Pharm Assistant	**https://www.youtube.com/watch?v=cG5tzgAkRBc**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Ex.No.	Lab Exercises	Learning Outcomes	Highest Bloom's Taxonomic Level of Transaction
1	**Simple Programs**	Write a console application to use all types of variables, to perform arithmetic operations	K5
		Write a console application to perform arithmetic operations on numbers	K6
3		Write a c# program to pass arguments to the console application	
4		Write a console application to perform all logical and bitwise operations	
5		Write a console application to manipulate strings	
6		Write a C# program to parse from strings to numbers or dates and times	
7	Movie Database Application	Create an application for movie database using MVC	K6
8	MVC and Razor with Database Connection for CRUD	Develop a web application for CRUD operations with Razor pages	K6
9	MVC with Bootstrap	Design a responsive web application using MVC Bootstap	K6
10	Event Management System	Design a web application for event management system	K6
11	Restaurant Table Booking Application	Build an application for restaurant table booking	K6
12	Online Quiz Application with Dashboard	Design an online quiz application with dashboard	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	M	H	M	H	H	H	H	H	M	L	L	M
CO2	H	M	M	M	H	H	H	M	H	L	L	L	M
CO3	H	H	H	M	H	H	H	H	H	H	H	H	H
CO4	H	H	H	M	H	H	H	H	H	H	H	H	H
CO5	H	H	H	M	H	M	H	H	H	H	H	H	H
CO6	H	H	H	M	H	H	H	H	H	H	H	H	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Practical Components): Closed Book
2. Cooperative Learning Report, Assignment, Group Discussion, project Report, Field Visit Report, Seminar.
3. Pre/Post Test, Viva, Report for each Exercise.
4. Lab Model Examination & End Semester Practical Examination

INDIRECT:

1. Course end survey (Feedback)

****

Core Practical II: OPERATING SYSTEM PROGRAMMING LAB

SEMESTER: I   **CODE: P22CA1P2**
CREDITS: 2   **HOURS/WEEK: 4**

1. COURSE OUTCOMES
After the successful completion of this course the students will be able to:

S.No.	Course Outcomes	Level	Exercise
CO1	Compare the various CPU scheduling algorithms	K5	1
CO2	Compare the file allocation strategies	K5	2,6
CO3	Implement various memory management techniques	K6	3,4,5
CO4	Determine the situations that lead to deadlock	K3	7
CO5	Make use of disk scheduling algorithms	K5	8
CO6	Make use of page replacement algorithms	K5	9,10

Ex. No.	Exercise
1	Write a C program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time. a)FCFS b)SJF c) Round Robin d)Priority
2	Write a C program to simulate the following file allocation strategies. a)Sequential b)Indexed c)Linked
3	Write a C program to simulate the MVT and MFT memory management techniques.
4	Write a C program to simulate the following contiguous memory allocation techniques a)Worst-fit b)Best-fit c)First-fit
5	Write a C program to simulate paging technique of memory management.
6	Write a C program to simulate the following file organization techniques a) Single level directory b) Two level directory c)Hierarchical
7	Write a C program to simulate Bankers algorithm for the purpose of deadlock avoidance.
8	Write a C program to simulate disk scheduling algorithms a)FCFS b)SCAN c)C-SCAN
9	Write a C program to simulate page replacement algorithms a)FIFO b)LRU c)LFU
10	Write a C program to simulate page replacement algorithms a) Optimal

2. TOPICS FOR SELF STUDY:

S.No	Topics	Web Link
1	Simulate Optimal Page Replacement Algorithms	**https://www.iare.ac.in/sites/default/files/lab 2/OS%20LAB%20MANUAL_0.pdf**

2	Simulate product-consumer problem using semaphores	**https://www.iare.ac.in/sites/default/files/lab 2/OS%20LAB%20MANUAL_0.pdf**
3	Simulate Dining Philosophers problem	**https://www.iare.ac.in/sites/default/files/lab 2/OS%20LAB%20MANUAL_0.pdf**
4	Deadlock Prevention	**criteriaiiwithevidencelinkfinal.zip**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Ex.No.	Lab Exercises	Learning Outcomes	Highest Bloom's Taxonomic Level of Transaction
1	CPU Scheduling Algorithms	Develop a C program to find the turnaround time and waiting time	K6
2	File Allocation Strategies	Develop a C program to simulate file allocation strategies	K6
3	Memory Management Techniques	Create a C program to simulate the MVT and MFT memory management techniques.	K6
4	Memory Allocation Techniques	Design a C program for contiguous memory allocation techniques	K6
5	Paging technique of Memory Management	Develop a C program to use paging technique for memory management.	K6
6	File Organization Techniques	Create a C program to use the file organization techniques	K6
7	Bankers Algorithm for Deadlock Avoidance	Design a C program to simulate Bankers algorithm for the purpose of deadlock avoidance.	K6
8	Disk Scheduling Algorithms	Create a C program for disk scheduling algorithms	K6
9	Page Replacement Algorithms	Develop a C program to utilize replacement algorithms	K6
10	Page Replacement Algorithms	Create a C program to make use of page replacement algorithms	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	M	H	L	H	H	H	H	H	L	L	L	-
CO2	H	M	M	M	H	H	H	M	H	L	L	L	-
CO3	H	H	H	M	H	H	H	H	H	H	H	H	H
CO4	H	H	H	M	H	H	H	H	H	H	H	H	H
CO5	H	H	H	M	H	M	H	H	H	H	H	H	H
CO6	H	H	H	M	H	H	H	H	H	H	H	H	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Practical Components): Closed Book
2. Cooperative Learning Report, Assignment, Group Discussion, project Report, Field Visit Report, Seminar.
3. Pre/Post Test, Viva, Report for each Exercise.
4. Lab Model Examination & End Semester Practical Examination

INDIRECT:

1. Course end survey (Feedback)

****

BRIDGE COURSE I: OBJECT ORIENTED PROGRAMMING

SEMESTER: I   **CODE: PB22CA11**
CREDITS: 4   **HOURS/WEEK: …**

1. COURSE OUTCOMES
After the completion of this course the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Recall about evolution and features of C++ and OOPs basics	K1	I
CO2	Construct applications using the concept of Function Overloading	K6	II
CO3	Developing C++ programs using Class and Objects	K6	III
CO4	Apply Friend Function in real time applications	K6	III
CO5	Develop Programs using Operator Overloading	K6	IV
CO6	Develop programs using Virtual functions	K6	V

2A. Syllabus

UNIT I - Introduction to C++ and OOP:
Evolution of C++- The Object-Oriented Technology- Disadvantage of Conventional Programming- Programming Paradigms - Key Concepts of Object-Oriented Programming Advantage of OOP- Object-Oriented Languages – Usage of OOP – Usage of C++.

UNIT II - I/O in C++:
Streams in C++ – Formatted and Unformatted Console I/O Operations - Manipulators – Custom built I/O Objects - **C++ Declarations:** Keyword – Identifiers – Data Types in C++ - Type modifiers – Type Casting – Constants – Operators in C++. **C++ Functions:** Parts of Functions - Passing Arguments – Returning Values – Default Arguments – Inline Function – Function Overloading – Library Functions.

UNIT III - Classes and Objects:
Declaring Objects – Defining member functions - Data hiding and Encapsulation – Classes, Objects and Memory – Static Member Variable and Functions –Array of Objects - Object and Function Arguments – Friend functions – Recursive Member Function – Local Classes – Empty, Static and Const Classes – Member and Non-Member Functions –Overloading Member Functions –

UNIT IV - Constructors and Destructors:
Characteristics – Applications – Overloading Constructors – Copy Constructors - Destructors – Calling Constructors and Destructors – Private Constructors and Destructors. **Operator Overloading:** The Keyword Operator –Overloading Unary & Binary Operators – Type Conversion – Rules for Overloading Operators. **Inheritance:** Access Specifiers and Simple Inheritance –Types of Inheritance –Virtual Base Classes –Object as a Class member - Abstract Classes -Arrays of classes –

UNIT V - Binding, Polymorphism and Virtual Functions:

Binding in C++ -Pointer to derived class Objects –Virtual Functions - Array of Pointers – Abstract Classes – Virtual Functions in Derived Classes . **Exception Handling:** Principles –Exception Handling Mechanism –Catching Multiple Exceptions - Rethrowing and Specifying Exceptions - Exceptions in Constructors and Destructors - Controlling Uncaught Exception.

B. TOPICS FOR SELF-STUDY:

S.No	Topics	Web Link
1	C++ file concept	**https://www.w3schools.com/CPP/cpp_files.asp**
2	Polymorphism concept	**https://www.w3schools.com/CPP/cpp_polymorphism.asp**
3	Storage classes in	**https://www.tutorialspoint.com/cplusplus/cpp_storage_classes.htm**
4	Dynamic memory	**https://www.tutorialspoint.com/cplusplus/cpp_dynamic_memory.htm**

C. Text Book:

1. Ashok N. Kamathane, "Object-Oriented Programming with ANSI and Turbo C++", Pearson Education Pvt. Ltd., New Delhi, 2005**.**

D. Reference Book:

2. Balagurusamy E., "Object-Oriented Programming with C++", 3rd edition TMH Publishing company Ltd., New Delhi, 2006.

E. Web links:

1. **www.W3school.com**
2. **www.tutorialspoint.com**
3. **www.javapoint.com**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Introduction to C++ and OOP**		
1.1	The Object-Oriented Technology- - Programming Paradigms	Recall the History of C++ programming	K1
1.2	Disadvantage of Conventional Programming	Outline the importance of Conventional Programming	K6
1.3	Programming Paradigms	Explain the basic of Programming Paradigms	K6
1.4	Key Concepts of Object-Oriented Programming - –	Recall the basics of Object-Oriented Programming	K1
1.5	Advantage of OOP	Illustrate Advantage of OOP	K2
1.6	Object-Oriented Languages	Explain about Object-Oriented Languages	K6
1.7	Usage of C++	Outline the Usage of C++	K6
II	**I/O in C++**		
2.1	Streams in C++ - –	Illustrate use of stream	K2

2.2	Formatted and Unformatted Console I/O Operations	Illustrate the I/O Operation	K2
2.3	Manipulators	Create programs using Manipulators	K6
2.4	Custom built I/O Objects - **C**++	Illustrate I/O objects	K2
	Declarations		
2.5	Keyword – Identifiers –	Illustrate Keywords and Identifiers	K2
2.6	Data Types in C++	Recall the basics of Data types	K1
2.7	Constants	Illustrate the constant	K2
2.8	Operators in C++	Outline the use of operators	K6
	C++ Functions:		
2.9	Parts of Functions -	Create programs with functions.	K6
2.10	Passing Arguments – Returning Values	Illustrate function arguments	K2
2.11	Function Overloading	Develop programs using Function overloading	K6
III	**Classes and Objects**		
3.1	Declaring Objects –Array of Objects	Illustrate Array of Objects	K2
3.2	Defining member functions	Recall the basics of member function	K1
3.3	Classes, Objects	Recall the basics of class and object	K1
3.4	Static Member Variable and Functions	Illustrate static variable	K2
3.5	Friend functions	Develop program using Friend functions	K6
3.6	Member and Non-Member Functions	Illustrate member function	K2
3.7	Overloading Member Functions	Create program using overloading	K6
IV	**Constructors and Destructors**		
4.1	Characteristics – Applications –	Outline application of constructors	K6
4.2	Overloading Constructors	Illustrate Overloading Constructors	K2
4.3	Copy Constructors -	Create program using Copy Constructors	K6
4.4	Destructors	Illustrate Destructors	K2
4.5	Overloading Unary & Binary Operators –	Create program using Unary & Binary Operators	K6
4.6	Rules for Overloading Operators	Outline Rules for Overloading Operators	K6
		Inheritance	
4.7	Simple Inheritance –--	Recall the basics of Inheritance	K1
4.8	Types of Inheritance	Illustrate Types of Inheritance	K2
4.9	Virtual Base Classes	Create program using Virtual Base Classes	K6
		Abstract Classes	
5.1	Pointer to derived class Objects	**Illustrate** Pointer to derived class Objects	K2
5.2	Virtual Functions -	Outline use of Virtual Functions	K6
5.3	Array of Pointers –	Develop program using Array of Pointers	K6

5.4	Abstract Classes –	Illustrate Abstract Classes	K2
		Exception Handling	
5.5	Exception Handling Mechanism -	Create program using Exception Handling	K6
5.6	Catching Multiple Exceptions	illustrate Multiple Exceptions	K2
5.7	Re throwing and Specifying Exceptions	Develop program using Re throwing Exception	K6
5.8	Controlling Uncaught Exception	Illustrate Controlling Uncaught Exception	K2

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	H	H	M	M	H	M	L	M	H	M	L	-L
CO2	H	H	H	M	M	L	L	L	M	H	M	L	-L
CO3	H	M	H	M	M	L	L	L	M	H	M	L	M-
CO4	H	M	H	M	M	L	L	L	M	H	M	L	M-
CO5	H	M	H	H	L	L	L	L	L	H	L	L	H-
CO6	H	M	H	M	L	M	L	L	L	H	M	L	M -

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

BRIDGE COURSE II: INFORMATION TECHNOLOGY

SEMESTER: I   **CODE: PB22CA12**
CREDITS: 4   **HOURS/WEEK: …**

1. COURSE OUTCOMES
After the successful completion of this course the students will be able to:

S.No.	Course Outcomes	Level	Unit
CO1	Explain the applications of information technology	K5	I
CO2	Distinguish system software and application software	K4	II
CO3	Classify the network topologies	K4	III
CO4	Explain LAN,WAN,MAN	K2	III
CO5	Explain IP Addressing	K2	IV
CO6	Classify the operating system	K4	V

2A. Syllabus

UNIT I - Basics of Information Technology:
        Definition - Information Technology for Business - Technological Trends in IT - Applications of Information Technology - Information technology law **- Introduction to Computers**: Definition - Characteristics of a Computer - Classification of Computers - Basic Anatomy of the Computer - Applications / Uses of Computers in different fields

UNIT II - Input and Output Devices:
        Input Devices **-** Output Devices - Data Representation - Programming Languages / Computer Languages - **Software**: System Software - Application Software - Difference between System Software and Application Software - Device Drivers - Computer Viruses, Bombs, Worms - Types of Viruses

UNIT III - Data Communication and Computer Networks:
        Data Communication - Computer Network - The Uses of a Network - Types of Networks: LAN, MAN, WAN - -Intranet and Extranet - Network Topologies- Transmission Media: Guided Transmission Media - Wireless Transmission

UNIT IV - Internet and its Applications:
        History of Internet - Uses of Internet / Application of Internet-Advantages of Internet - ISP - Internet Services - IP Address - Web Browser - URL - DNS - Internet Explorer - Types of internet connections - E-mail - Search Engine

UNIT V - Operating System:
        Evolution of operating systems - Function of Operating System - Classification of Operating – System - Example of Operating System – DOS –Windows – UNIX - Linux - Difference between Windows and DOS- Difference between Linux and Windows

B. TOPICS FOR SELF-STUDY:

S.No	Topics	Web Link
1	Installing OS	**https://docs.oracle.com/cd/E19121-01/sf.x2100m2/819-6592-13/Chap1.html**
2	Subnetting	**https://www.cisco.com/c/en/us/support/docs/ip/routing-information-protocol-rip/13788-3.html**
3	Ubuntu OS	**https://ubuntu.com/tutorials/command-line-for-beginners#1-overview**
4	Home Wireless Networking	**https://stevessmarthomeguide.com/home-wireless-networking/**

C. Text Books:

1. Introduction to Information Technology Pelin Aksoy, Laura DeNardis, Cengage Learning India Private Limited, 2008.
2. Alexis Leon and Mathews Leon, "Fundamentals of Information Technology", Vikas Publishing House Pvt. Ltd. 2009
3. Dr.P.Rizwan Ahmed, Introduction to Information Technology, Second Edition, Margham Publications, Chennai,2016.

D. Web links:

1. **https://www.ibm.com/cloud/learn/networking-a-complete-guide**
2. **https://www.sophia.org/tutorials/basic-introduction-to-information-technology**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Basics of Information Technology**		
1.1	Information Technology for Business	List the uses of information technology in business.	K1
1.2	Technological Trends in IT	Summarize the technological trends in IT.	K2
1.3	Applications of Information Technology	Explain the applications of Information Technology.	K5
1.4	Information technology law	Outline the information technology Law	K2
1.5	**Introduction to Computers**: Definition	Define computer.	K1
1.6	Characteristics of a Computer	Examine the characteristics of computer	K4
1.7	Classification of Computers	Classify the types of computers	K4
1.8	Basic Anatomy of the Computer	Explain the anatomy of computer	K2
1.9	Applications / Uses of Computers in different fields	List the uses of computers in different fields	K1
II	**Input and Output Devices**		

2.1	Input Devices	List the input devices	K1
2.2	Output Devices	List the output devices	K1
2.3	Data Representation	Outline the representation of data.	K2
2.4	Programming Languages / Computer Languages	Classify the types of computer languages.	K4
2.5	**Software**: System Software	Define system software	K1
2.6	Application Software	Recall application software	K1
2.7	Difference between System Software and Application Software.	Distinguish system software and application software	K4
2.8	Device Drivers	Summarize the functions of device drivers	K2
2.9	Computer Viruses, Bombs, Worms	Summarize the types of viruses, bombs worms.	K2
2.10	Types of Viruses	Categorize the types of viruses	K4
III	**Data Communication and Computer Networks**		
3.1	Data Communication	Define data communication	K1
3.2	Computer Network	Recall computer network	K1
3.3	The Uses of a Network	Summarize the uses of network	K2
3.4	Types of Networks: LAN, MAN, WAN	Explain LAN,MAN,WAN.	K2
3.5	Intranet and Extranet	Explain Intranet	K5
3.6	Network Topologies	Classify the network topologies	K4
3.7	Transmission Media: Guided Transmission Media	Illustrate guided transmission media	K2
3.8	Wireless Transmission	Summarize wireless transmission media	K2
IV	**Internet and its Applications**		
4.1	History of Internet	Outline the history of internet	K2
4.2	Uses of Internet / Application of Internet	List the uses of internet	K1
4.3	Advantages of Internet	Summarize the advantages of internet	K2
4.4	ISP - Internet Services	Explain ISP	K5
4.5	IP Address	Explain IP Addressing.	K2
4.6	Web Browser	Summarize the functions of web browser.	K2
4.7	URL	Outline URL format	K2
4.8	DNS	Elaborate the functioning of DNS	K6
4.9	Internet Explorer	List the features of IE	K1
4.10	Types of internet connections	Summarize the types of internet connections	K2
4.11	E-mail	Explain E-mail protocols	K5

4.22	Search Engine	Summarize the functions of search engine	K2
V	**Operating System**		
5.1	Evolution of operating systems	Outline the evolution of operating system	K2
5.2	Function of Operating System	Elaborate the functions of operating system	K6
5.3	Classification of Operating System	Classify the operating system	K4
5.4	Example of Operating System: DOS –Windows – UNIX - Linux	Explain various types of operating system.	K2
5.5	Difference between Windows and DOS	Distinguish windows and DOS	K4
5.6	Difference between Linux and Windows	Distinguish Linux and windows	K4

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	-	H	L	-	L	L	-	L	H	M	L	M
CO2	H	M	H	-	-	L	-	-	-	H	M	M	M
CO3	H	M	L	L	-	-	-	-	-	H	H	L	L
CO4	H	-	M	M	L	L		-	L	M	M	-	L
CO5	L	-	L	L	H	-	-	-	L	H	M	M	M
CO6	H	-	L	L	H	-	-	-	H	M	L	M	M

L-Low   **M-Moderate**   **H- High**

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1 (Theory): Closed Book
2. Open Book Test.
3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

BRIDGE COURSE III: OBJECT ORIENTED PROGRAMMING LAB

SEMESTER: I   **CODE: PB22CA1P**

CREDITS: 2   **HOURS/WEEK: …**

1. COURSE OUTCOMES

After the successful completion of this course the students will be able to:

S.No.	Course Outcomes	Level	Exercise
CO1	Demonstrate the concept of class and Object	K2	1,2,3,5
CO2	Demonstrate Function Overloading	K6	4
CO3	Develop a C++ program using Constructor and Destructor	K6	7
CO4	Make use of Operator overloading	K2	8
CO5	Apply Inheritance in C++ programming	K3	9
CO6	Develop a C++ program using virtual functions	K6	10

2A. Syllabus

1. **Default Arguments**
   (a) Write a C++ program to find out the Sum of the given Numbers using Default Argument.

2. **Reference Arguments**
   (a) Write a C++ program to Swap Two Numbers using Reference Arguments.

3. **Inline Functions**
   (a) Write a C++ program to Add and Multiply Two integer Numbers using Inline Functions.

4. **Function overloading**
   (a) Write a C++ program using Function Overloading.

5. **Class and objects**
   (a) Process student details using class and objects.
   (b) Create a class to process employee payroll.

6. *Friend Function*
   (a)Write a C++ program to demonstrate the Friend Function.

7. *Constructor & Destructor*
   (a) Write a C++ program to initialize the Complex Number with zero, to initialize with the given values and to read the value.

8. **Operator Overloading**
   (a) Write a C++ program to Overload Unary Operators.
   (b) Write a C++ Program to Add Two Complex Numbers using Binary Operators.

9. **Inheritance**
   (a) Prepare Pay Roll of an Employee using Single Inheritance.
   (b) Prepare Student Mark List using Multilevel Inheritance.

10. Virtual Function

   (a) Demonstrate the use of Virtual Function (run time polymorphism) to find the Area of the Given Object.
      Base class : shape
      Subclass   : circle, square, rectangle, triangle.

B. TOPICS FOR SELF-STUDY:

S.No.	Topics	Web Links
1	C++ file concept	https://www.w3schools.com/CPP/cpp_files.asp
2	Polymorphism concept	https://www.w3schools.com/CPP/cpp_polymorphism.asp
3	Storage classes	https://www.tutorialspoint.com/cplusplus/cpp_storage_classes.htm
4	Dynamic memory	https://www.tutorialspoint.com/cplusplus/cpp_dynamic_memory.htm

C. Text Book:

1. Ashok N. Kamathane, "Object-Oriented Programming with ANSI and Turbo C++", Pearson Education Pvt. Ltd., New Delhi, 2005**.**

D. Reference Book:

1. Balagurusamy E., "Object-Oriented Programming with C++", 3rd edition TMH Publishing company Ltd., New Delhi, 2006.

E. Web links:

1. https://github.com
2. https://swayam.gov.in/NPTEL

3. SPECIFIC LEARNING OUTCOMES (SLO)

Ex.No.	Lab Exercises	Learning Outcomes	Highest Bloom's Taxonomic Level of Transaction
1	find out the Sum of the given Numbers	Develop a C++ Program using Default Argument	K6
2	Swap Two Numbers using Reference Arguments	Create a C++ program using Reference Arguments	K6
3	. Add and Multiply Two integer Numbers using Inline Functions	Build a C++ program implementing Inline Functions	K6
4	. program using Function Overloading	Develop a C++ program using Function Overloading	K6
5	Process student details using class and objects. Create a class to process employee payroll	Create a C++ program to .Class and object	K6
6	demonstrate the Friend Function	Develop a C++ program using Friend function	K6
7	initialize the Complex Number with zero, to initialize with the given values and to read the value	Build a C++ program using Constructor and destructor	K6
8	Overload Unary Operators. Add Two Complex Numbers using Binary Operators	Create a C++ program to .Operator over loading	K6

9	Pay Roll of an Employee using Single Inheritance Prepare Student Mark List using Multilevel Inheritance	Develop a C++ program using Inheritance	K6
10	use of Virtual Function (run time polymorphism) to find the Area of the Given Objec	Build a C++ program using Virtual function	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	M	H	L	H	H	H	H	H	M	M	M	M
CO2	H	M	M	M	H	H	H	M	H	H	M	H	H
CO3	H	H	H	M	H	H	H	H	H	H	H	H	H
CO4	H	H	H	M	H	H	H	H	H	H	H	H	H
CO5	H	H	H	M	H	M	H	H	H	H	H	H	H
CO6	H	H	H	M	H	H	H	H	H	H	H	H	H

L-Low   **M-Moderate**   **H- High**

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Practical Components): Closed Book
2. Cooperative Learning Report, Assignment, Group Discussion, project Report, Field Visit Report, Seminar.
3. Pre/Post Test, Viva, Report for each Exercise.
4. Lab Model Examination & End Semester Practical Examination

INDIRECT:

1. Course end survey (Feedback)

****

Core V: PROGRAMMING IN JAVA

SEMESTER: II   **CODE: P22CA205**
CREDITS: 4   **HOURS/WEEK: 4**

1. COURSE OUTCOMES
After the completion of this course the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Summarize the basics of Object-Oriented Programming	K1	I
CO2	Create programs using methods of Thread class	K6	II
CO3	Construct Java applications using classes of Util and Land Packages	K6	III
CO4	Build interactive applications using AWT and Swing Controls	K6	III
CO5	Design applications with AWT, Swing controls and JDBC/ODBC connectivity	K6	IV
CO6	Develop Web Applications	K6	V

2A. Syllabus

UNIT I
The History and Evolution of Java : The Creation of Java - The Evolution of Java . **An Overview of Java** : Object-Oriented Programming - Two Paradigms - Sample Program – **Introducing Classes** : Declaring Objects – Methods – Method Overloading – Method Overriding – Constructors – A closer look at argument passing – Recursion – Inheritance – Packages and Interfaces – Exception Handling.

UNIT II
Multithreaded Programming : The Java Thread Model - The Main Thread - Creating a Thread - Creating Multiple Threads - Uing isAlive( ) and join( ) - Thread Priorities -Synchronization. **Input/Output: Exploring java.io:** The I/O classes and interfaces – I/O Exceptions – The Stream Classes – The Byte Streams – The Character Streams- The Console class – Serialization – Lambda Expressions – Modules - String Handling – Generics

Unit III
Exploring java.lang: Primitive type wrappers – System – Math – Throwable. **Java.util:** The Collection Framework: Collections Overview – The collection interfaces – **The Collection classes**: ArrayList – LinkedList – HashSet – TreeSet -   Accessing a Collection via an Iterator - Working with Maps – The Legacy classes and Interfaces - **More Utility Classes** : Date – StringTokenizer – Date – Calendar – Locale – Random – Time and TimerTask – Scanner - **Networking**: Networking basics – InetAddress – TCP/IP – URL – Datagrams

UNIT IV:
Event Handling : Two Event Handling Mechanisms - The Delegation Event Model - Event Classes - The KeyEvent Class - Sources of Events - Event Listener Interfaces - Using the Delegation Event Model - Adapter Classes - Inner Classes. **Introducing the AWT**: Working with Windows, Graphics, and Text : AWT Classes - Window Fundamentals - Working with Frame Windows - Introducing Graphics - Working with Color - Setting the Paint Mode - Working with Fonts - Managing Text Output Using FontMetrics. Using AWT Controls, Layout Managers, and Menus. **Introducing Swing**: Exploring Swing – Introducing Swing Menus – Database Connectivity - JDBC/ODBC connectivity steps – Simple Applications

Unit V : Web application basics- Definition-Distributed system-Available Frontends and Backends to develop web applications-Various IDE configurations- Multitiered architecture- HTTP request and response- HTTP methods-**Java Servlets:** Java Servlets -A Simple Java Servlet-Anatomy of a Java Servlet. **Java ServerPages: JSP**-JSP Tags-Tomcat-Adding jar dependencies- Creating sample web application with database connectivity -CRUD-Hibernate.

B. TOPICS FOR SELF-STUDY:

S. No	Topics	Web Link
1	Frameworks	**https://www.javatpoint.com/what-is-framework-in-java**
2	Spring	**https://www.tutorialspoint.com/spring/index.htm**
3	Robot	**https://www.edureka.co/blog/robot-class-java/**
4	Struts	**https://www.tutorialspoint.com/struts_2/index.htm**

C. Text Books:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2018.

D. Reference Books:

1. Jim Keogh, "J2EE: The Complete Reference", Tata McGraw Hill Publishing Company, New Delhi 2010.
2. Ken Arnold, James Gosling, David Holmes, "Java™ Programming Language", Fourth Edition, Addison Wesley Profession, 2005.
3. Paul J. Deitel, Harvey M. Deitel, "Java™ for Programmers", Second Edition*,* PHI Publications, 2011.

E. Web links:

1. **www.geeksforgeeks.org**
2. **www.codeproject.com**
3. **www.stackoverflow.com**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**The History and Evolution of Java**		
1.1	The Creation of Java	Recall the History of Java programming	K1
1.2	The Byte Code	Outline the importance of Byte Code	K6
1.3	Java Buzzwords	List out the Java Buzzwords	K2
	An Overview of Java		
1.4	Overview of Java	Recall the basics of Java Programming	K1
	Introducing Classes		
1.5	Classes	Create a Class and access the members of the class using objects	K6
1.6	Methods	Construct Programs using Methods	K6

		Inheritance	
1.7	Inheritance and its types	Evaluate inheritance and its types	K4
		Packages	
1.8	Packages	Create packages and import them	K6
		Interfaces	
1.9	Interfaces	Illustrate the mechanisms in interfaces	K2
		Exception Handling	
1.10	Exception Handling	Create exceptions and handle the same with catch	K6
1.11	User Defined Exceptions	Illustrate User defined exceptions	K2
II		**Multi-Threaded Programming**	
2.1	By Extending a Thread Class	Construct programs by extending a thread class	K6
2.2	By implementing Runnable Interface	Construct programs by implementing runnable interfaces	K6
		Input/Output: Exploring java.io	
2.3	The Stream Classes	Construct programs using Stream Classes	K6
2.4	The Character Streams	Construct programs using character streams	K6
2.5	Console Class	Create console applications	K6
2.6	Serialization	Demonstrate Serialization	K5
2.7	Lambda Expressions	Illustrate Lambda Expressions	K3
2.8	Modules	Illustrate Modules in Java	K3
		String Handling	
2.9	Strings	Create programs with string handling functions.	K6
2.10	Generics	Illustrate Generics	K3
III		**Exploring java.lang**	
3.1	Primitive Type Wrappers	Apply Primitive Type wrappers	K3
3.2	System	Apply System class	K3
3.3	Math	Apply Math class	K3
		Java.util	
	The Collections Framework		
3.4	Collections Overview	Construct programs using functions and do recursion	K6
3.5	The Collection Interfaces	Apply string handling functions	K3
3.6	Collection Classes	Compare Collection classes such as ArrayList, LinkedList, HasSet and TreeSet	K5
3.7	Accessing a Collection via an Iterator	Illustrate accessing collection with an iterator	K2
		Utility classes	
3.8	StringTokenizer	Create Class and invoke class members	K6
3.9	Date	Create a Class and access the members of the class using objects	K6
3.10	Calendar	Create applications using Calendar class	K6
3.11	Locale	Create applications using Lacale	K6

3.12	Random	Construct programs using Random class	K6
3.13	Time and TimerTask	Illustrate Time and TimerTask	K3
3.14	Scanner	Illustrate Scanner class	K3
IV		**Event Handling**	
4.1	Event Classes	Demonstrate Event Classes	K5
4.2	Event Listeners	Demonstrate Event Listeners	K5
		Introducing the AWT	
4.3	AWT	Apply modules and Python packages	K3
4.4	Working with Windows	Illustrate various programs for word count and copy file	K2
4.5	Graphics and Text	Recall the basics of Graphics and Text	K3
4.6	Using AWT controls	Construct programs using different AWT controls	K6
		Layout Managers and Menus	
4.7	Layouts	Recall the basics of layouts	K3
4.8	Types of Layouts	Create java programs using different layouts	K6
4.9	Menus	Apply menus in java programs	K3
	Introducing Swing		
4.10	Exploring Swing	Compare the working procedure of Swings with AWT controls	K4
		Java Database Connectivity	
4.11	Database Operations	Create a Java program to insert, delete and update into a database	K6
		Web Applications Basics	
5.1	Definition	Define Web Application	K1
5.2	Front ends and Backends to develop Web Applications	Recall the frontends and backends to develop web applications	K1
5.3	Http Methods	Illustrate HTTP methods	K3
		Java Servlets	
5.4	Simple Java Servlets	Construct servlet programs	K6
		JSP	
5.4	JSP Applications	Construct JSP programs	K6
5.5	CRUD	Demonstrate CRUD	K5
5.6	Hibernate	Explain Hibernate	K5

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	H	H	M	M	H	M	L	M	H	M	L	-
CO2	H	H	H	M	M	L	L	L	M	H	M	L	-
CO3	H	M	H	M	M	L	L	L	M	H	M	L	-
CO4	H	M	H	M	M	L	L	L	M	H	M	L	-
CO5	H	M	H	H	L	L	L	L	L	H	L	L	-
CO6	H	M	H	M	L	M	L	L	L	H	M	L	-

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

SEMESTER: II   **CODE: P22CA206**
CREDITS: 4   **HOURS/WEEK: 4**

1. COURSE OUTCOMES:

After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Analyze the concepts in database management systems	K4	I
CO2	Design ER model to represent database application scenarios	K6	II
CO3	Improve the database design by normalization	K6	II
CO4	Examine the use of indexing and hashing technique used in database design	K4	III
CO5	Explain the concepts of transaction management.	K5	IV
CO6	Create a database using SQL and PL/SQL	K6	V

2A. Syllabus

UNIT I - Introduction to Database   **12 Hours**
Introduction: Database System Applications – Database Systems vs File Systems – View of data – Data Models – Database Languages – Database Users and Administrators – Transaction Management – Database System Structure – Application Architectures. Entity – Relationship model: Basic Concepts – Constraints – Keys – Entity – Relationship Diagram – Weak entity Sets – Extended E–R Features. Relational Model: Structure of Relational Database – Relational Algebra–Extended Relational Algebra Operations.

UNIT II - Relational Database Design and Integrity   **12 Hours**
Integrity and security: Domain Constraints Referential Integrity – Assertions – Security and Authorization – Authorization in SQL – Encryption and Authentication. **Relational Database Design:** First Normal Form – Pitfalls in Relational Database Design – Functional Dependencies – Decomposition – Desirable Properties of Decomposition – Boyce Codd Normal Form – Third Normal Form – Fourth Normal Form – More normal Forms.

UNIT III - File Structure and Indexing   **12 Hours**
Storage and File Structure: RAID – File Organization – Organization of Records in Files – Dictionary Storage. **Indexing and Hashing**: Basic Concepts – Ordered Indices – B+ – Tree Index Files – Static Hashing – Dynamic Hashing.

UNIT IV - Transaction Management and Concurrency control   **12 Hours**
Transaction Management: Transactions Concept – Transaction state – Implementation of Atomicity and Durability – Concurrent Executions– Serializability –**Concurrency control:** Lock Based Protocols – Timestamp Based Protocols – Validation Based Protocols – **Recovery system:** Failure classification – Storage Structure – Recovery and Atomicity – Log Based Recovery–Shadow Paging.

UNIT V - Oracle   and PL/SQL   **12 Hours**
Introduction to Oracle: Classification of SQL Commands – Data Types – Operators – Built in functions – Sorting – Joins – Special Operators: Set Operators. **Indexing:** Removing Index – Creating Index on Multiple Columns. **Views:** Creating and Accessing – Classification of Views. **PL/SQL:**

Introduction – Advantages of PL/SQL – Structure of PL/SQL Block – Conditional Statement – Stored Functions: Structure of Function – Compiling a Function – Calling a Function. **Stored Procedures:** Advantages of Procedures – Why Called "Stored Procedures"? – Differences between Procedures and Functions – Compiling a Procedure – Executing a Procedure. **Cursors:** What is Cursor? – Purpose of Cursors – Classification of Cursors.**Database Triggers:** Components of Trigger–Types of Triggers.

B. TOPICS FOR SELF STUDY:

S.No	Topics	Web Link
1	Object Oriented Database	**www.tutorialspoint.com**
2	Client-Server Architecture	**www.geeksforgeeks.org**
3	Data Warehouse	**www.talend.com**
4	Distributed database	**www.geeksforgeeks.org**

C. Text Books:
1. Abraham Silberchatz, Henry F. Korth and S. Sudharshan, "Data Base System concepts" Mc Graw Hill, Fifth Edition, 2006.
2. Satish Asnani, "Oracle Database 11g –Hands–on SQL and PL/SQL", PHI Learning, 2010.

D. Reference Books:
1. C.J. Date, A. Kannan, S.Swamynathan, "Introduction to Database Systems", Pearson Education, Eighth Edition 2006.
2. RamezElmasri, "Fundamentals of Database Systems", Pearson Education, 2008.

E. Web links:

1. **https://swayam.gov.in/nd1_noc19_cs51/**
2. **https://nptel.ac.in/courses/106106144/**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Database Systems Overview**		
1.1	Database Systems	Recall the basic concepts of database systems	K1
1.2	Database System Applications	Summarize the applications of database system	K2
1.3	Data Models	Classify data models	K4
1.4	Database Languages	Categorize database languages	K4
1.5	Database System Structure	Discuss the structure of a database system	K6
	Design of E-R Diagram		
1.6	Transaction Management	Explain transaction management	K2
1.7	E- R model	Identify the purpose of E-R model	K3

1.8	Constraints and keys	Make use of constraints & keys	K3
1.9	E- R Diagram	Construct E- R diagram model	K6
1.10	Relational Algebra	Solve relational algebra.	K3
II	**Integrity and Security**		
2.1	Domain Constraints	Utilize domain constraints	K3
2.2	Referential integrity	Apply referential integrity in tables	K3
2.3	Security and Authorization	Outline security and authorization in SQL	K2
2.4	Encryption and Authentication.	Test encryption and authentication in SQL	K6
	Types of Normal Form		
2.5	First Normal Form	Apply first normal form in tables	K3
2.6	Functional dependencies	Utilize functional dependencies In relational	K3
2.7	Decomposition	Make use of decomposition concepts	K3
2.8	BCNF	Compare BCNF and 4NF	K4
2.9	Third Normal Form	Examine third normal form in tables	K4
2.10	Fourth Normal Form	Evaluate fourth normal form in tables	K5
III	**Storage and File Structure**		
3.1	File Organization	Summarize file organization	K2
3.2	RAID	Compare the levels in RAID	K5
3.3	Organization of Records	Plan the organization of records	K3
3.4	Dictionary Storage	Make use of dictionary storage	K3
	Indexing and Hashing		
3.5	Basic Concepts	Recall the basic concepts of indexing	K1
3.6	Ordered Indices	Outline ordered Indices	K2
3.7	B+ Tree Index Files	Construct B+ tree index files	K6
IV	**Transaction Management**		
4.1	Transactions Concept	Outline the concepts in transactions	K2
4.2	Transaction state	Summarize the states of a transaction	K2
4.3	Concurrent Executions	List the advantages of concurrent execution	K1
4.4	Serializability	Interpret serializability	K2
	Concurrency Control and Recovery		
4.5	Lock based protocols	Apply lock-based protocols	K3
4.6	Timestamp Based Protocols	Predict the timestamp	K6
4.7	Failure classification	Classify the types of failures	K4
4.8	Recovery and Atomicity	Recall the definition of recovery and atomicity	K1
4.9	Log Based Recovery	Apply log-based recovery for retrieving the database	K3
V	**Introduction to Oracle**		

5.1	Classification of SQL commands	Categorize SQL commands	K4
5.2	Data Types and Operators	Utilize data types and operators in SQL	K3
5.3	Built-in functions	Analyze the built-in functions in SQL	K4
5.4	Sorting and Joins	Examine sorting and join methods	K3
5.5	Set operators	Experiment with set operations	K3
	Indexing and Views		
5.6	Create &Remove Index	Create Indices	K6
5.7	Create Views	Create views in a table	K6
5.8	Classification of Views	Classify the different types of views	K4
	PL/SQL and Stored Procedure		
5.9	Structure of PL/SQL Block	Illustrate the structure of PL/SQL Block	K2
5.10	Conditional Statement	Make use of conditional statement	K3
5.11	Structure of Function	Explain the structure of function	K2
5.12	Advantages of Procedures	List the advantages of procedures	K1
5.13	Executing a Procedure	Test the execution of a procedure	K6
	Cursors and Triggers		
5.14	Purpose of Cursors	Summarize the uses of cursors.	K2
5.15	Classification of Cursors	Classify cursors.	K4
5.16	Components of Trigger	Utilize the components of triggers	K3
5.17	Types of Triggers.	Compare the types of triggers	K4

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	-	L	L	-	-	M	H	L	M	-		M
CO2	H	H	L	M	M	H	M	L	H	H	H	M	-
CO3	H	H	H	M	H	H	H	M	H	H	L	L	L
CO4	H	H	H	H	H	M	M	H	H	H	H	M	M
CO5	H	H	L	M	M	H	M	L	H	M	M	L	L
CO6	H	H	M	H	H	M	H	M	M	H	H	H	H

L-Low   **M-Moderate**   **H- High**

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book

2. Open Book Test.

3. Assignment, Group Presentation, Group Discussion, project Report, Presentation, Seminar.

4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

SEMESTER: II   **CODE: P22CA207**
CREDITS: 4   **HOURS/WEEK: 4**

1. COURSE OUTCOMES
After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Summarize the basic concepts of data structures	K2	I
CO2	Distinguish the applications of various binary tree	K4	II
CO3	Decide the applications that can make use of graph structures	K5	III
CO4	Test various algorithms for sorting	K6	IV
CO5	Solve shortest path problems	K6	V
CO6	Construct applications by applying graph coloring	K6	V

2A. Syllabus

UNITI - Introduction to Data structure   **12 Hours**
        Introduction and Overview: Definitions – Concept of Data Structures – Overview of Data Structures – Implementation of Data Structures. **Linked Lists:** Definition – Single Linked List – Circular Linked List – Double Linked List – Circular Double Linked List – Application of Linked Lists. **Stacks:** Introduction – Definition – Representation of Stack – Operations on Stacks – Application of Stacks. **Queues:** Introduction – Definition – Representation of Queues – Various Queue Structures– Application of Queues.

UNIT II - Tree and Binary Tree   **12 Hours**
        Trees : Basic Terminologies – Definition and Concepts – Representation of Binary Tree – Operations on Binary Tree – Types of Binary Trees – Trees and Forests – B Trees .

UNIT - III - Graphs and Algorithm Analysis   **12 Hours**
        Graphs: Introduction – Graph Terminologies – Representation of Graphs – Operations on Graphs – Applications of Graph Structures – BDD and its Applications. **Introduction:** What is an Algorithm? – Algorithm Specification – Performance Analysis**.**

UNIT IV - Divide–and–Conquer and Greedy Method   **12 Hours**
        Divide–and–Conquer: General Method – Binary Search – Finding the Maximum and Minimum – Merge Sort – Quick Sort – Selection. **The Greedy Method:** The General Method – Minimum Cost Spanning Trees – Single–Source Shortest Paths.

UNIT V - Dynamic Programming and Backtracking   **12 Hours**
        Dynamic Programming: The General Method – Multistage Graphs – All Pairs Shortest Paths – Single Source Shortest Paths. **Backtracking:** The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring.

B. TOPICS FOR SELF-STUDY:

S.No	Topics	Web Link
1	Graph Traversal	**www.tutorialspoint.com**
2	AVL Tree	**www.geeksforgeeks.com**
3	Tree Traversal	**www.geeksforgeeks.com**
4	Heap	**www.tutorialspoint.com**

C. Text Books:
1. Samanta D, "Classic Data Structures", Prentice Hall of India, 2006.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publications, Second Edition, 1998.

D. Reference Books:
1. V. Aho, J. E. Hopcroft, and J. D. Ullman, " and Algorithms", Pearson Education, 2008.
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education 2003.

E. Web links:
1. **https://swayam.gov.in/nd1_noc19_cs51**
2. **https://nptel.ac.in/courses/106106144**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Basics of Data Structures**		
1.1	Data Structure Basics	Recall the basic concepts of data structures	K1
1.2	Outline the operations on data structure	Demonstrate the operations on data structure	K2
1.3	Single Linked List	Choose single linked list for suitable applications	K6
1.4	Doubly Linked List.	Decide the applications for using doubly linked list.	K5
	Stacks and Queue		
1.5	Operations on Stack	Explain the operations on stack	K2
1.6	Application of Stack	Outline the applications of stack	K2
1.7	Representation of Queues	Explain the representation of queues	K2
1.8	Application of Queue	Discuss about applications of queue	K6
II	**Tree and Binary Tree Concepts**		
2.1	Tree Basics	Recall the basic concepts of tree	K1
2.2	Binary Tree	Define binary tree	K1
2.3	Representation of binary tree	Explain the representation of binary tree	K2
2.4	Operation on binary tree	Demonstrate operations on binary tree	K2
2.5	Types of binary trees	Compare various types of binary trees	K4
2.6	B Tree	Discuss about B Tree	K6
2.7	Forest	Define forest	K1
III	**Graphs and Algorithm**		
3.1	Graph Basics	Make use of graph structures	K3

3.2	Representation of Graphs	Decide application types that can use graph representations	K5
3.3	Applications of Graphs	Apply graph structures for various applications	K3
	Algorithm		
3.4	Algorithm Basics	Define algorithm	K1
3.5	Performance analysis	Test for the performance analysis on an algorithm	K4
IV	**Divide and Conquer**		
4.1	Divide and Conquer algorithms	Solve problems using divide and conquer algorithm	K6
4.2	Binary search algorithm.	Examine binary search algorithm	K4
4.3	Merge Sort	Test the use of merge sort	K6
4.4	Quick Sort	Utilize quick sort algorithm for sorting	K3
4.5	Selection Sort	Apply selection sort algorithm	K3
	Greedy Method		
4.6	Greedy algorithms	Select greedy algorithms for problem solving	K5
4.7	Shortest path algorithm	Evaluate shortest path algorithms	K5
4.8	Minimum cost Spanning Tree	Build minimum cost spanning trees for shortest path finding problems	K6
V	**Dynamic Programming and Backtracking**		
5.1	Dynamic Programming	Determine the uses of dynamic programming	K5
5.2	Multistage Graphs	Construct multi stage graphs for problem solving	K6
5.3	All Pairs Shortest Paths	Test all pairs shortest path algorithms	K6
5.4	Backtracking	Formulate problem solving with backtracking algorithms	K6
5.5	The 8-Queens Problem	Solve 8-queens problem	K6
5.6	Graph Coloring	Build applications using graph coloring algorithms	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	-	-	-	-	-	-	-	-	-	-	-	L	-
CO2	-	L	-	L	-	-	-	M	-	-	-	L	-
CO3	-	M	-	H	-	-	-	H	M	-	M	M	-
CO4	-	-	-	-	L	-	L	L	M	-	L	M	-
CO5	H	H	-	H	M	-	M	H	H	-	H	H	-
CO6	H	H	-	H	H	-	M	H	H	-	H	H	-

L-Low   **M-Moderate**   **H- High**

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

Elective II : SOFT COMPUTING

SEMESTER: II

CREDITS: 3

CODE: P22CA2:A

HOURS/WEEK: 4

1. COURSE OUTCOMES

After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Summarize the Soft Computing techniques, their development and features	K2	I
CO2	Analyze the basic concept of Artificial Neural Network and its models	K4	II
CO3	Explain the importance of various supervised learning techniques	K5	III
CO4	Discuss the various types of defuzzification methods.	K6	IV
CO5	Formulate the formation of Fuzzy rules and reasoning based on Fuzzy rules	K5	IV
CO6	Make use of the knowledge in Genetic algorithms to solve optimization problem	K3	V

2A. Syllabus

UNIT I - Introduction to Soft Computing **12 Hours**

Introduction: Artificial Neural Network– Advantages of Neural Networks– Fuzzy Logic– Genetic Algorithms–Hybrid Systems– Neuro Fuzzy Hybrid Systems – Neuro Genetic Hybrid Systems– Fuzzy Genetic Hybrid Systems.

UNIT II - Artificial Neural Networks **12 Hours**

Artificial Neural Networks– Fundamental Concept– Evolution of Neural Networks– Basic Models of Artificial Neural Network– Terminologies of ANNs– McCulloch-Pitts Neuron– Linear Separability – Hebb Network.

UNIT III - Supervised Learning Network **12 Hours**

Supervised Learning Network– Perceptron Networks–Adaptive Linear Neuron (Adaline) – Multiple Adaptive Linear Neurons–Back Propagation Network–Radial Basis Function Network.

UNIT IV - Introduction to Fuzzy Logic **12 Hours**

Introduction to Fuzzy Logic – Classical Sets–Operations on Classical Sets – Fuzzy Sets, –Fuzzy Relations–Membership Functions–Defuzzification–Fuzzy Arithmetic and Fuzzy Measures– Fuzzy Rule base and Approximate Reasoning– Fuzzy Decision Making– Fuzzy Logic Control System.

UNIT V - Genetic Algorithms **12 Hours**

Genetic Algorithms – Introduction– Traditional Optimization and Search Techniques –Genetic Algorithm and Search Space– Genetic Algorithms vs. Traditional Algorithms– Basic Terminologies in Genetic Algorithm– Simple GA– General Genetic Algorithm– The Schema Theorem–Classification of Genetic Algorithm–Holland Classifier System–Genetic Programming– Applications of GA.

B. TOPICS FOR SELF-STUDY:

S.No	Topics	Web Link
1	Fuzzy Graph Theory	**https://www.mdpi.com/2227-7390/7/1/63/html**
2	Artificial Intelligent Methods for Handling Spatial Data	**https://www.bokus.com/bok/9783030002374/artificial-intelligent-methods-for-handling-spatial-data/**
3	Fuzzy Measures and Integrals	**https://hal.archives-ouvertes.fr/hal-01477514/document**
4	Hybrid Soft Computing Models to Graph Theory	**https://www.knygos.lt/lt/elektronines-knygos/hybrid-soft-computing-models-applied-to-graph-theory-19pso/**

C. Text Book:

1.Dr.S.N. Sivananda, Dr.S.N. Deepa, Principles of Soft Computing, Wiley India Edition, 2011.

D. Reference Books:

1. F.O. Karray& C.D. Silva Soft Computing and Intelligent Systems Design – theory, tools and applications, Pearson Education, 2009

2. J.S.R. Jang, C.T. Sun & E. MizutaniNeuro-Fuzzy and Soft Computing – A computational approach to learning and machine intelligence, Pearson Education, 2004.

E. Web links:

1. **www.tutorialspoint.com**
2. **www.geeksforgeeks.org**
3. **www.javatpoint.com**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Introduction**		
1.1	Artificial Neural Network:Definition	Define Artificial Neural Network	K1
1.2	Advantages of Neural Networks	Summarize the advantages of Neural Networks	K2
1.3	Fuzzy Logic	Outline Fuzzy Logic	K2
1.4	Genetic Algorithms	Explain Genetic Algorithm	K2
	Hybrid Systems		
1.5	Neuro Fuzzy Hybrid Systems	Combine Fuzzy and Neural Networks	K6
1.6	Neuro Genetic Hybrid Systems	Apply Genetic algorithm and Neural Networks for problem solving	K3
1.7	Fuzzy Genetic Hybrid Systems	Make use of Fuzzyand Genetic algorithms	K3
II	**Artificial Neural Networks**		
2.1	Fundamental Concepts of ANN	Explain the Fundamentals of Artificial Neural Network	K2

2.2	Evolution of Neural Networks	Outline the development of Neural Networks	K1
2.3	Basic Models of Artificial Neural Network	Construct the models of ANN	K3
2.4	Terminologies of ANNs	Make use of the terminologies of ANN	K3
2.5	McCulloch-Pitts Neuron	Design the McCulloch-Pitts Neuron model	K4
2.6	Linear Separability	Discuss the concept of linear separability	K6
2.7	Hebb Network	Analyze Hebb network	K2
III	**Supervised Learning Network**		
3.1	Perceptron Networks	Discuss the Perceptron Networks.	K6
3.2	Adaptive Linear Neuron (Adaline)	Build the Adaline model	K6
3.3	Multiple Adaptive Linear Neurons	Design the multiple adaptive linear neurons	K6
3.4	Back Propagation Network	Propose the various learning factors	K6
3.5	Radial Basis Function Network.	Create radial basis function network	K3
IV	**Introduction to Fuzzy Logic**		
4.1	Classical Sets	Define the classical sets	K1
4.2	Operations on Classical Sets	List various operations on classical sets	K1
4.3	Fuzzy Sets	Examine the properties of Fuzzy Sets	K4
4.4	Fuzzy Relations	Importance of Fuzzy Relations	K5
4.5	Membership Functions	Discuss the Membership Function	K6
4.6	Defuzzification	Make use of Defuzzification	K3
4.7	Fuzzy Arithmetic and Fuzzy Measures	Summarize the concepts involved in Fuzzy Arithmetic	K2
4.8	Fuzzy Rule base and Approximate Reasoning	Apply Fuzzy Rule for reasoning	K3
4.9	Fuzzy Decision Making	Discuss the types of Fuzzy Decision Making	K6
4.10	Fuzzy Logic Control System.	Design a general Fuzzy Logic Control System	K6
V	**Genetic Algorithms**		
5.1	Introduction to Genetic Algorithms	Explain the natural evolution	K2
5.2	Traditional Optimization and Search Techniques	Discuss the different types of optimization method	K2
5.3	Genetic Algorithm and Search Space	Solve problemsusingsearch space	K6
5.4	Genetic Algorithms vs. Traditional Algorithms	Compare traditional algorithm and GA	K4
5.5	Basic Terminologies in Genetic Algorithm	List out the terminologies in Genetic Algorithm	K1

5.6	Simple GA	Explain the operational flow of simple GA	K2
5.7	General Genetic Algorithm	Make use of the General Genetic Algorithm	K3
5.8	The Schema Theorem	Prove the result on the behavior of GA	K5
5.9	Classification of Genetic Algorithm	Classify Genetic Algorithms	K2
5.10	Holland Classifier System	Adapt the concepts involved in Holland Classifier System	K6
5.11	Genetic Programming	Examine the features properties of Genetic Program	K4
5.12	Applications of GA	Discuss the applications of GA	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	-	L	-	-	-	M	H	L	M	-	-	M
CO2	H	H	M	H	M	H	M	L	H	H	H	M	-
CO3	H	H	M	H	H	H	H	M	H	H	L	L	L
CO4	H	H	H	H	H	M	M	H	H	H	H	M	M
CO5	H	H	M	H	M	H	M	L	H	M	M	L	L
CO6	H	H	H	H	H	M	H	M	M	H	H	H	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

<div align="center">**ELECTIVE II: DATAWAREHOUSING AND DATA MINING**</div>

SEMESTER: II   **CODE: P22CA2:B**
CREDITS: 3   **HOURS/WEEK: 4**

1. COURSE OUTCOMES
After the successful completion of this course the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Summarize the basic concepts in data mining and the techniques in knowledge mining	K2	I
CO2	Analyze the fundamentals of Data Preprocessing	K4	II
CO3	Apply the various concepts of Data Warehousing and Online Analytical Processing for forecasting	K3	II
CO4	Elaborate the techniques in classification	K6	III
CO5	Analyze the cluster algorithms	K4	IV
CO6	Estimate the knowledge of Outlier Detection, Data Mining Trends and Research Frontiers	K6	V

2A. Syllabus

UNIT I - Data Mining Introduction and Preprocessing   **12 Hours**
        Introduction: Why Data Mining? – What is Data Mining? – What Kinds of Patterns can be Mined? – Which Technologies Are Used? – Which Kinds of Applications Are Targeted? – Major issues in Data Mining. **Data Preprocessing**: **Data Preprocessing:** An Overview – Data Clearing – Data Integration – Data Reduction – Data Transformation and Data Discretization.

UNIT II - Data Warehousing Concepts   **12 Hours**
        Data Warehousing and Online Analytical Processing: Data Warehouse: Basic Concepts – Data Warehouse Modeling: Data Cube and OLAP – Data Warehouse Design and Usage – Data Warehouse Implementation – Data Generalization by Attribute – Oriented Induction.

UNIT III - Patterns and Classification Techniques   **12 Hours**
        Mining Frequent Patterns, Associations, and Correlations: Basics Concepts and Methods: Basic Concepts – Frequent Itemset Mining Methods. **Classification: Basic Concepts:** Basic Concepts – Decision Tree Induction – Rule Based Classification – Lazy Learners.

UNIT IV - Cluster Analysis Concepts and Techniques   **12 Hours**
        Cluster Analysis: Basic Concepts and Methods: Cluster Analysis – Partitioning Methods – Hierarchical Methods – Density Based Methods – Grid Based Methods.

UNIT V - Outlier Detection Techniques   **12 Hours**
Outlier Detection: Outliers and Outlier Analysis–Outlier Detection Methods – Statistical Approaches – Proximity based Approaches – Clustering based Approaches – Classification based Approaches. **Data Mining Trends and Research Frontiers:** Data Mining Applications.

B. TOPICS FOR SELF STUDY:

S.No	Topics	Web Link
1	Baye's Theorem	**https://www.tutorialspoint.com/data_mining/dm_bayesian_classification.htm**
2	Backpropagation	**https://towardsdatascience.com/understanding-backpropagation-algorithm**
3	Rule-based classification	**https://www.tutorialspoint.com/data_mining/dm_rbc.htm**
4	Clustering Evaluation Measuring Clustering Quality	**https://www.coursera.org/lecture/cluster-analysis/6-2-clustering-evaluation-measuring-clustering-quality-RJJfM**

C. Text Book:
  1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, rgan Kaufmann, 2012.

D. Reference Books:
  1. Margaret H.Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education, 2003.
  2. Arun K.Pujari, "Data Mining Techniques", University Press, 2001.

E. Web links:
  1. **https://swayam.gov.in/**
  2. **https://nptel.ac.in/**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Introduction**		
1.1	Why Data Mining?	Recall the basic concepts of Data Mining.	K1
1.2	What is Data Mining?	Illustrate the applications of Data Mining.	K2
1.3	What Kinds of Patterns can be Mined?	Discuss about the kinds of patterns.	K6
1.4	Which Technologies Are Used?	Identify the technologies used in data mining	K2
1.5	Which Kinds of Applications Are Targeted?	Discuss about kinds of mining applications.	K6
1.6	Major issues in Data Mining	List out themajor issues in data mining	K4
	Data Preprocessing: Data Preprocessing		
1.7	An Overview	Discuss about preprocessing techniques	K6
1.8	Data Clearing	Illustrate data cleaning	K2
1.9	Data Integration	Elaborate data integration	K6
1.10	Data Reduction	Explain data reduction	K2

1.11	Data Transformation and Data Discretization	Compare data transformation and data discretization	K5
II	**Data Warehousing and Online Analytical Processing**		
2.1	Data Warehouse	Discuss data warehouse	K6
2.2	Basic Concepts	Explain basic concept of data warehousing	K2
2.3	Data Warehouse Modeling	Build a data warehouse model	K6
2.4	Data Cube and OLAP	Compare Cube and OLAP	K5
2.5	Data Warehouse Design and Usage	Discuss data warehouse design and usage	K6
2.6	Data Warehouse Implementation	Explain data warehouse implementation	K2
2.7	Data Generalization by Attribute	List data generalization by attribute	K1
2.8	Oriented Induction	Illustrate oriented induction	K2
III	**Mining Frequent Patterns, Associations, and Correlations: Basics Concepts and Methods**		
3.1	Basic Concepts	Illustrate the basic concepts of mining	K2
3.2	Frequent Itemset Mining Methods	Discuss frequent itemset mining methods	K6
	Classification: Basic Concepts:		
3.3	Basic Concepts	Explain basic concepts the classification	K2
3.4	Decision Tree Induction	Builddecision tree induction	K3
3.5	Rule Based Classification	Discuss rule-based classification	K6
3.6	Lazy Learners	Develop lazy learners	K3
IV	**Cluster Analysis: Basic Concepts and Methods**		
4.1	Cluster Analysis	Explain cluster analysis	K2
4.2	Partitioning Methods	Illustrate partitioning methods	K2
4.3	Hierarchical Methods	Discuss hierarchical methods	K6
4.4	Density Based Methods	Analyze density-based methods	K4
4.5	Grid Based Methods	Outline grid-based methods	K2
V	**Outlier Detection**		
5.1	Outliers and Outlier Analysis	Compare outliers and outlier analysis	K4
5.2	Outlier Detection Methods	Explain outlier detection methods	K2
5.3	Statistical Approaches	List statistical approaches	K1
5.4	Proximity based Approaches	Discuss the proximity-based approaches	K6
5.5	Clustering based Approaches	Analyze clustering-based approaches	K4
5.6	Classification based Approaches	Construct classification-basedapproaches	K3
	Data Mining Trends and Research Frontiers		
5.7	Data Mining Applications	Build data mining applications	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	M	L	M	M	L	M	M	L	H	M	M	M

CO2	M	H	M	L	M	L	M	M	M	H	M	M	L
CO3	M	M	M	L	M	M	L	M	L	H	M	H	M
CO4	M	M	L	M	M	M	M	L	M	M	M	M	H
CO5	H	M	H	M	H	M	H	H	H	M	H	M	H
CO6	H	H	H	H	H	M	M	M	L	M	M	M	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book

2. Open Book Test.

3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project
   Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).

4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

ELECTIVE II: ARTIFICIAL INTELLIGENCE

SEMESTER: II
CREDITS: 3

CODE: P22CA2: C
HOURS/WEEK: 4

1. COURSE OUTCOMES:
After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Apply the fundamentals of Artificial Intelligence (AI) and its foundations for solving AI problems	K3	I
CO2	Solve real life problems using AI techniques like searching and game playing in a state space representation	K6	II
CO3	Propose solutions using knowledge representation,logic and heuristic search for AI problems	K6	III
CO4	Compare the different types of intelligent agents,ExpertSystems,Artificial Neural Networks and other Machine Learning Models	K5	IV
CO5	Develop applications using Artificial Intelligence techniques and Data Mining Tools	K6	IV
CO6	Discuss the concepts of Expert Systems and Machine Learning	K6	V

2A. Syllabus

UNIT I - Introduction to Artificial Intelligence   **12 Hours**

What is Artificial Intelligence? The AI problems – What is an AI technique? - Criteria for success. Problems, Problem Spaces and Search: Defining the Problem as a State Space Search – Production Systems – Problem Characteristics.

UNIT II - Searching Techniques   **12 Hours**

Heuristic Search Techniques: Generate and Test – Hill Climbing: Simple Hill Climbing, Steepest Ascent Hill Climbing – Best First Search: OR Graphs, The A* Algorithm – Problem Reduction: AND-OR Graphs, The AO* Algorithm – Constraint Satisfaction – Means Ends Analysis.

UNIT III - Knowledge Representation   **12 Hours**

Knowledge Representation Issues: Representation and Mappings – Approaches to Knowledge Representation – Issues in Knowledge Representation: Important Attributes, Relationship among Attributes. Using Predicate Logic: Representing Simple Facts in Logic – Representing Instance and Isa Relationships – Computable Functions and Predicates – Resolution.

UNIT IV - Representing Knowledge using Rules   **12 Hours**

Representing Knowledge Using Rules: Procedural versus Declarative Knowledge – Logic Programming – Forward versus Backward Reasoning – Matching – Control Knowledge.

UNIT V - Expert Systems   **12 Hours**

Expert Systems: Representing and Using Domain Knowledge – Expert System Shells Explanation – Knowledge Acquisition. Perception and Action: Real-Time Search – Perception: Speech Recognition – Action – Robot Architectures.

B. TOPICS FOR SELF STUDY:

S.No	Topics	Web Link
1	Robotics	**www.tutorialspoint.com**
2	Natural Language Processing	**www.en.wikipedia.org**
3	Artificial Neural Network	**www.searchenterpriseai.techtarget.com**
4	Reinforcement Learning	**www.geeksforgeeks.org**

C. Text Book:

1. Elaine Rich, Kevin Knight, "Artificial Intelligence", Second Edition, Tata McGraw Hill publications, 2008.

D. Reference Books:

1. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Second Edition, Prentice Hall of India Publications, 2006.
2. Nils J. Nilsson, "Artificial Intelligence: A New Synthesis", Second Edition, Harcourt Asia Publications, 2000.
3. V.S. Janakiraman, K. Sarukesi, P. Gopalakrishnan, "Foundations of Artificial Intelligence and Expert Systems", McMillan India Publications, 2005.

E. Web links:

1. **www.tutorialspoint.com**
2. **www.geeksforgeeks.org**
3. **www.javatpoint.com**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Problems and Search-What is Artificial Intelligence**		
1.1	The AI Problems	Explain the task domains of Artificial Intelligence	K5
1.2	What is an AI Technique?	Construct problems using AI techniques	K3
1.3	Criteria for Success	Summarize the goals for success	K2
	Problems, Problem Spaces and Search		
1.4	Defining the Problem as a State Space Search	Elaborate the production rules for the water jug problem	K6
1.5	Production Systems	Develop algorithms using Breadth-First Search	K6
1.6	Problem Characteristics	Explain the problem characteristics in detail	K5
II	**Heuristic Search Techniques**		
2.1	Generate and Test	Utilize the generate and test algorithm	K3
2.2	Hill Climbing	Solve the problems using various Hill Climbing algorithms	K6

2.3	Best-First Search	Discuss on the Best-First Search algorithms.	K6
2.4	Problem Reduction	Elaborate the operations of problem reduction	K6
2.5	Constraint Satisfaction	Solve Cryptarithmetic problems	K6
2.6	Means Ends Analysis	Summarize the techniques of Means Ends Analysis	K2
III	**Knowledge Representation- Knowledge Representation Issues**		
3.1	Representation and Mappings	Classifyfacts and representations	K4
3.2	Approaches to Knowledge Representation	Elaborate on the approaches of knowledge representation	K6
3.3	Issues in Knowledge Representation	Discuss the issues in knowledge representation	K6
	Using Predicate Logic		
3.4	Representing Simple Facts in Logic	Determine the use of propositional logic	K5
3.5	Representing Instance and Isa Relationships	Identify the three ways of representing class membership	K3
3.6	Computable Functions and Predicates	Prove the computable functions and predicates using the set of facts	K5
3.7	Resolution	Propose algorithm to convert a clause form	K6
IV	**Representing Knowledge Using Rules**		
4.1	Procedural versus Declarative Knowledge	Compare procedural and declarative knowledge	K4
4.2	Logic Programming	Explain logic programming	K5
4.3	Forward versus Backward Reasoning	Compare forward and backward reasoning	K5
4.4	Matching	Develop matching between current state and preconditions of the rules	K6
4.5	Control Knowledge	Outline control knowledge	K2
V	**Expert Systems**		
5.1	Representing and Using Domain Knowledge	Outline the usage of domain knowledge	K2
5.2	Expert System Shells	Summarize on expert system shells	K2
5.3	Explanation on Domain Knowledge	Explain domain knowledge	K1
5.4	Knowledge Acquisition	Elaborate on knowledge acquisition	K6
	Perception and Action		
5.5	Real-Time Search	Propose algorithms using Real Time Search	K6
5.6	Perception	Design systems for speech recognition	K6
5.7	Action	Construct visibility graph	K6
5.8	Robot Architectures	Summarize the architecture of robot	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	M	L	L	H	H	M	M	H	H	M	M	H
CO2	H	H	M	M	H	H	M	M	H	H	M	M	M
CO3	M	H	H	M	M	H	M	M	M	M	H	M	L
CO4	M	M	L	M	L	M	M	M	H	M	H	M	M
CO5	H	H	M	M	M	M	M	H	H	M	M	M	H
CO6	H	H	H	H	H	M	H	H	H	H	H	H	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

Elective III - CUSTOMER RELATIONSHIP MANAGEMENT

SEMESTER: II **CODE: P22CA2: D**
CREDITS: 3 **HOURS/WEEK: 4**

1. COURSE OUTCOMES
After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Evaluate customer lifetime values	K5	I
CO2	Plan ways for retaining a customer	K6	II
CO3	Summarize customer lifecycle and customer values	K2	II
CO4	Compare value in use and value in exchange	K4	III
CO5	Develop customer related database for knowledge management	K6	IV
CO6	Analyze structured and unstructured data	K4	V

2A. Syllabus

UNIT I - Introduction to CRM: **12 Hours**

Introduction -Strategic CRM - Operational CRM - Analytical CRM - Where does social CRM fit? - Misunderstandings about CRM - Defining CRM - CRM constituencies - Commercial contexts of CRM - The not-for-profit context – the 'third sector' - Models of CRM -**Understanding relationships**: What is a relationship? Relationship quality - Why companies want relationships with customers - Customer lifetime value -   When might companies not want relationships with customers? - Why customers want relationships with suppliers - Customer satisfaction, loyalty and business performance -Relationship management theories.

UNIT II - Managing the customer lifecycle – **customer acquisition:** **13 Hours**

Introduction - What is a new customer? - Portfolio purchasing - Prospecting - Key performance indicators of customer acquisition programmes   - Making the right offer - Operational CRM tools that help customer acquisition   Managing the customer lifecycle. **Customer retention and development**: Introduction What is customer retention? - Economics of customer retention - Which customers to retain? -Strategies for customer retention - Positive customer retention strategies - Context makes a difference - Key performance indicators of customer retention programmes - Strategies for customer development -Strategies for terminating customer relationships

UNIT III - Strategic CRM: Customer Portfolio Management: **11 Hours**

What is a portfolio? - Who is the customer? - Customer portfolio models   - Strategically significant customers - The seven core customer management strategies - How to deliver customer-experienced value :introduction   Understanding value - When do customers experience value?-Modelling customer-perceived value -Sources of customer value - Customization   - Value through the marketing mix

UNIT IV - Operational CRM : Sales Force Automation: **12 Hours**

What is SFA? - The SFA eco-system SFA software functionality - SFA adoption - How SFA changes sales performance. Marketing Automation : What is marketing automation? - Benefits of marketing automation - Software applications for marketing.

UNIT V - Analytical CRM : **Developing and managing customer-related databases**:   **12 Hours**

Corporate customer-related data - Structured and unstructured data - Developing a customer-related database - Data integration - Data warehousing - Data marts - Knowledge management. **Using Customer-Related Data:** Introduction - Analytics for CRM strategy and tactics -   Analytics throughout the customer lifecycle - Analytics for structured and unstructured data - Big data analytics Analytics for structured data - Three ways to generate analytical insight

B. TOPICS FOR SELF-STUDY:

S.No	Topics	Web Link
1	Data Quality in CRM	**https://www.mycustomer.com/selling/crm/how-to-improve-data-quality-in-your-crm-system**
2	Service Automation	**https://www.simplecrm.com/crm/service-automation/**
3	CRM Implementation	**https://www.discovercrm.com/crm-implementation-process.html**
4	Data Science to CRM	**https://www.kaggle.com/general/5782**

C. Text Book:
1. Francis Buttle and Stan Maklan, Customer Relationship Management: Concepts and Technologies, Routledge, 2015.

D. Reference Books:
1. Ed Peelan and Rob Beltman., Customer Relationship Management., Pearson, 2013.
2. V. Kumar, Werner Reinartz, Customer Relationship Management, John Willey & Sons, 2006.

E. Web links:
1. **https://www.salesforcetutorial.com/**
2. **https://www.tutorialspoint.com/microsoft_crm/microsoft_crm_forms.htm**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Introduction to CRM**		
1.1	Strategic CRM	Recall strategic CRM	K1
1.2	Operational CRM	List the applications of operational CRM	K1
1.3	Analytical CRM	Define analytical CRM	K1
1.4	Where does social CRM fit?	Identify the ways of enhancing CRM using social media	K3
1.5	Misunderstandings about CRM	Distinguish CRM and database marketing	K4

1.6	Defining CRM	Define CRM	K1
1.7	CRM constituencies	List the constituencies having an interest in CRM	K1
1.8	Commercial contexts of CRM	Summarize commercial contexts, which present a range of different customer relationship management problems	K2
1.9	The not for profit context	Classify for profit and not for profit context of CRM	K2
1.10	Models of CRM	Explain various model of CRM	K5
1.11	Understanding relationships: What is a relationship?	Identify the five general phases through which customer–supplier relationships can evolve	K3
1.12	Relationship quality	Define relationship quality	K1
1.13	Why companies want relationships with customers	Examine why companies want relationship with customer	K4
1.14	Customer lifetime value	Evaluate customer lifetime values	K5
1.15	When might companies not want relationships with customers?	Examine why companies not want relationships with customers	K4
1.16	Why customers want relationships with suppliers	Summarize why customers want relationships with suppliers	K2
1.17	Customer satisfaction, loyalty and business performance	Recall customer loyalty	K1
1.18	Relationship management theories	Apply relationship management theories to given scenario	K3
II	**Managing the customer lifecycle**		
2.1	Customer Acquisition: Introduction	List the issues need to be carefully considered and programmed into a properly resourced customer acquisition plan	K1
2.2	What is a new customer?	Outline a new customer	K2
2.3	Portfolio purchasing	outline conversion model	K2
2.4	Prospecting	Explain Business to consumer lead generation	K5
2.5	Key performance indicators of customer acquisition programmes	Categorize Key performance indicators of customer acquisition programmes	K4
2.6	Making the right offer	What is the right offer?	K1
2.7	Operational CRM tools that help customer acquisition Managing the customer lifecycle.	Summarize operational tools that help in the customer acquisition process, including lead management, campaign	K2

		management and event-based marketing	
2.8	Customer retention and development: Introduction What is customer retention?	Define customer retention	K1
2.9	Economics of customer retention	Examine the economics of customer retention	K4
2.10	Which customers to retain?	List the types of customers to retain	K1
2.11	Strategies for customer retention	Apply the strategies for customer retention in given scenario	K3
2.12	Positive customer retention strategies	Summarize positive customer retention strategies	K2
2.13	Context makes a difference	List contextual considerations impact on customer retention practices	K1
2.14	Key performance indicators of customer retention programmes	Summarize key performance indicators of customer retention programmes	K2
2.15	Strategies for customer development	Explain CRM technologies that are useful for customer development purposes	K2
2.16	Strategies for terminating customer relationships	Apply the strategies for terminating customer relationships in given scenario	K4
III	**Strategic CRM**		
3.1	Customer Portfolio Management: What is a portfolio?	Define portfolio	K1
3.2	Who is the customer?	Recall Customer	K1
3.3	Customer portfolio models	Explain customer portfolio models	K2
3.4	Strategically significant customers	Summarize the classes of strategically significant customers	K2
3.5	The seven core customer management strategies	Explain the core customer management strategies	K2
3.6	How to deliver customer experienced value: introduction , Understanding value	Define value	K1
3.7	When do customers experience value?	Compare value in use and value in exchange	K4
3.8	Modeling customer perceived value	Construct a customer perceived value model	K3
3.9	Sources of customer value	List the sources of customer value	K1
3.10	Customer Value through the marketing mix	Outline 7Ps of value propositions	K2
IV	**Operational CRM**		
4.1	Sales Force Automation: What is SFA?	Define Sales force automation	K1

4.2	The SFA eco system	List the components of SFA	K1
4.3	SFA software functionality	Summarize the functionality provided by SFA	K2
4.4	SFA adoption	List the benefits from SFA	K2
4.5	How SFA changes sales performance.	Summarize the condition of SFA having impact on sales performance	K2
4.6	Marketing Automation : What is marketing automation?	Define marketing automation	K1
4.7	Benefits of marketing automation	Outline the benefits of marketing automation	K2
4.8	Software applications for marketing	Discuss the functionalities offered by marketing software	K6
V	**Analytical CRM**		
5.1	Developing and managing customer related databases: Corporate customer related data	Recall customer related data.	K1
5.2	Structured and unstructured data	Summarize the types of databases	K2
5.3	Developing a customer related database	Develop a customer related data	K2
5.4	Data integration	Recall data integration	K1
5.5	Data warehousing	Define data warehousing	K1
5.6	Data marts	Recall Data mart	K1
5.7	Knowledge management.	Define knowledge management (KM) from a CRM perspective	K1
5.8	Using Customer Related Data: Introduction	Recall customer related data.	K1
5.9	Analytics for CRM strategy and tactics	Apply forecasting technique to customer data	K2
5.10	Analytics throughout the customer lifecycle	Apply forecasting technique to customer data	K3
5.11	Analytics for structured and unstructured data	Analyze structured and unstructured CRM data	K4
5.12	Big data analytics	Summarize three 3Vs of Big data	K2
5.13	Analytics for structured data	Classify various types of data	K2
5.14	Three ways to generate analytical insight	Develop OLAP report on CRM	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	-	-	-	L	-	H	H	M	H	-	-	M	H
CO2	-	-	-	-	-	H	H	H	M	-	-	M	M
CO3	-	-	L	L	-	M	M	M	L	-	-	L	L
CO4	M	M	M	M	L	H	M	M	M	-	-	-	L

CO5	M	M	M	M	H	M	M	M	H	M	M	H	M
CO6	M	M	M	H	H	H	H	H	H	M	M	H	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1 (Theory): Closed Book

2. Open Book Test.

3. Assignment, Group Discussion, Poster Presentation, Seminar, Quiz (written).

4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

Elective III: ENTERPRISE RESOURCE PLANNING

SEMESTER: II   **CODE: P22CA2: E**
CREDITS: 3   **HOURS/WEEK: 4**

1. COURSE OUTCOMES:
After the successful completion of this course, the students will be able to:

S. No.	Course Outcomes	Level	Unit Covered
CO1	Summarize the basic concepts of ERP systems	K2	I
CO2	Distinguish between MRP, MRP II and ERP systems	K4	II
CO3	Analyze the technologies related to ERP systems and major components	K4	III
CO4	Discover the knowledge of typical ERP systems	K4	III
CO5	Assess the advantages and limitations of implementing ERP systems	K5	IV
CO6	Relate the various processes in business using ERP concepts and techniques	K2	V

2A. Syllabus

UNIT I - Introduction to ERP   **12 Hours**
     Introduction to ERP: Enterprise - ERP concepts - Justification for ERP investment – Risk involved in ERP implementation - Benefits of ERP - Important ERP Products (Software)

UNIT II - ERP and related Technologies   **12 Hours**
     ERP and related Technologies: Business Intelligence - E-Commerce & E-Business – Business Process Re-engineering - Data Warehousing and Data Mining - Online Analytical Process (OLAP) - Supply Chain Management - Customer Relationship Management

UNIT III - Business Modules in ERP   **12 Hours**
     Business Modules in ERP: Marketing – Finance - Material Management – Production - Quality Management - Sales Distribution – Plant Maintenance - Human Resource Management

UNIT IV - ERP Implementation   **14 Hours**
     ERP Implementation: ERP Implementation Life Cycle - Requirement definition - Implementation methodologies - Process definition Vendors and Consultants - ERP Project Teams - Dealing with Employee Resistance - Training and Education Data Migration

UNIT V - ERP Operation, Maintenance and Future Trends   **10 Hours**
     ERP Operation, Maintenance and Future Trends: Post implementation Activities - Operation and maintenance of ERP Systems - Performance Measurement of ERP Systems - Internet enabled ERP - Future trends in ERP

B. TOPICS FOR SELF-STUDY:

S.No	Topics	Web Link
1	The Future of ERP Market	**www.deskera.com**
2	ERP vs. ERP II vs. ERP III	**www.iitrun.com**
3	Open-Source ERP Technologies	**www.thebalancesmb.com**
4	Deploying ERP Applications	**www.networkworld.com**

C. Text Book:
1. Alexis Leon, "ERP Demystified", Tata McGraw-Hill Publications, 2008.

D. Reference Book:
1. Dr. Ashim Raj Singla, "Enterprise Resource Planning", 2nd Edition, Cengage Learning India Pvt., Ltd., 2016

E. Web links:
1. **www.ebooks.lpude.in/management**
2. **www.akwl.org/wp-content/uploads**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Introduction to ERP**		
1.1	ERP concepts	Recall the concepts of Enterprise Resource Planning	K1
1.2	Justification for ERP investment	List out the growth reasons of ERP	K1
1.3	Risk involved in ERP Implementation	Analyze the risks factors in ERP implementation	K4
1.4	Benefits of ERP	Explain the benefits of ERP	K2
1.5	Important ERP Products (Software)	Discuss integrated data model and business modeling	K6
	ERP and related Technologies		
2.1	Business Intelligence	Apply the concepts of MIS, DSS and EIS in Business Intelligence	K3
.2.2	E-Commerce & E-Business	Outline the characteristics of BPR	K2
2.3	Business Process Re-engineering	Compare the various needs for business process re-engineering	K4
2.4	Data Warehousing and Data Mining	Discuss the concepts of data warehousing and data mining	K6
2.5	Online Analytical Process (OLAP)	Summarize the concepts of OLAP	K2
2.6	Supply Chain Management	Elaborate on supply chain business process integration	K6
2.7	Customer Relationship Management	Explain the concept of Customer Relationship Management	K2
III	**Business Modules in ERP**		
3.1	Marketing	Discuss the business modules of ERP	K6
3.2	Finance	Summarize the finance module	K2
3.3	Material Management	Organize material management module of ERP	K3
.3.4	Production and Quality Management	Recall the need for quality management	K1

3.5	Sales Distribution	Compare sales distribution between delivery and creation of quality certificates	K5
3.6	Plant Maintenance	Explain the plant maintenance module	K2
3.7	Human Resource Management	Solve HRM problems by applying system approach	K6
IV	**ERP Implementation**		
4.1	ERP Implementation Life Cycle	Discuss the ERP implementation cycle	K6
4.2	Requirement definition	Elaborate on gap analysis technique	K6
4.3	Implementation methodologies	Design ERP packages using implementation methodologies	K6
4.4	Process definition Vendors and Consultants	Outline the role of Vendors	K2
4.5	ERP Project Teams	Categorize the pros and cons of In-house Implementation	K4
4.6	Dealing with Employee Resistance	Explain the phases in project planning	K2
4.7	Training and Education Data Migration	Identify the need for end user training	K3
V	**ERP Operation, Maintenance and Future Trends**		
5.1	Post implementation Activities	Discuss the faster implementation methodology	K6
5.2	Operation and maintenance of ERP Systems	Distinguish between new markets and new channels	K4
5.3	Performance Measurement of ERP Systems	Outline the challenges of ERP Systems	K2
5.4	Internet enabled ERP	Summarize the concept of Internet enabling	K2
5.5	Future trends in ERP	Predict new business segments	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	H	M	L	M	H	L	L	M	H	M	M	H
CO2	H	H	M	L	M	H	M	L	M	H	M	L	H
CO3	H	H	M	L	L	H	L	M	M	M	H	L	H
CO4	H	H	M	L	L	H	M	L	M	M	H	L	H
CO5	H	H	M	L	L	H	L	M	M	H	M	L	H
CO6	H	H	M	L	L	H	M	L	M	H	M	L	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

Elective III: MANAGEMENT INFORMATION SYSTEMS

SEMESTER: II   **CODE: P22CA2: F**
CREDITS   : 3   **HOURS/WEEK: 4**

1. COURSE OUTCOMES
After the successful completion of this course the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Understand the concept of a system and how it relates to information systems.	K1	I
CO2	Explain the functions of major components of hardware, software, networks, media, and services.	K2	II
CO3	Analyze and synthesize aspects of customer relationship management, enterprise resource management, and supply chain management systems	K3	III
CO4	Describe several evaluation factors that should be considered in evaluating the acquisition of hardware, software, and IS services.	K3	IV
CO5	Propose several ways that business managers and professionals can help lessen the harmful effects and increase the beneficial effects of the use of information technology.	K5	V
CO6	Create the theoretical models used in database management systems to answer business questions	K6	V

2. A. Syllabus

Unit I: Foundation Concepts   **15 Hours**
Information Systems in Business: The Real World of Information Systems - The Fundamental Roles of IS in Business - Trends in Information Systems - The Role of e-Business in Business - Types of Information Systems - Managerial Challenges of Information Technology. **The Components of Information Systems:** Components of Information Systems - Information System Resources - Information System Activities - Recognizing Information Systems.

Unit II: Information Technologies   **15 Hours**
Hardware: Digital Devices - Processing Data: The CPU - Motherboard - Random-Access Memory - Hard Disk - Solid State Drives - Removable Media - Input and Output Devices - Other Computing Devices - Smartphones - Integrated Computing and Internet of Things (IoT) - The Commoditization of the Personal Computer. **Software:** Operating Systems - Application Software - Utility Software and Programming Software - Applications for the Enterprise - Enterprise Resource Planning - Supply Chain Management - Mobile Applications - Cloud Computing - Open-Source Software. **Data and Databases:** Big Data - Databases - Data Models and Relational Databases - Database Management Systems - Structured Query Language - Other Types of Databases - **Finding Value in Data:** Business Intelligence - Data Warehouse - Data Mining and Machine Learning - Knowledge Management. **Networking and Communication:** The Internet and the World Wide Web - The Dot-Com Bubble - Web 2.0 - Wireless Networking - Mobile Network - Bluetooth - VoIP - Organizational Networking - Cloud Computing.

Unit III: Business Applications   **15 Hours**
e-Business Systems: Cross-Functional Enterprise Applications - Enterprise Application Integration - Transaction Processing Systems - Enterprise Collaboration Systems. **Functional Business Systems:** Marketing Systems - Manufacturing Systems - Human Resource Systems - Accounting Systems - Financial Management Systems. **Customer Relationship Management:** The Three Phases of CRM -

Trends in CRM - **Enterprise Resource Planning:** Trends in ERP - **Supply Chain Management:** The Role of SCM - Trends in SCM - **e-Commerce -** The Scope of e-Commerce - Electronic Payment Processes. **Decision Support in Business -** Decision Support Trends - Decision Support Systems - Management Information Systems - Online Analytical Processing - Using Design Support Systems - Executive Information Systems - Enterprise Portals and Decision Support - Knowledge Management Systems - **Artificial Intelligence Technologies in Business -** Business and AI - Expert Systems - Developing Expert Systems - Neural Networks - Genetic Algorithms - Virtual Reality - Intelligent Agents.

Unit IV: Development Processes 15 Hours

Developing Business/IT Strategies: Planning Fundamentals **-** Organizational Planning - The Scenario Approach - Planning for Competitive Advantage - Business Models and Planning - Business/IT Architecture Planning - Identifying Business/IT Strategies - Business Application Planning. **Implementation Challenges:** Implementing Information Technology - End-User Resistance and Involvement - Change Management. **Developing Business Systems:** IS Development - The Systems Approach - Systems Analysis and Design - The Systems Development Life Cycle - Starting the Systems Development Process - Systems Analysis - Systems Design - End-User Development - Technical Notes: Overview of Object-Oriented Analysis and Design. **Implementing Business Systems:** Implementing New Systems - Project Management - Evaluating Hardware, Software, and Services - Other Implementation Activities.

Unit V: Management Challenges 15 Hours

Security, Ethical, and Societal Challenges of IT: Ethical Responsibility of Business Professionals - Computer Crime - Privacy Issues - The Current State of Cyber Law - Other Challenges - Health Issues - Societal Solutions. **Security Management of Information Technology:** Tools of Security Management - Inter-Networked Security Defenses - System Controls and Audits. **Managing Information Technology:** Business and IT - Managing Information Technology - Business/IT Planning - Managing the IT Function - Organizing IT - Outsourcing and Offshoring IT and IS - Failures in IT Management - Management Involvement. **Managing Global IT:** The International Dimension - Global IT Management - Cultural, Political, and Geoeconomic Challenges - Global Business/IT Strategies - Global Business/IT Applications - Global IT Platforms - Global Data Access Issues - Global Systems Development.

B. TOPICS FOR SELF-STUDY:

S.No	Topics	Web Link
1	Functional Information Systems	**https://ecomputernotes.com/mis/structure-and-classification/explain-briefly-the-different-functional-information-systems**
2	Enterprise Resource Planning	**https://solutionsreview.com/enterprise-resource-planning/understand-erp-by-watching-these-5-youtube-videos/**
3	Trends in MIS	**https://moonwelfarefoundation.blogspot.com/2018/11/trends-in-management-information-systems.html**
4	Enterprise Software Systems	**https://www.floridatechonline.com/blog/information-technology/types-of-enterprise-systems-and-their-applications/**

C. Text Books:
1. James A. O'Brien, George M Marakas, Ramesh Bebl, "*Management Information Systems*", Thirteenth Edition, Tata McGraw Hill Education Private Limited, 2017.
2. David Bourgeois, Joseph Mortati, Shouhong Wang, James Smith, "*Information Systems for Business and Beyond*", Lulu.com, Illustrated edition, 2019.

D. Reference Books:
1. Gordon B. Davis, Margrethe H. Olson, "*Management Information Systems: Conceptual Foundations, Structure and Development*", Tata McGraw Hill Education, 2000.
2. Raymond Jr McLeod Jr., George Schell, "*Management Information System*", Pearson Publication, 10th Edition, 2000.
3. Kenneth C. Laudon, Jane P. Laudon, "*Management Information Systems: Managing the Digital Firm Hardcover*", Pearson Publication, 13th Edition, 2013.
4. James A. O'Brien, George M Marakas, Ramesh Bebl, "*Management Information Systems*", Nineth Edition, Tata McGraw Hill Education Private Limited, 2010.

E. Web links:
1.**https://nptel.ac.in/courses/122/105/122105022/**
2.**https://www.youtube.com/watch?v=N8F7eOqgH8Q**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Foundation Concepts**		
1.1	The Real World of Information Systems	Understand the concept of a system and how it relates to information systems.	K1
1.2	The Fundamental Roles of IS in Business	Explain why knowledge of information systems is important for business professionals	K2
1.3	Trends in Information Systems	Illustrate how the business applications of information systems can support a firm's business processes, managerial decision making, and strategies for competitive advantage	K2
1.4	Components of Information Systems	Summarize the components of real world information systems.	
1.5	Information System Activities	Show the pyramid of information system in organization	K2
II	**Information Technologies**		
2.1	Hardware in IT	Outline the major technologies and uses of computer peripherals for input, output, and storage.	K2

2.2	Software in IT	Explain several important trends occurring in computer software.	K2
2.3	The Internet and the World Wide Web	Identify several strategic uses of Internet technologies and give examples of how they can help a business gain competitive advantages.	K2
2.4	Integrated Computing and Internet of Things (IoT)	Criticize how business process reengineering frequently involves the strategic use of Internet technologies.	K5
2.5	Knowledge Management.	Identify the business value of using Internet technologies to become an agile competitor or form a virtual company.	K2
2.6	Organizational Networking and Cloud Computing.	Explain how knowledge management systems can help a business gain strategic advantages.	K2
2.7	Managing Data Resources	Identify the stages of transaction from a manual system to automated systems	K3
2.8	Technical Foundation of Database Management	Summarize the need for database systems.	K2
III	**Business Applications**		
3.1	e-Business Systems	Why is there a trend toward cross-functional integrated enterprise systems in business	K1
3.2	Functional Business Systems	Explain how EAI works	K2
3.3	Customer Relationship Management	Three Phases of CRM	K5
3.4	Enterprise Resource Planning	Benefits and Challenges of ERP	K3
3.5	Supply Chain Management	Trends in SCM	
3.6	Decision Support in Business	Summarize the levels of Managerial Decision Making	K2
3.7	Artificial Intelligence Technologies in Business	Develop the Expert Systems with Neural Networks	K6
IV	**Development Processes**		
4.1	Developing Business/IT Strategies	Explain the Components of Organizational Planning	K2
4.2	Identifying Business/IT Strategies	Compare the Planning Approaches	K5
4.3	Implementation Challenges	Criticize the impact and scope of implementing IT	K5

4.4	Developing Business Systems	Illustrate the new implementation process for developing business systems	K2
4.5	Implementing Business Systems	Analyze the five phases of Project management	K4
V	**Management Challenges**		
5.1	Security, Ethical, and Societal Challenges of IT	Categorize the Ethical Business Issues	K4
5.2	Security Management of Information Technology	Explain the Public/Private Key Encryption	K2
5.3	Planning for Business Change with IT	Discuss the challenges faced by the CIO.	K4
5.4	Implementing Business Changes with IT	Develop new concepts of management in technological companies using IT	K5
5.5	Security and Control Issues in Information system.	Examine the various ethical & security issues in information system	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	M	M	_	L	M	H	H	M	L	M	M	H
CO2	M	M	_	M	M	L	M	M	M	L	L	L	M
CO3	M	M	H	M	M	L	_	M	M	L	M	M	L
CO4	M	H	H	M	L	_	L	M	H	M	M	M	_
CO5	H	H	M	M	M	H	M	M	M	M	M	M	L
CO6	M	M	M	M	H	_	L	M	M	M	M	H	L

L-Low   **M-Moderate**   **H- High**

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

Core Practical III: PROGRAMMING IN JAVA LAB

SEMESTER: II   **CODE: P22CA2P3**
CREDITS: 2   **HOURS/WEEK: 4**

1. COURSE OUTCOMES
After the successful completion of this course the students will be able to:

S.No.	Course Outcomes	Level	Exercise
CO1	Demonstrate the concept of package, interface	K2	1,2,3,4
CO2	Demonstrate exception handling mechanism	K6	5
CO3	Develop a java program to handle multithreads	K3	6
CO4	Make use of collections and IO streams	K2	7,8
CO5	Apply event handling on AWT and Swing components	K3	9,10
CO6	Develop a Java program to manipulate database, using Java Data Base Connectivity (JDBC)	K6	11

Ex.No.	Exercise
1	Classes and Objects. Create Student Class with the following data and methods. Member Data: regno, name, course, java_mark, dbms_mark, os_mark, total, average and result. Member Methods: readData(), processData(), display() Create 5 objects for students and display the mark sheet.
2	Inheritance. Create a class Employee with employee details such as Emp_Name, E_ID, Age, Sex, Date_of_Join etc., define a sub class Salary of Employee with details like LIC, HRA, DA and TA. Calculate salary of the employee by inheriting Employee details.
3	Interfaces. Define an interface Bank with a method rateofInterest() and implement the same with classes SBI, PNB and Axis.
4	Packages. Create packages like Pack and MyPack and import the same into some user defined classes.
5	Exceptions handling. Create a try block that is likely to generate three types of exception (handle ArithmeticException, ArrayIndexOutOfBoundsException, FileNotFoundException) using try and then incorporate necessary catch blocks to catch and handle them appropriately. Create an user defined Exception.
6	Multithreading. Create a class Parent by extending a Thread class and also create a class as Child and illustrate the concept of multithreading by applying thread class methods.
7	Lambda Expressions Write a Java program to illustrate lambda expressions with parameters.

8	Collection Interfaces. Write a program to create a List(Books) using ArrayList and add items to the list and traverse the items through Iterator.
9	I/O Streams. Create a class named InputStreamReaderExample and read the contents of the file using the methods FileInputStream() and InputStreamReader().
10	Applying AWT concepts. Design a Registration form with AWT Controls.
11	Applying swing concepts. Develop a java swing Frame to retrieve the records form the Job Portal database table Design a scientific Calculator using swing components.
12	JDBC Design a web application for Student details with database operations insert, delete and update.
13	(i) Simple Java Code for Welcome Servlet. (ii) Servlet Program to read data from a client.
14	Create an Address Book application using Servlet With CRUD Operation.
15	(i) Simple Jsp program for Welcome User. (ii) Using JSP: declarations, expressions and scriplets (iii) JSP code to read data from a client.
16	Create a Job Portal application using Jsp With CRUD Operation
17	Test the CRUD API using Postman.
18	Create an API for CRUD.

B. TOPICS FOR SELF-STUDY:

S.No.	Topics	Web Links
1	Advanced Swing	**https://docs.oracle.com/javase/tutorial/uiswing/misc/index.html**
2	Security in Java	**https://www.javatpoint.com/java-security-package**
3	Java RMI	**https://docs.oracle.com/javase/8/docs/technotes/guides/rmi/hello/hello-world.html**
4	Java Network	**https://www.javatpoint.com/java-networking**

C. Text Books:
1. Herbert Schildt,, "JAVA^{TM} : Complete Reference", Eleventh Edition, McGraw Hill, 2019.
2. Ivan Bayross, "Web Enabled Commercial Application Development using Java 2", BPB Publications, 2013. (Unit Covered-V : Java Database Connectivity)

D. Reference Books:
1. Ken Arnold, James Gosling, David Holmes, "Java™ Programming Language", Fourth Edition, Addison Wesley Profession, 2005.
2. Paul J. Deitel, Harvey M. Deitel, "Java™ for Programmers",Second Edition*,* PHI Publications, 2011.

E. Web links:
1**.** https://beginnersbook.com/2013/03/inheritance-in-java/
2. https://www.programiz.com/java-programming/examples

3. SPECIFIC LEARNING OUTCOMES (SLO)

Ex.No.	Lab Exercises		
1	Classes and Objects. Create Student Class with the following data and methods. Member Data: regno, name, course, java_mark, dbms_mark, os_mark, total, average and result. Member Methods: readData(), processData(), display() Create 5 objects for students and display the mark sheet.	Develop a Java Program with class and object.	K6
2	Inheritance. Create a class Employee with employee details such as Emp_Name, E_ID, Age, Sex, Date_of_Join etc., define a sub class Salary of Employee with details like LIC, HRA, DA and TA. Calculate salary of the employee by inheriting Employee details.	Create a java program using inheritance.	K6
3	Interfaces. Define an interface Bank with a method rateofInterest() and implement the same with classes SBI, PNB and Axis.	Build a java program implementing interfaces.	K6
4	Packages. Create packages like Pack and MyPack and import the same into some user defined classes.	Develop a java program using packages.	K6
5	Exceptions handling. Create a try block that is likely to generate three types of exception (handle ArithmeticException, ArrayIndexOutOfBoundsException, FileNotFoundException) using try and then incorporate necessary catch blocks to catch and handle them appropriately. Create an user defined Exception.	Create a java program to handle exceptions.	K6
6	Multithreading. Create a class Parent by extending a Thread class and also create a class as Child and illustrate the concept of multithreading by applying thread class methods.	Design a Java program to handle multithreads.	K6
7	Lambda Expressions Write a Java program to illustrate lambda expressions with parameters.	Create a java program to illustrate lambda expressions	K6

8	Collection Interfaces. Write a program to create a List(Books) using ArrayList and add items to the list and traverse the items through Iterator.	Create a program to create a List(Books) using ArrayList and add items to the list and traverse the items through Iterator.	K6
9	I/O Streams. Create a class named InputStreamReaderExample and read the contents of the file using the methods FileInputStream() and InputStreamReader().	Build a java program to read the contents of the file using IO Streams	K6
10	Applying AWT concepts. Design a Registration form with AWT Controls.	Design a registration from using AWT Controls.	K6
11	Applying swing concepts. Develop a java swing Frame to retrieve the records form the Job Portal database table Design a scientific Calculator using swing components.	Develop a java program using Swing.	K6
12	JDBC Design a web application for Student details with database operations insert, delete and update.	Design a web based application for students with data base connectivity	K6
13	(i) Simple Java Code for Welcome Servlet. (ii) Servlet Program to read data from a client.	Develop a Java Programs with servlet	K6
14	Create an Address Book application using Servlet With CRUD Operation.	Create an Address Book application using Servlet With CRUD Operation.	K6
15	(i) Simple Jsp program for Welcome User. (ii) Using JSP: declarations, expressions and scriplets (iii) JSP code to read data from a client.	Build JSP applications.	K6
16	Create a Job Portal application using Jsp With CRUD Operation	Develop Job Portal	K6

17	Test the CRUD API using Postman.									Design an API with CRUD.			K6
18	Create an API for CRUD.									Test the CRUD API using Postman			K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	M	H	L	H	H	H	H	H	M	M	M	M
CO2	H	M	M	M	H	H	H	M	H	H	M	H	H
CO3	H	H	H	M	H	H	H	H	H	H	H	H	H
CO4	H	H	H	M	H	H	H	H	H	H	H	H	H
CO5	H	H	H	M	H	M	H	H	H	H	H	H	H
CO6	H	H	H	M	H	H	H	H	H	H	H	H	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:
1. Continuous Assessment Test: T1, T2 (Practical Components): Closed Book
2. Cooperative Learning Report, Assignment, Group Discussion, project Report, Field Visit Report, Seminar.
3. Pre/Post Test, Viva, Report for each Exercise.
4. Lab Model Examination & End Semester Practical Examination

INDIRECT:
1. Course end survey (Feedback)

****

Core Practical IV : DATABASE MANAGEMENT SYSTEMS LAB

SEMESTER : II   **CODE: P22CA2P4**
CREDITS: 2   **HOURS/WEEK: 4**

1. COURSE OUTCOMES:

After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Exercise
CO1	Create tables and insert values	K6	1,2
CO2	Construct queries for table manipulation	K6	3,4
CO3	Compile sub queries for retrieving data from tables	K6	5
CO4	Develop queries using aggregate, string and date functions	K6	6
CO5	Create views on tables	K6	7
CO6	Develop PL/SQL programs using triggers, functions, cursors and exception	K6	8,9,10,11,12, 13

Ex.No.	Exercise
1	Create an Employee table using the details employee name, Designation, Department date of joining, salary etc..
2	Insert values into Employee table using the details employee name, Designation, Department, date of joining, salary etc.
3	Find out name of students those who are getting result as "Pass" using Where clause. Find out List of students, whose name start with "B" using LIKE operator Find out list of Employee those who getting salary between 20000 and 40000
4	Find out list of Employee those who are working in Finance and HR department using Logical operator. Sort the records in employee table in ascending order using name Find out the number are staff working in each department using grouping Apply Set operations like Union, Intersection, Difference in employee table.
5	Find out name of student who score maximum marks using sub query Apply Inner and Outer Join in employee table.
6	Use Aggregate function in student table to find MIN, MAX in total marks Use String function, Date function in student table.
7	Create view by selecting employee those who are getting salary as more than Rs 40,000 Display records from newly created view
8	Develop a PL/SQL program using function to find out factorial of given number
9	Develop a PL/SQL program using Procedure to calculate result of student.
10	Develop a PL/SQL program using Cursors to process records in employee table
11	Develop a PL/SQL program using Triggers to process records in student table
12	Develop a PL/SQL program using Exception.
13	Develop a PL/SQL program using function to Prepare pay bill for employee

B. TOPICS FOR SELF STUDY:

S.No	Topics	Web Link
1	Oracle PL/SQL Exception Handling	https://www.guru99.com/exception-handling-pl-sql.html
2	Develop application using Oracle Forms	https://docs.oracle.com/cd/E21764_01/web.1111/e10240/intro.htm#FSDEP108
3	Create trigger	https://docs.oracle.com/cd/B19306_01/server.102/b14200/statements_7004.htm
4	Access Control List	http://www.brainkart.com/article/DBMS---Advanced-Topics_11388

2. SPECIFIC LEARNING OUTCOMES (SLO)

Exercise	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
1	Creating an Employee Table	Create an employee table using SQL commands	K6
2	Inserting values into an Employee Table	Construct a table by inserting the values	K6
3	Using Where Clause	Make use of Where Clause to retrieve the required information	K3
4	Using Logical Operators and Set Operations	Apply logical and set operators in the table	K3
5	Using Sub Queries and Apply Join Operations in a Table	Apply the sub queries for retrieving data	K3
6	Using Aggregate, String and Date Functions	Construct queries using aggregate, string and date functions	K6
7	Create Views	Create views on tables	K6
8	PL/SQL Program Using Function	Develop a PL/SQL program using function	K6
9	PL/SQL Program Using Procedure	Build a PL/SQL program using procedure	K6
10	PL/SQL Program Using Cursors	Create a PL/SQL program using cursors	K6
11	PL/SQL Program Using Triggers	Develop a PL/SQL program using triggers	K6
12	PL/SQL Program Using Exception	Build a PL/SQL program using exception	K6
13	PL/SQL Program for Preparing Paybill	Create a PL/SQL program for preparing the paybill	K6

3. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	M	H	L	H	H	H	H	H	L	L	L	-
CO2	H	M	M	M	H	H	H	M	H	L	L	L	-

CO3	H	H	M	M	H	H	H	M	H	H	H	H	H
CO4	H	M	H	M	H	H	H	H	H	H	H	H	H
CO5	H	M	M	M	H	M	H	H	H	H	H	H	H
CO6	H	M	M	M	H	H	H	H	H	H	H	H	H

L-Low   M-Moderate   H- High

4. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Practical Components): Closed Book

2. Assignment, Group Discussion, project Report, Seminar.

3. Pre/Post Test, Viva, Report for each Exercise.

4. Lab Model Examination & End Semester Practical Examination

INDIRECT:

1. Course end survey (Feedback)

SEMESTER: I   **CODE: P22CAPS1**
CREDIT: 1   **HOURS/WEEK: 2**

1. COURSE OUTCOMES
After the successful completion of this course the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Summarize the importance of Listening, Speaking, Reading and Writing	K2	I
CO2	Construct effective reports and contents for writing	K6	II
CO3	Build leadership and problem-solving skills	K6	III
CO4	Develop good interaction skills	K6	IV
CO5	Compose a good resume and cover letters	K6	V
CO6	Improve their presentation skills for facing interviews	K6	V

2A. Syllabus

UNIT I - Language Skills   **6 Hours**
Active Listening Skills- Effective Speaking skills- Reading Skills- Techniques for Improving Comprehension- Elements of Effective Writing Skills.

UNIT II - Employability Skills   **6 Hours**
Writing Reports: Importance of Report- Meeting Minutes-Writing Cover Letter: -Academic and Business-Resume Writing.

UNIT III - Creative Skills   **6 Hours**
Social Media writing: E mail and Blog-Preparing Presentation Graphics-PPT-Content writing (Paraphrasing, Summarizing and Story writing)-Describing products and services-describing processes-persuading people-giving opinions-presenting arguments-explaining-proposing-presenting a product.

UNIT IV - Presentational Skills   **6 Hours**
Presentation Strategies - Process of Preparing and Delivering Presentation - Planning the Introduction and the Conclusion - Answering Questions after Presentation - Group Discussion.

UNIT V - Conversational Skills   **6 Hours**
Face to face interaction in formal and informal situations - greetings-replying to greetings-introducing others-welcoming-bidding farewell-appearing in an interview-talking about oneself - Telephonic interactions: taking messages-making appointments-making enquiries regarding travel/hotel bookings-apologizing-complaining-giving information.

B. TOPICS FOR SELF-STUDY:

S.No.	Topics	Web Links
1	Essential Grammar	**https://www.englishclub.com/grammar/**
2	Phonetic	**https://www.youtube.com/watch?v=7mahm MmnSx4**
3	Idioms and Phrases	**https://www.youtube.com/watch?v=Hm-n-_uqCvQ**
4	Figurative Language	**https://www.youtube.com/watch?v=OZZkO Ojlcgc**

C. Text Books:
1. Raman, Meenakshi, and Sangeeta Sharma. Technical Communication. 3rd ed., Oxford University Press, 2015.
2. Santhi Jeya. V, R. Selvam. Advanced Skills for Communication in English Book - I. New Century Book House (P) Ltd, 2011.

D. Reference Books:
1. Raman, Meenakshi, and Sangeeta Sharma. Technical Communication for Gujarat Technological University. 2nd ed., Oxford University Press, 2017.
2. Raman, Meenakshi, and Sangeeta Sharma. Professional English. 1st ed., Oxford University Press, 2019.
3. MacKenzie, Andrea et al. NET Working Workplace Communication in the English Classroom. Curriculum Development Institute Education Bureau Hong Kong (SAR), 2009.

E. Web links:
1. **https://www.youtube.com/watch?v=kBOccKc5yxY**
2. **https://www.youtube.com/watch?v=IKjl7Kdq-VQ&t=2554s**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered	Course Content	Learning Outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Language Skills**		
1.1	Active Listening Skills	List out the importance of being an active listener.	K4
1.2	Effective Speaking skills	Categorize ways to improvise the fluency in English	K4
1.3	Reading Skills	Appraise and develop the strategies for reading	K5
1.4	Improving Comprehension	Discover various ways on comprehending reading	K4
1.5	Effective Writing Skills	Improve writing skills for language proficiency and employment	K6
II	**Employability Skills**		

2.1	Writing Reports	Explain techniques and analyze various components of writing a good Report.	K4
2.2	Writing Minutes	Inspect methods involved in conducting meetings and writing minutes	K4
2.3	Academic Cover Letter	Compose a Cover Letter in line with the resume	K6
2.4	Business Cover Letter	Outline different parts of academic and business letters	K2
2.5	Resume Writing	Understanding the significance of a good resume for a job. Design a formal Resume	K2
III	**Creative Skills**		
3.1	Writing Social Media	Compile a write up for Specific Audience in Social Media	K6
3.2	Create Presentation Graphics	Determine the significance of preparing infographics.	K5
3.3	Description of Events	Construct an essay for a given topic	K6
3.4	Paraphrasing	Evaluate on the effective construction of word order and sentence	K5
3.5	Story Writing	Create and develop a story using hints	K6
IV	**Presentational Skills**		
4.1	Presentation Strategies	Outline and Structure the presentation	K2
4.2	Delivering Presentation	List out the significant skills pertinent to delivering a presentation	K4
4.3	Body Language	Build the etiquette and Body Language	K6
4.4	Answering Queries	Model the correct expressions for answering questions	K3
4.5	Group Discussion	Demonstrate on the techniques of Group Discussion	K2
V	**Conversational Skills**		
5.1	5.1. Face to face interaction	Define the significance of nonverbal communication	K1
5.2	5.2. Greetings and Reply	List out the basic types of greetings	K4
5.3	5.3. Introducing and bidding farewell	List out the formal and informal methods of introducing people and opportUnit Coveredies	K4
5.4	5.4. Telephonic Interaction	What are the formal preparation needed before telephonic interview	K1
5.5	5.5. Enquiries and Giving Information	List out the various ways of gathering information	K4

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	L	H	-	L	L	L	H	H	H	-	-	-	H
CO2	-	-	-	-	-	-	-	H	M	-	-	-	-
CO3	-	H	-	-	-	M	H	H	M	-	-	-	H
CO4	L	L	-	-	-	M	L	H	M	-	-	-	M
CO5	M	-	-	-	-	-	-	H	-	-	-	-	-
CO6	L	L	-	L	-	-	M	H	M	-	-	-	M

L-Low　　**M-Moderate**　　**H- High**

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

BRIDGE COURSE – IV: INTERNET PROGRAMMING

SEMESTER: IV
CREDITS: 4

CODE: PB22CA24
HOURS/WEEK: …

1. COURSE OUTCOMES
After the completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Define the basics of HTML5 tags with semantic elements	K1	I
CO2	Outline the web applications using tables and multimedia	K2	II
CO3	Build an appropriate primitives and operations in JavaScript	K3	III
CO4	Distinguish the web pages to interact by using JavaScript and DOM concepts	K4	IV
CO5	Adapt events and event handlers for Dynamic web application	K6	V
CO6	Design a web application with secure and user-friendly with angular web framework	K6	V

2A. Syllabus

UNIT I - Overview of Basic Html Tags   **10 Hours**

Getting Started with HTML – Formatting Text by using Tags – using Lists and Backgrounds – Creating Hyperlinks and Anchors – Introduction to Style Sheets – Formatting Text by using Style Sheets – Formatting Paragraphs by using Style Sheets.

UNIT II - Multimedia Tags and Overview of Java script   **10 Hours**

Displaying Graphics – Creating Division Based Layouts – Creating Tables – Formatting Tables – Creating User Forms – Incorporating Sound and Video – Canvas. **The Basics of Java Script:** Overview of Java Script – Object Oriented and Java Script – General Syntactic Characteristics – Primitives, Operations, and Expressions – Screen Output and Keyboard Input – Control Statements – Object Creation and Modification.

UNIT III - Arrays, Functions and Event Handling   **10 Hours**

Arrays – Functions – An Example – Constructors – Pattern Matching Using Regular Expressions – Another Example – Errors in Scripts. **Java Script and XHTML Documents:** The Java Script Execution Environment – The Document Object Model –Element Access in Java Script. **Events and Event Handling**: Handling Events from Body Elements – Handling Events from Button Elements – Handling Events from Text Box and Password Elements – The DOM 2 Event Model – The Navigator Object – DOM Tree Traversal and Modification.

UNIT IV - Dynamic Html   **10 Hours**

Dynamic Documents with Java Script: Introduction – Positioning Elements – Moving Elements – Element Visibility – Changing Colors and Fonts – Dynamic Content – Stacking Elements – Locating the Mouse Cursor – Reacting to a Mouse Click – Slow Movement of Elements – Dragging and Dropping Elements.

UNIT V - Angular JS an Overview   10 Hours

Introduction to AngularJS: Introduction – Understanding Directives – Creating Controllers – Working with AngularJS Expression – Making Use of AngularJS Filters – Understanding AngularJS Modules – Exploring AngularJS Services – Learning AngularJS Views

B. TOPICS FOR SELF-STUDY:

S.No.	Topics	Web Links
1	Classical Inheritance In JavaScript	https://www.crockford.com/javascript/inheritance.html#:~:text=JavaScript%20is%20a%20class%2Dfree,inheritance%20instead%20of%20classical%20inheritance.&text=Little%20type%2Dsafety%20is%20obtained,explicit%20casting%20of%20object%20references.
2	HTTP/HTTPS/1 And 2, web sockets	https://www.grotto-networking.com/WebDevTopics.html#httphttps1-and-2-websockets
3	Angular is Animations	https://docs.angularjs.org/guide/animations
4	Working with Remote Web Services	https://www.youtube.com/watch?v=oTzNRv6X51o

C. Text Books:

1. Faithe Wempen, "HTML5 Step by Step", First edition, Microsoft Press, 2011.

2. Robert W. Sebesta, "Programming the World Wide Web", Pearson Education, Seventh Edition, 2014.

3. Felix Alvaro, "ANGULARJS: Easy AngularJS for Beginners", Kindle Edition, 2016.

D. Reference Book:
1. Joel Skylar, "Principles of Web Design: The Web Technologies Series," Fifth Edition, 2011.

E. Web links:
1. https://www.javatpoint.com/html5-tutorial
2. https://angular.io/start

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Overview of Basic Html Tags**		
1.1	Getting Started with HTML	Recall the basic HTML tags	K1
1.2	Formatting Text by using Tags	Compare html tag with html5	K2
1.3	Using Lists and Backgrounds	Make use of lists and backgrounds	K3
1.4	Creating Hyperlinks and Anchors	Apply hyperlinks in web page	K3
	Designing web using Style Sheets		
1.5	Introduction to Style Sheets	Recall various styles in designing	K1

1.6	Formatting Text by using Style Sheets	Apply the style sheet to use different styles for text and background	K3
1.7	Formatting Paragraphs by using Style Sheets.	Create paragraph to organize the content	K6
II	**Multimedia Tags and Overview of Java script**		
2.1	Displaying Graphics	Build web page using graphics	K3
2.2	Creating Division Based Layouts	Categorize content using division layouts	K4
2.3	Creating Tables – Formatting Tables Creating User Forms	Build table and forms using various elements	K6
2.4	Incorporating Sound and Video	Construct web page for video and audio content	K6
2.5	Canvas	Construct geometric shapes using canvas	K6
	Basics of Java Script		
2.6	Overview of Java Script	Relate java script in html5	K2
2.7	Object Oriented and Java Script	Apply object oriented in java script	K3
2.8	General Syntactic Characteristics	Identify the basic scripts and general syntactic	K3
2.9	Primitives, Operations, and Expressions	List out the types of operations and expressions	K4
2.10	Screen Output and Keyboard Input	Choose the screen output and keyboard input	K5
2.11	Control Statements – Object Creation and Modification	Examine the control statements	K4
III	**Arrays, Functions and Event Handling**		
3.1	Arrays	Experiment with arrays in JS	K3
3.2	Functions	Examine functions in JS	K4
3.3	Constructors	Apply constructors	K3
3.4	Pattern Matching Using Regular Expressions	Illustrate the pattern matching	K2
	Java Script and XHTML Documents		
3.5	The Document Object Model	Explain the DOM concept	K2
3.6	Element Access in Java Script	List out the elements in java script	K4
	Events and Event Handling		
3.7	Handling Events from Body/Button Elements	Categorize events for button and body elements	K4
3.8	Handling Events from Text Box and Password Elements	Evaluate text and password event handling for validation	K5
3.9	The DOM 2 Event Model	Analyze DOM2 event model	K4
3.10	The Navigator Object/ DOM Tree Traversal and Modification	Adapt tree traversal for DOM	K6
IV	**Dynamic Html**		
4.1	Introduction to Java Script	Explain script in web design	K2
4.2	Positioning Elements	Utilize cursor to position elements	K3
4.3	Moving Elements	Make use of cursor to move elements	K3
4.4	Changing Colors and Fonts	Change the web page color and fonts	K6
4.5	Dynamic Contents – Stacking Element	Determine the stack elements for dynamic operation	K5

4.6	Mouse Click Event	Build web page for mouse click event	K6
4.7	Dragging and Dropping Elements	Adapt mouse event to drag and drop element	K6
V	**Angular JS an Overview**		
5.1	Introduction to AngularJS	Define angular JS in web design	K1
5.2	Understanding Directives	Illustrate directives in angularJS	K2
5.3	Creating Controllers	Analyze various controllers	K4
5.4	Working with AngularJS Expression	Apply expression to operate data	K3
5.5	Making Use of AngularJS Filters	Choose filter to format data	K5
5.6	Understanding AngularJS Modules	Adapt modules to define application	K6
5.7	Exploring AngularJS Services – Learning AngularJS Views	Discuss the advance trends in angular js	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	M	H	-	M	L	M	H	M	H	L	H	M
CO2	H	-	H	-	H	L	L	M	L	L	L	H	M
CO3	H	L	H	-	L	M	M	M	L	H	H	H	L
CO4	H	M	L	-	M	L	M	L	M	H	M	H	M
CO5	H	M	H	-	H	L	L	M	L	H	M	H	M
CO6	H	M	H	M	M	L	H	L	L	M	L	H	M

L-Low   **M-Moderate**   **H- High**

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

BRIDGE COURSE – V: LINUX PROGRAMMING

SEMESTER: IV   **CODE: PB22CA25**
CREDITS: 4   **HOURS/WEEK: …**

1. COURSE OUTCOMES:
 After the completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit covered
CO1	Create and work with Linux Shell programming techniques and files	K6	I
CO2	Assess the information in the files and terminals	K5	II
CO3	Apply various data management techniques, tools with other debugging functions.	K3	III
CO4	Design and apply various functionalities of process and signals	K6	IV
CO5	Develop GNOME programming using GTK+.	K6	V
CO6	Construct programming with KDE using Qt	K6	V

2A. Syllabus

UNITI - Shell Programming and Files   **12 Hours**
        Getting Started: An Introduction to UNIX, Linux and GNU -Programming Linux:. **Shell Programming:** why program with a shell? a bit of philosophy-what is a shell?-pipes and redirection-the shell as a programming language-shell syntax-going graphical the dialog utility-putting it all together. **Working with Files:** linux file structure-system calls and device drivers-library functions-low-level file access-the standard I/O library-Formatted input and output-file and directory maintenance-scanning directories-errors-the/proc file system-advanced topics.

UNIT II - The Linux Environment and Terminals   **12 Hours**
        The Linux Environment: program arguments-environment variables-time and date-temporary files-user information-host information-logging-resources and limits**. Terminals:** Reading from and Writing to the terminal-talking to the terminal-the terminal driver and the general terminal interface-the termios structure-terminal output-detecting keystrokes. **Managing Text-Based Screens with curses:** compiling with curses-curses terminology and concepts-the screen-the keyboard-windows-sub windows-the keypad-using color-pads-the CD collection application,

UNIT III - Data Management and Tools with Debugging   **12 Hours**
Data Management: managing memory-file locking-databases-the CD application. **Development Tools:** problems of multiple source files-the make command and make files-source code control-writing a manual page-distributing software-RPM packages-other package formats-development environments. **Debugging:** types of errors-general debugging techniques-debugging with gdb-more debugging tools-assertions-memory debugging.

UNIT IV - Process Signals, POSIX .Pipes and Semaphores   **12 Hours**
        Processes and Signals: what is a process:-process structure-starting new processes-signals, POSIX **Threads:** what is a thread?-advantages and drawbacks of threads-a first threads program-simultaneous execution-synchronization-thread attributes-cancelling a thread-threads in abundance. **Inter-Process Communication: Pipes:** what is a pipe?-process pipes-sending output to popen-the pipe call-parent and child processes-named pipes: FIFOs-the CD database application. **Semaphores, Shared memory and Message Queues:** semaphores-shared memory-message queues-the CD database application-IPC status commands.

UNIT V - Sockets, Programming with GNOME and KDE using GTK+ and Qt   12 Hours

Sockets: what is a socket?-socket connections-network information-multiple clients-datagrams. **Programming GNOME using GTK+:** introducing X-introducing GTK+ -Events, signals and widgets-GTK+ widgets-GNOME widgets- GNOME menus-dialogs-CD database application .**Programming KDE Using Qt :**introducing KDE and Qt-installing Qt-signals and slots-Qt widgets-dialogs-menus and toolbars with KDE-CD database application using KDE/Qt.

B. TOPICS FOR SELF-STUDY:

S.No	Topics	Web Links
1	Shell Generalities	**https://www.math.uh.edu/~torok/math_6298/unix/commands.html**
2	Interactive Shell Script	**https://www.shellscript.sh/interactive.html**
3	The sed stream Editor	**https://www.tutorialspoint.com/sed/sed_quick_guide.htm**
4	The awk Programming Language	**https://www.linode.com/docs/guides/introduction-to-awk/**

C. Text Books:

1. Neil Matthew,Richard Stones,"Beginning Linux Programming", Fourth Edition,Wiley Publishing Inc,2008.

D. Reference Books:

1. Paul Cobbaut,"Linux Fundamentals" version 1.3,published by Free Software Foundation on 24 may 2015.
2. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, "Linux in a Nutshell", 6th Edition, O'Reilly Media, 2009.
3. Neil Matthew, Richard Stones, Alan Cox, "Beginning Linux Programming", 3rd Edition, 2004.
4. Robert Love, "Linux System Programming" ,O'Reilly Media, 2ndEd., 2007.
5. William Shotts,"The Linux Command Line"version 16.07,3rd internet edition, published by No Starch press on July 28,2016.

E. Web Links:

1. **https://www.javatpoint.com/linux-tutorial**
2. **https://www.whoishostingthis.com/resources/linux-programming/**
3. **https://medium.com/better-programming/linux-survival-guide-for-beginners-c18bfd982036**
4. **https://www.tuxcademy.org/download/en/grd2/grd2-en-manual.pdf**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Getting Started**		
1.1	An Introduction for UNIX and Linux	Distinguish between Unix and Linux.	K4

1.2	The GNU Project	Explain the GNU project	K2
1.3	Linux Distributions	Discuss on linux distributions.	K6
1.4	Programming Unix - Linux Programs	Show the working of alinux shell program.	K1
1.5	Text Editors	Summarize on various text editors.	K2
1.6	The C Compiler	Explain the C Compiler	K5
1.7	Development System Roadmap	Discuss on the system roadmap	K6
1.8	Shell program , A bit of philosophy	Summarize on shell program.	K2
1.9	Pipes and Redirection	Explain the different types of redirection.	K5
1.10	The Shell as a Programming Language	Outline the shell as a programming language	K2
1.11	Shell Syntax	Show the syntax for a shell.	K1
1.12	Variables	Explain variables in detail.	K5
1.13	Condition control structures	Develop programs using condition control structures.	K6
1.14	Shell Syntax – Functions	Explain functions in detail	K5
1.15	Commands	Make use of the different types of shell commands	K3
1.16	Command Execution	Discuss on command execution of the program.	K6
1.17	Shell Syntax -documents	Recall the shell documents	K1
1.18	Debugging Scripts	Elaborate the debugging scripts.	K6
1.19	Graphical	Outline the concept of graphical structure.	K2
1.20	Linux File Structure	Summarize the process of linux file structure.	K2
1.21	System Calls	Explain system calls	K5
1.22	Device Drivers	Illustrate the device drivers	K2
1.23	Library Functions	Elaborate on library functions	K6
1.24	Lowlevel File Access	Discuss the importance of low level file access.	K6
1.25	The Standard I/O Library	Illustrate the standard i/o library functions	K6
1.26	Formatted Input and Output	Determine the concept of formatted input and output functions	K5
1.27	File and Directory Maintenance	Discuss on directory maintenance	K6
1.28	Scanning Directories	Explain about scanning directories	K5
1.29	Errors, The /proc File System	Recall on /proc file system	K1
II	**The Linux Environment**		
2.1	Program Arguments	Explain program arguments	K5
2.2	Environment Variables	Outline on environment variables	K1
2.3	Time and Date	Explain Time and Date variables	K5
2.4	Temporary Files	Discuss temporary files in detail	K6
2.5	User Information	Elaborate the importance of user information	K5
2.6	Host Information	Illustrate on host information	K2
2.7	Logging	Recall logging	K1

2.8	Resources and Limits	Summarize the concept of resources and limits	K2
		Terminals	
2.9	Reading from and writing to the terminal	Explain reading from and writing to the terminal	K5
2.10	Talking to the terminal	Outline the concept of talking to the terminal	K2
2.11	The terminal driver and the general terminal interface	Discuss the terminal driver and general terminal interface	K6
2.12	The termios structure	Elaborate the termios structure	K6
2.13	Terminal output	Summarize on terminal output	K2
2.14	Detecting keystrokes	Recall the detecting keystrokes	K1
		Managing Text-Based Screens with curses	
3.7	Compiling with curses	Explain the concept of compiling with curses	K5
3.8	Curses terminology and concepts	Elaborate on the concept of curses terminology	K6
3.9	The screen-the keyboard-windows-subwindows-the keypad-using color-pads-the	Outline the concepts of screen, keyboard and windows.	K2
III	**Data Management**		
3.1	Managing memory	Explain memory management	K5
3.2	File locking and databases	Discuss file locking	K6
		Development Tools	
3.3	Problems of multiple source files	Recall the problem of multiple source files	K1
3.4	The make command and make files	Explain make command and make files	K5
3.5	Source code control	Outline on source code control	K2
3.6	Writing a manual page	Illustrate on writing a manual page	K2
3.7	Distributing software	Summarize on distributing a software	K2
3.8	RPM packages	Explain RPM package	K5
3.9	Other package formats and development environments	Illustrate the package formats	K2
		Debugging	
3.10	Types of errors	Explain the types of errors	K5
3.11	General debugging techniques	Summarize on general debugging techniques	K2
3.12	Debugging with gdb	Elaborate debugging with gdb	K6
3.13	More debugging tools	Discuss the debugging tools in detail	K6
3.14	Assertions, and memory debugging	Recall assertion	K1
IV	**Processes and Signals**		
4.1	Process structure	Explain process structure	K5
4.2	Starting new processes	Illustrate on starting a new process	K2
4.3	Signals	Discuss the concept of signals	K6
		POSIX Threads	
4.4	Advantages and drawbacks of threads	List the advantages and disadvantages of threads	K1
4.5	A first threads program	Create a thread program.	K6

4.6	Simultaneous execution	Explain simultaneous execution	K5
4.7	Synchronization	Discuss synchronization	K6
4.8	Thread attributes	Outline thread attributes in detail	K2
4.9	Cancelling a thread	Illustrate cancelling a thread	K2
4.10	Threads in abundance	Elaborate the concept of thread in abundance	K5
	Inter-Process Communication: Pipes		
4.11	Process pipes	Discuss process pipes	K6
4.12	Sending output to popen	Explain the process of sending output to popen	K5
4.13	The pipe call	Summarize the importance of pipe call	K2
4.14	Parent and child processes	Explain the parent and child processes.	K2
4.15	Named pipes: FIFOs	Elaborate the concept of FIFO.	K6
	Semaphores, Shared memory and Message Queues		
4.16	Semaphores	Explain semaphores	K5
4.17	Shared memory	Discuss shared memory in detail	K6
4.18	Message queue	Recall message queues	K1
V		**Sockets**	
5.1	Socket connections and network information	Explain socket connections and network in detail	K5
5.2	Multiple clients	Elaborate on multiple clients	K6
5.3	Datagrams	Summarize on datagrams	K2
	Programming GNOME using GTK+		
5.4	Introducing X-introducing GTK+	Recall the concept of GTK+	K1
5.5	Events	Summarize on events	K2
5.6	Signals and widgets-GTK+ widgets-GNOME widgets	Discuss on signals and widgets	K6
5.7	GNOME menus and dialogs	Outline on GNOME menus and dialogues	K2
	Programming KDE Using Qt		
5.8	Introducing KDE and Qt	Explain KDE	K5
5.9	Installing Qt	Elaborate on the Installation process of Qt	K6
5.10	Signals and slots	Discuss the concepts of signals and slots	K6
5.11	Qt widgets	Outline the importance ofQt widget	K2
5.12	Dialogs and menus	Summarize the dialogues and menus in KDE	K2
5.13	Toolbars with KDE	Recall the toolbars in KDE	K1

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	M	L	L	-	M	M	H	L	M	M	-	M
CO2	H	H	M	H	M	H	M	L	H	H	H	M	-
CO3	H	H	M	H	H	H	H	M	H	H	L	L	L

CO4	H	H	M	H	M	M	M	H	H	H	H	M	M
CO5	M	H	M	H	M	H	M	L	H	M	M	L	M
CO6	H	H	H	H	H	M	H	M	M	H	H	H	H

<div align="right">

L-Low　　　**M-Moderate**　　　**H- High**

</div>

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

<div align="center">

****

</div>

BRIDGE COURSE – VI: INTERNET PROGRAMMING LAB

SEMESTER: II   **CODE: PB22CA2P**
CREDITS: 2   **HOURS/WEEK: …**

1. COURSE OUTCOMES
After the completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Exercise Covered
CO1	Summarize the basic tags to develop web pages design using Html	K2	1,3,4
CO2	Construct the web page using image mapping and link the pages using hyperlinks	K6	2
CO3	Create the tabular content in web page using tables, form and canvas	K6	5,6,8,13
CO4	Develop a web page with multimedia and display the new articles using semantic elements	K6	7,9
CO5	Design a web page for various event and event handlers	K6	10,11,12
CO6	Design a web site to interact with users AngularJS	K6	14,15

2A. Syllabus

1. Create a sample web site for the college and courses offered using various formatting text tags and hyperlink
2. Create a web page contain world map which link various parts of the map using
    i.   To embed an image map concept in web page
    ii.   To locate hotspot in an image map
3. Write a program to design a website of your home town with the following
    i.   Cascading Style Sheet
    ii.   External style Sheet
    iii. Inline Style Sheet
4. Create a web site for a restaurant that links pages using list and hyperlinks
5. Design a web page to display the class time table using tables
6. Create a web page to display various geometric transformations.
7. Write a program to play a video and audio clip of your department activities using multimedia content in a web page
8. Create a web page for a bio-data to enter the personal information using various input elements
9. Design a web page for a news article using semantic elements
10. Write a java script program to validate the screen input
11. Write a program in java script to design calculator using event handler
12. Design a web page to change the background color of a web page using button element.
13. Create a web page for college admission forms
14. Write a program to create a web page using AngularJS expressions
15. Create a validation form in web page using Angular JS framework

B. TOPICS FOR SELF-STUDY:

S.No.	Topics	Web Links
1	Giphy with a unique API	https://medium.com/@mattcroak718/beginners-guide-to-the-giphy-api-316f98459d06
2	AJAX-style login	https://www.youtube.com/watch?v=U1yQNnG4lyA
3	JavaScript quiz game	https://www.youtube.com/watch?v=49pYIMygIcU
4	Webpack Angular JS	https://codecraft.tv/courses/angularjs-migration/step-2-typescript-and-webpack/using-webpack/

C. Text Books:

1. Faithe Wempen, "HTML5 Step by Step", First edition, Microsoft Press, 2011.
2. Robert W. Sebesta, "Programming the World Wide Web", Pearson Education, Seventh Edition, 2014.
3. Felix Alvaro, "ANGULARJS: Easy AngularJS for Beginners", Kindle Edition, 2016.

D. Reference Book:
2. Joel Skylar, "Principles of Web Design: The Web Technologies Series," Fifth Edition, 2011.

E. Web links:
1. https://www.w3schools.com/js/DEFAULT.asp
2. https://www.javascripttutorial.net/
3. https://www.codecademy.com/learn/introduction-to-javascript

3. SPECIFIC LEARNING OUTCOMES (SLO)

Exercise	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
1	Create a sample web site for the college and courses offered using various formatting text tags and hyperlink	Develop a web site using basic html tags with hyperlinks and text formatting	K6
2	Create a web page contain world map which link various parts of the map using hotspot in an image map	Construct a web site to locate a place in a world map and links its corresponding home page	K5
3	Write a program to design a website of your home town with the using CSS	Design a web page for a home town with various style sheets	K6
4	Create a web site for a restaurant that links pages using list and hyperlinks	Develop a web page for a restaurant contains its menu and other details with ordered and un ordered list	K6
5	Design a web page to display the class time table using tables	Construct a class time table using table format	K6

6	Create a web page to display various geometric transformations.	Build web page displaying various geometry shapes using canvas tags	K6
7	Write a program to play a video and audio clip of your department activities using multimedia content in a web page	Adapt the audio and video content on the web page	K6
8	Create a web page for a bio-data to enter the personal information using various input elements	Develop a web page to fill the personal details using forms with various elements	K6
9	Design a web page for a news article using semantic elements	Design a news article about a college using semantic elements	K6
10	Write a java script program to validate the screen input	Design a web page for login details with username and password	K6
11	Write a program in java script to design calculator using event handler	Develop a calculator in a web page	K6
12	Design a web page to change the background color of a web page using button element.	Design a web page to change the background color by clicking a button using event handler	K6
13	Create a web page for college admission forms	Create an admission form for college	K6
14	Create a validation form in web page using Angular JS framework	Create a web page for using expressions in angular JS	K6
15	Create a validation form in web page using Angular JS framework	Create a web page to validate the form	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	L	M	-	L	L	H	L	M	H	M	H	H
CO2	H	H	H	L	H	-	L	L	M	M	H	H	H
CO3	H	-	H	-	H	M	H	L	M	H	H	H	H
CO4	H	H	M	L	M	M	M	-	H	M	H	H	H
CO5	H	M	H	L	H	M	H	-	H	H	H	H	H
CO6	H	L	M	M	H	M	H	M	M	H	H	H	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Practical Components): Closed Book

---

2. Cooperative Learning Report, Assignment, Group Discussion, project Report, Field Visit Report, Seminar.

3. Pre/Post Test, Viva, Report for each Exercise.

4. Lab Model Examination & End Semester Practical Examination

INDIRECT:

1. Course end survey (Feedback)

****

SEMESTER: III   **CODE: P22CA308**
CREDITS: 4   **HOURS/WEEK: 4**

1. COURSE OUTCOMES
After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered Covered
CO1	Explain various mobile application developing environments and IDEs	K5	I
CO2	Create mobile applications using intents, activities and components	K6	II
CO3	Choose the appropriate layouts and UI controls based on the specification	K6	III
CO4	Construct SQLite database to build Android application	K6	IV
CO5	Utilize the memory management mechanisms efficiently	K6	V
CO6	Test the applications in web and launch the services	K6	V

UNIT I - Getting Started with Android Programming: **12 Hours**
        What Is Android? -Android Versions -Features of Android - Architecture of Android - Android Devices in the Market - The Android Market - **Obtaining the Required Tools**: Eclipse - Android SDK - Android Development Tools (ADT) - Creating Android Virtual Devices (AVDs) - Creating Android Applications. **Activities and Intents**: Understanding Activities: Applying Styles and Themes to Activity - Hiding the Activity Title - Displaying a Dialog Window - Displaying a Progress Dialog. **Linking Activities Using Intents**: Resolving Intent Filter Collision - Returning Results from an Intent - Passing Data Using an Intent Object

UNIT II - Getting to Know the Android User Interface: **12 Hours**
        Understanding the Components of a Screen - Views and ViewGroups - LinearLayout - AbsoluteLayout - TableLayout - RelativeLayout - FrameLayout - ScrollView - **Adapting to Display Orientation**: Anchoring Views - Resizing and Repositioning.**Managing Changes to Screen Orientation**: Persisting State Information during Changes in Configuration - Detecting Orientation Changes - Controlling the Orientation of the Activity - **Creating the User Interface Programmatically -Listening for UI Notifications:** Overriding Methods Defined in an Activity - Registering Events for Views.

UNIT III - Designing Your User Interface Using Views : **Basic Views**:   **12 Hours**
        TextView View - Button, ImageButton, EditText, CheckBox, ToggleButton, RadioButton and RadioGroup Views - ProgressBar View - AutoCompleteTextView View - **Picker Views**: TimePicker View - Displaying the TimePicker in a Dialog Window - DatePicker View - Displaying the DatePicker View in a Dialog Window - **List Views:**ListView View - Customizing the ListView - Using the Spinner View.Displaying Pictures and Menus with Views. **Using Image Views to Display Pictures**: Gallery and ImageView Views - ImageSwitcher - GridView. **Using Menus with Views**: Creating the Helper Methods - Options Menu - Context Menu

UNIT IV - Data Persistence: **12 Hours**
        Saving and Loading User Preferences - Using get Shared Preferences() -Using getPreferences() - Persisting Data to Files - **Saving to Internal Storage**: Saving to External Storage (SD Card) - Choosing the Best Storage Option - Using Static Resources - **Creating and Using Databases**:Creating

the DBAdapter Helper Class - Using the Database Programmatically - Adding Contacts - Retrieving All the Contacts - Retrieving a Single Contact - Updating a Contact - Deleting a Contact -Upgrading the Database - Pre-Creating the Database - Bundling the Database with an Application - **Content Providers** : Sharing Data in Android - Using a Content Provider - Predefined Query String Constants - Projections - Filtering - Sorting.

UNIT V - Messaging and Location based services: **12 Hours**
        SMS Messaging: Sending SMS Messages Programmatically - Getting Feedback After Sending the Message - Sending SMS Messages Using Intent - Receiving SMS Messages - Updating an Activity from a Broadcast Receiver - Invoking an Activity from a BroadcastReceiver - Caveats and Warnings. **Sending E- Mail**. **Displaying Maps** : Creating the Project - Obtaining the Maps API Key - Displaying the Map - Displaying the Zoom Control - Changing Views - Navigating to a Specific Location - Adding Markers - Getting the Location That Was Touched - Geocoding and Reverse Geocoding - **Getting Location Data** : Monitoring a Location. Developing Android Services – Publishing Android Applications.

B. TOPICS FOR SELF-STUDY:

S.No	Topics	Web Link
1	Animations and Transitions	**https://developer.android.com/training/animation**
2	Sending SMS	**https://www.tutorialspoint.com/android/android_advanced_tutorial.pdf**
3	Working with Sensor data	**https://google-developer-training.github.io/android-developer-advanced-course-practicals/Unit Covered-1-expand-the-user-experience/lesson-3-sensors/3-1-p-working-with-sensor-data/3-1-p-working-with-sensor-data.html#tolearn**
4	Google Play's billing system	**https://developer.android.com/google/play/billing**

C. Text Books:

   1. Wei-Meng Lee, "Beginning Android Application Development", Wrox, First Edition,2012.

D. Reference Book:

   1. Tim Warren, "Android Programming for Beginners: The simple Guide to learning
   2. Android Programming Fast", Ingram Publications, 2020.
   3. John Horton, "Android Programming for Beginners", Second Edition, Packt Publications, 2018.
   4. PratiyushGuleria , "Android for Beginners" , BPB Publications.

E. Web links:
   1. **https://developer.android.com/**
   2. **https://www.tutorialspoint.com/android/index.htm**
   3. **https://www.javatpoint.com/android-tutorial**
   4. **https://www.vogella.com/tutorials/android.html**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Getting Started with Android Programming**		

1.1	What Is Android?	Tell about android	K1
1.2	Android Versions	List out the android versions	K1
1.3	Features of Android	Outline the features of android OS	K2
1.4	Architecture of Android	Explain the architecture of android	K2
1.5	Android Devices in the Market	Spell out android devices in the market	K2
1.6	The Android Market	Discover the appropriate android market	K4
Obtaining the Required Tools			
1.7	Eclipse	Test eclipse IDE	K6
1.8	Android SDK	Test SDK plug in with eclipse	K6
1.9	Android Development Tools (ADT)	Make use of ADT.	K3
1.10	Creating Android Virtual Devices (AVDs)	Create Android Virtual Device(AVD)	K6
1.11	Creating Android Applications	Develop simple android applications	K6
Activities and Intents			
1.12	Applying Styles and Themes to Activity	Apply styles in activities	K3
1.13	Hiding the Activity Title	Show the hiding activity title	K2
1.14	Displaying a Dialog Window	Design an user defined dialog window	K6
1.15	Displaying a Progress Dialog	Construct a progress dialog and display	K6
Linking Activities Using Intents			
1.16	Resolving Intent Filter Collision	Utilize intents to link activities	K3
1.17	Returning Results from an Intent	Inspect the results returned from intent	K4
1.18	Passing Data Using an Intent Object	Demonstrate the use of passing the data through an intent object	K2
II	**Getting to Know the Android User Interface**		
2.1	Understanding the Components of a Screen	Create activities using various components	K6
2.2	Views and ViewGroups	Compare the different views and viewGroups	K5
2.3	LinearLayout	Build applications using linear layout	K6
2.4	AbsoluteLayout	Develop android applications using absolute layout	K6
2.5	TableLayout	Improve the developed applications by using TableLayout	K6
2.6	RelativeLayout	Construct Services with relative layout	K6
2.7	FrameLayout	Choose frame layout to develop applications	K6
2.8	ScrollView	Adapt the scrollview	K6
Adapting to Display Orientation			
2.9	Anchoring Views	Examine the anchoring views in android	K3

2.10	Resizing and Repositioning	Demonstrate resizing and repositioning options	K3
	Managing Changes to Screen Orientation		
2.11	Persisting State Information during Changes in Configuration	Recall the persisting state information during changes in configuration	K3
2.12	Detecting Orientation Changes	Identify the various orientation changes	K3
2.13	Controlling the Orientation of the Activity	Design applications with different orientations	K6
	Creating the User Interface Programmatically -Listening for UI Notifications		
2.14	Overriding Methods Defined in an Activity	Illustrate overriding methods in an activity	K2
2.15	Registering Events for Views	Outline the importance of registering the events for views	K2
III	**Designing Your User Interface Using Views : Basic Views**		
3.1	TextView View, Button, ImageButton, EditText, CheckBox, ToggleButton, RadioButton and RadioGroup Views, ProgressBar View - AutoCompleteTextView View	Design a sample android application with basic views	K6
	Picker Views		
3.2	TimePicker View - Displaying the TimePicker in a Dialog Window - DatePicker View	Combine picker views with basic views.	K6
3.3	Displaying the DatePicker View in a Dialog Window	Develop an application by DatePicker view	K6
	List Views		
3.4	ListView view	Improve application by embedding ListView view	K6
3.5	Customizing the ListView	Build Android application that customize the ListView	K6
3.6	Using the Spinner View.Displaying Pictures and Menus with Views	Adapt menus with views	K6
	Using Image Views to Display Pictures		
3.7	Gallery and ImageView Views	Apply gallery and image view	K3
3.8	ImageSwitcher	Apply ImageSwitcher in developing applications	K3
3.9	GridView	Test GridView	K6
	Using Menus with Views		
3.10	Creating the Helper Methods	Create Applications with Helper methods	K6
3.11	Options Menu	Apply option menu	K3
3.12	Context Menu	Design applications with Context Menu	K6
IV	**Data Persistence**		
4.1	Saving and Loading User Preferences	Apply saving and loading user preferences	K3
4.2	Using getSharedPreferences()	Create Android applications with getSharedPreferences()	K6

4.3	Using getPreferences()	Design application using getPreferences()	K6
4.4	Persisting Data to Files	Develop Android applications by persisting data to files	K6
Saving to Internal Storage			
4.5	Saving to External Storage (SD Card)	Improve application by integrating with SD card services	K6
4.6	Choosing the Best Storage Option	Test application with best storage option	K6
4.7	Using Static Resources		
Creating and Using Databases			
4.8	Creating the DBAdapter Helper Class	Utilize DBAdapterHelper Class	K3
4.9	Using the Database Programmatically	Develop applications using database	K6
4.10	Adding Contacts	Develop applications with contacts	K6
4.11	Retrieving All the Contacts	Develop applications for retrieving all contacts	K6
4.12	Retrieving a Single Contact	Develop applications for retrieving a single	K6
4.13	Updating a Contact, Deleting contact	Develop applications for deleting and updating all contacts	K6
4.14	Upgrading the Database - Pre-Creating the Database - Bundling the Database with an Application	Design application with database	K6
Content Providers			
4.15	Sharing Data in Android	Demonstrate sharing data in Android	K2
4.16	Using a Content Provider	Demonstrate Content Providers	K2
4.17	Predefined Query String Constants	Eloborate predefined query string constants	K6
4.18	Projections - Filtering - Sorting.	Create applications with projections, filtering and sorting	K6
V	**Messaging and Location based services**		
5.1	SMS Messaging: Sending SMS Messages Programmatically - Getting Feedback After Sending the Message - Sending SMS Messages Using Intent - Receiving SMS Messages -.	Design application by applying SMS services	K6
5.2	Updating an Activity from a BroadcastReceiver - Invoking an Activity from a BroadcastReceiver - Caveats and Warnings	Create application with the help of BroadcastReceiver	K6
Sending E- Mail. Displaying Maps			
5.3	Creating the Project - Obtaining the Maps API Key	Develop application with Maps services	K6
5.4	Displaying the Map - Displaying the Zoom Control - Changing Views - Navigating to a Specific Location	Develop applications with location based services	K6

5.5	Adding Markers - Getting the Location That Was Touched - Geocoding and Reverse Geocoding	Create applications with Geocoding and reverse geocoding	K6
	Getting Location Data		
5.6	Monitoring a Location	Develop applications with location monitoring services	K6
5.7	Developing Android Services	Develop real time android services	K6
5.8	Publishing Android Applications.	Test the android applications by publishing in play store	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	-	-	-	H	-	-	-	-	-	-	-	-
CO2	M	H	M	M	H	-	-	-	-	H	M	M	-
CO3	-	-	H	-	H	-	-	-	L	M	-	M	-
CO4	H	M	M	L	M	-	-	-	-	H	H	H	L
CO5	H	M	M	M	M	-	-	L	L	H	M	M	-
CO6	H	H	H	M	H	-	-	L	L	M	H	H	L

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

Course Coordinator	**Director-MCA**
Dr. P.S.ELIAHIM JEEVARAJ	**Dr. R.THAMARAI SELVI**

****

Core IX: PROGRAMMING IN PYTHON

SEMESTER: III   **CODE: P22CA309**
CREDITS: 4   **HOURS/WEEK: 5**

1. COURSE OUTCOMES

After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Illustrate the basics of python to develop python programs with conditional controls and loops	K2	I
CO2	Experiment with python data structures –lists, tuples and dictionaries for programming	K3	II
CO3	Examine python functions and call them	K4	III
CO4	Construct programs using classes and objects	K6	III
CO5	Adapt files, modules and packages and perform database operations on them	K6	IV
CO6	Construct programs using GUI and django framework	K6	V

2 A Syllabus

UNIT I - Introduction to Python, Data types and Statements   **15 Hours**
Introduction: Getting Started with Python Programming - **Data Types, and Expressions**: Strings, Assignment, and Comments - Numeric Data Types and Character Sets, Expressions - **Loops and Selection Statements**: Definite iteration: the for Loop - Selection: if and if-else statements - Conditional iteration: the while Loop.

UNIT II - Strings, Files, Lists and Functions   **15 Hours**
Strings and Text Files: Accessing Characters and substrings in strings - Data Encryption -Strings and Number systems - String methods - Text Files - Text Files and Their Format - Writing Text to a File - Reading Text from a File. **Lists and Dictionaries**: Lists – Tuples - Dictionaries - **Design with Functions**: Defining Simple Functions - Design with recursive Functions.

UNIT III - OOPs and Databases   **15 Hours**
Design with Classes: Getting inside Objects and Classes - Structuring Classes with Inheritance and Polymorphism. **Python and Databases**: Working with Databases in MySQL - Working with Tables in MySQL - Managing users in MySQL - Accessing (CRUD) MySQL data from Python - Working with SQLite Database.

UNIT IV - Numpy, Panda and Matplotlib   **15 Hours**
Introduction to NumPy: NumPy Standard Data Types - The Basics of NumPy Arrays - NumPy Array Attributes - Computation on NumPy Arrays: Universal Functions - Aggregations: Min, Max, and Everything in Between. **Data Manipulation with Pandas**: Installing and Using Pandas - Introducing Pandas Objects - Data Indexing and Selection. **Visualization with Matplotlib**: Importing matplotlib - Setting Styles - Saving Figures to File - Simple Line Plots - Simple Scatter Plots.

UNIT V - Introduction to Django   **15 Hours**

Introduction to Django: Virtual Environments - Install Django - Text Editors. **Hello World app:** Initial Set Up - Create an app - Views and URLConfs. **Pages app:** Initial Set Up - Templates - Class-Based Views - URLs - Add an About Page - Extending Templates - Tests.

B. TOPICS FOR SELF-STUDY:

S.No	Topics	Web Link
1	Python MongoDB	**https://www.w3schools.com/python/python_mongodb_getstarted.asp**
2	Python Random Module	**https://www.w3schools.com/python/module_random.asp**
3	cMath Module	**https://www.w3schools.com/python/module_cmath.asp**
4	PostgreSQL	**https://www.tutorialspoint.com/postgresql/postgresql_python.htm**

C. Text Books:

1. K.A. Lambert, "*Fundamentals of Python: first programs*", Second Edition, Cengage Learning, 2020 (Unit - I, II and III)
2. Jake VanderPlas, "*Python Data Science Handbook: Essential Tools for Working with Data*", O'Reilly Media Inc., First Edition, 2020 (Unit - IV)
3. William S Vincent, "*Django for Beginners: Build Websites with Python and Django*", 2022 (Unit - V)

D. Reference Books:

1. John V Guttag. "*Introduction to Computation and Programming Using Python*", 2nd Edition, Prentice Hall of India,2015
2. R Nageswara Rao, "*Core Python Programming*", 2nd Edition, Dreamtech Press, 2016
3. Mark Lutz, "Learning Python", O' Reilly, 2018
4. John Zelly, Mark Lutz, "*Python Programming: An Introduction to Computer Science*", O' Reilly, 2018.
5. Antonio Mele, "*Django 3 By Example*", Third Edition, 2020.

E. Web links:

1. **https://nptel.ac.in/courses/106/106/106106182**
2. **https://www.w3schools.com/python**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Introduction to Python, Data types and Statements**		
1.1	Getting Started with Python Programming	Demonstrate how to install Python.	K2
	Data Types, and Expressions		
1.2	Strings	Demonstrate Strings.	K2
1.3	Assignment	Illustrate assignment statement in Python.	K2

1.4	Comments	What are comments?	K1
1.5	Numeric Data Types	Identify the numeric data types in python.	K3
1.6	Character Sets	List out the character sets of Python.	K1
1.7	Expressions	Illustrate the expressions.	K2
	Loops and Selection Statements		
1.8	Definite iteration: the for Loop	Elaborate the for loop with example.	K6
1.9	Selection: if and if-else statements	Demonstrate the if and if-else statements.	K2
II	**Strings, Files, Lists and Functions**		
	Strings and Text Files		
2.1	Accessing Characters	Explain about accessing characters in Python	K5
2.2	substrings in strings	Demonstrate substrings in strings.	K2
2.3	Data Encryption	Discuss data encryption in python	K6
2.4	Strings and Number systems	Elaborate the string functions.	K6
2.5	String methods	Explain the string methods.	K5
2.6	Text Files	What are Text files?	K1
2.7	Text Files and Their Format	Discuss about text files and their formats.	K6
2.8	Writing Text to a File	Write a Python program for writing text to a file.	K6
2.9	Reading Text from a File	Write a Python program for reading text from a file	K6
	Lists and Dictionaries		
2.10	Lists	Explain about List and their operations.	K5
2.11	Tuples	Elaborate the methods of Tuple.	K6
2.12	Dictionaries	Discuss about Dictionaries.	K6
	Design with Functions		
2.13	Defining Simple Functions	Illustrate function with example	K2
2.14	Design with recursive Functions	Demonstrate recursive functions	K6
III	**OOPs and Databases**		
	Design with Classes		
3.1	Objects	Explain about Python objects.	K5
3.2	Classes	Explain classes with example.	K6
	Python and Databases		
3.3	Working with Databases in MySQL	Discuss about the working with databases in MySQL	K6
3.4	Working with Tables in MySQL	Demonstrate MySQL table.	K2
3.5	Managing users in MySQL	Explain how to manage users in MySQL	K5
3.6	Accessing (CRUD) MySQL data from Python	Explain about accessing CRUD MySQL data from Python	K5
3.7	Working with SQLite Database	Explain about the working of SQLite databases	K5
IV	**Numpy, Panda and Matplotlib**		
	Introduction to NumPy		

4.1	NumPy Standard Data Types	Identify the NumPy standard data types	K3
4.2	The Basics of NumPy Arrays	Demonstrate the NumPy arrays	K2
4.3	NumPy Array Attributes	Elaborate NumPy array attributes.	K6
4.4	Computation on NumPy Arrays: Universal Functions	Discuss about universal functions.	K6
4.5	Aggregations: Min, Max, and Everything in Between.	Demonstrate the aggregations in NumPy.	K2
	Data Manipulation with Pandas		
4.6	Installing and Using Pandas	Demonstrate how to install Pandas	K2
4.7	Introducing Pandas Objects	Illustrate Pandas objects.	K2
4.8	Data Indexing and Selection	Explain about data indexing and selection.	K5
	Visualization with Matplotlib		
4.9	Importing matplotlib	Explain how to import matplotlib	K5
4.10	Simple Line Plots	Demonstrate Line plots	K2
4.11	Simple Scatter Plots	Demonstrate scatter plots.	K2
V	**Introduction to Django**		
5.1	Virtual Environments	What is Django?	K1
5.2	Install Django	Explain how to install Django.	K5
5.3	Text Editors	Discuss about Text editors	K6
	Hello World app		
5.4	Create an app	Demonstrate how to create an app.	K2
5.5	Views and URLConfs	Discuss about views and URLconfs.	K6
	Pages app		
5.6	Templates	Explain about templates.	K5
5.7	Class-Based Views	Illustrate class-based views.	K2
5.8	URLs	Explain about URLs.	K5
5.9	Extending Templates	Discuss about extending templates.	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	H	H	M	M	H	M	M	M	H	H	M	L
CO2	H	H	H	M	M	L	L	L	M	H	M	L	H
CO3	H	M	H	M	M	L	L	L	M	H	M	L	L
CO4	H	M	H	M	M	L	L	L	M	H	M	L	L
CO5	H	H	H	H	L	L	L	L	L	H	L	L	L
CO6	H	H	H	H	H	M	M	M	M	H	M	M	L

L-Low   **M-Moderate**   **H- High**

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

    Course Coordinator   **Director-MCA**
    Dr. P. THANGARAJU   **Dr. R.THAMARAI SELVI**

****

Core X: COMPUTER NETWORKS AND NETWORK SECURITY

SEMESTER : III **CODE: P22CA310**
CREDITS : 4 **HOURS/WEEK: 5**

1. COURSE OUTCOMES:

After the completion of this course, the students will be able to:

S.No	Course Out Comes	Level	Unit Covered
CO1	Compare OSI and TCP/IP Reference Models	K4	I
CO2	Apply the framing methods and data-link layer issues of error detection, corrections and flow control	K3	II
CO3	Choose the routing algorithms for congestion control	K5	III
CO4	Analyze the functions of TCP and UDP protocols.	K4	IV
CO5	Evaluate the features and operations of application layer protocols	K5	IV
CO6	Test the cryptography and network security algorithms	K6	V

2A. Syllabus

UNIT I - Introduction - Uses of Computer Networks: 15 hours
Business Applications - Home Applications - Mobiles users - Social Issues - Network Hardware - Network Software. **Reference Models:** The OSI Reference model - The TCP/IP Reference model. **The physical Layer:** The Theoretical Basis for Data Communication - Guided Transmission Media - Wireless Transmission.

UNIT II - The Data Link Layer: 15 hours
Design Issues - Error Detection and Correction - Elementary Data Link Protocols - Sliding Window Protocols. **Ethernet:** Classic Ethernet Physical Layer - Classic Ethernet MAC Sub layer - Switched Ethernet- Fast Ethernet. **Bluetooth:** Bluetooth Architecture - Bluetooth Applications - The Bluetooth Protocol Stack - Bluetooth Frame Structure.

UNIT III - The Network Layer: 15 hours
Design Issues - Routing Algorithms. **Congestion Control Algorithms:** Approaches to Congestion Control - Traffic Aware Routing - Admission Control - Traffic Throttling - Load Shedding. **Quality of Service:** Application Requirements -Traffic Shaping - Packet Scheduling - Admission Control - Integrated Services - Differentiated Services - **The Network Layer in the Internet:** The IP Protocol - IP Address.

UNIT IV - The Transport Layer: 15 hours
The Transport Service - **The Internet Transport Protocol (UDP)**: Introduction to UDP - Remote Procedure Call - Real Time Transport Protocol. **The Internet Transport Protocol (TCP):** Introduction to TCP - TCP Service Model - The TCP Protocol - The TCP Segment Header - TCP Connection Establishment - TCP Connection Release. **The Application Layer:** Domain Name System - Electronic Mail.

UNIT V - Computer and Network Security Concepts: 15 hours
Computer Security Concepts **-** The OSI security Architecture - Security Attacks - Security Services - Security Mechanisms - **Classical Encryption Techniques:** Symmetric Cipher Model -

Substitution Techniques - Transposition Techniques - Rotor Machines – Steganography - **Block Ciphers and the Data Encryption Standard :** Traditional Block Cipher structure - The Data Encryption Standard - The Strength of DES - Cryptanalysis – Block Cipher Design Principles – **Public key Cryptography and RSA:** Principles of Public Key Cryptosystems – The RSA Algorithm.

B. TOPICS FOR SELF-STUDY:

S.No.	Topics	Web Links
1	Universal Mobile Telecommunication system	**https://www.tutorialspoint.com/universal-mobile-telecommunications-system**
2	IEEE 802.11	**https://www.tutorialspoint.com/wi-fi/wifi_ieee_standards.htm**
3	SIP and H.323	**https://www.geeksforgeeks.org/difference-between-h-323-and-sip/**
4	Stegnography	**https://www.geeksforgeeks.org/image-steganography-in-cryptography/**

C. Text Books:
  1. Andrew S. Tanenbaum and David J Wetherall, "Computer Networks", Pearson Education, Fifth Edition, Eighteenth Impression, 2020. (Unit Covered I to IV).
  2. William Stallings, "Cryptography and Network Security-Principles and Practice", Pearson Education, Seventh Edition, Eight Impressions, 2019. (Unit Covered V).

D. Reference Books:
  1. Behrouz A Forouzan, "Data Communications and Networking", McGraw Hill, Fifth Edition, 2012.
  2. William Stallings, "Data and Computer Communications", Pearson Education, Tenth Edition, 2014.

E. Web links:
  1. **https://nptel.ac.in/courses/106/105/106105183/**
  2. **https://www.tutorialspoint.com/_computer_network/index.html**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
1	**Introduction**		
1.1	Uses of Computer Networks	Outline the uses of computer networks	K2
1.2	Network Hardware	Explain the network hardware	K2
1.3	Network Software	Summarize the network software	K2
1.4	Reference Models: OSI Reference model	Estimate the layers of the OSI reference model	K5
1.5	TCP\IP Reference model	Illustrate the TCP /IP reference model	K2
	The physical Layer		
1.6	The Theoretical Basis for Data Communication	Define Bandwidth	K1

1.7	Guided Transmission Media.	Choose the guided transmission media	K3
1.8	Wireless Transmission.	Select the appropriate wireless transmission media	K3
II	**The Data Link Layer**		
2.1	Design Issues	Solve the issues of data-link layer	K6
2.2	Error Detection and Correction	Test the error detection and correction techniques	K6
2.3	Elementary Data Link Protocols	Make use of the protocols of data link layer	K3
2.4	Sliding Window Protocols	Utilize the sliding window protocol	K3
	Ethernet		
2.5	Classic Ethernet Physical Layer	Illustrate the use of Ethernet Physical Layer	K2
2.6	Classic Ethernet MAC Sublayer	Make use of Classic Ethernet Mac sublayer	K3
2.7	Switched Ethernet & Fast Ethernet	Apply the Concepts of Ethernet	K3
	Bluetooth		
2.8	Bluetooth Architecture	Illustrate the architecture of Bluetooth	K2
2.9	Bluetooth Applications	Outline the various applications of Bluetooth	K2
2.10	The Bluetooth Protocol Stack	Explain the Bluetooth protocol stack.	K2
2.11	Bluetooth Frame Structure	Illustrate the frame structure of Bluetooth	K2
III	**The Network Layer**		
3.1	Design Issues	Analyze the design issues in network layer	K4
3.2	Routing Algorithms	Test the various routing algorithms	K6
	Congestion Control Algorithms		
3.3	Approaches to Congestion Control	Discuss the Approaches to Congestion Control	K6
3.4	Traffic Aware Routing & Admission Control	Explain Traffic Aware Routing & Admission Control	K5
3.5	Traffic Throttling & Load Shedding	Assess Load Shedding & Traffic Throttling	K5
3.6	Integrated Services - Differentiated Services -	Compare Integrated Services & Differentiated Services	K4
	The Network Layer in the Internet		
3.7	The IP Protocol	Illustrate on the IP protocol	K2
3.8	IP Address	Classify IP addresses	K4
IV	**The Transport Layer**		
4.1	The Transport Service	Identify the services provided to the upper layers	K2
	The Internet Transport Protocol (UDP)		
4.2	Introduction to UDP	Explain the Internet transport protocol	K2

4.3	TCP Service Model & The TCP Protocol	Compare the service and protocol models of TCP	K2
4.4	The TCP Segment Header	Appraise the TCP segment header	K5
4.5	TCP Connection Establishment	Explain the TCP connection establishment	K5
4.6	TCP Connection Release	Make use of the TCP connection release	K3
	The Application Layer		
4.7	Domain Name System	Elaborate the domain name system	K6
4.8	Electronic Mail	Illustrate the architecture of E-mail system	K2
V	**Computer and Network Security Concepts**		
5.1	Computer Security Concepts	Define Computer Security Concepts	K1
5.2	The OSI Security Architecture	Outline OSI Security Architecture	K2
5.3	Security Attacks	Analyze the Security Attacks	K4
5.4	Security Services	Explain Security Services	K5
5.5	Security Mechanisms	Choose Security Mechanisms	K5
	Classical Encryption Techniques		
5.6	Symmetric Cipher Model	Test the symmetric cipher model	K6
5.7	Substitution Techniques	Define Substitution Techniques	K2
5.8	Transposition Techniques	Elaborate on transposition techniques	K6
5.9	Rotor Machines & Steganography	Explain Rotor Machines	K5
	Block Ciphers and the Data Encryption Standard		
5.10	Traditional Block Cipher Structure	Define Traditional Block Cipher Structure	K2
5.11	The Data Encryption Standard	Analyze Data Encryption Standard	K4
5.12	The Strength of DES & Cryptanalysis	Estimate the strength of DES & Cryptanalysis	K6
5.13	Block Cipher Design Principles	Outline the principles of block cipher design	K2
	Public Key Cryptography and RSA		
5.14	Principles of Public Key Cryptosystems	Define Public Key Cryptosystems	K2
5.15	The RSA Algorithm	Formulate and test public key cryptography using RSA Algorithm	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	H	M	L	M	-	M	L	-	-	-	M	L
CO2	M	H	M	M	M	-	-	L	L	-	L	M	M
CO3	H	M	M	H	H	-	-	-	M	M	M	H	M

CO4	M	M	M	M	M	L	-	-	L	L	L	L	M
CO5	H	H	H	H	H	M	-	-	M	H	-	H	M
CO6	H	H	H	H	H	L	L	-	M	L	L	M	L

<div align="right">L-Low   M-Moderate   H- High</div>

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Discussion, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination.

INDIRECT:

1. Course end survey (Feedback)

    Course Coordinator   **Director-MCA**
Dr. B.ARPUTHAMARY   **Dr. R.THAMARAI SELVI**

Elective IV: ORGANIZATIONAL BEHAVIOUR

SEMESTER: III **CODE: P22CA3: A**
CREDITS: 3 **HOURS/WEEK: 4**

1. COURSE OUTCOMES
After the successful completion of this course the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Practice the use of scientific foundations of Organizational Behavior and analyze the Individual Behavior	K3	I
CO2	Analyze the personality, perception and attitudes of an in an organization and to examine the levels of job satisfaction	K4	II
CO3	Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization	K3	III
CO4	Evaluate the conflict management strategies used in organization and to analyze the job frustration and job stress	K5	IV
CO5	Evaluate the appropriateness of various leadership styles	K5	V
CO6	Explain how organizational change and culture affect working relationships within organizations	K6	V

2A. Syllabus

UNIT I - Introduction to Organizational Behaviour **12 Hours**
        Introduction: Elements of OB – Nature and Scope of OB – Contributing Disciplines to OB. Organizational Behaviour in Historical Perspective – **Foundations of Individual Behaviour:** Introduction – The Individual and Individual Differences – Human Behaviour and its Causation.

UNIT II - Personality and Perception **12 Hours**
        Personality –Perception –Attitudes: Concept of Attitudes – Formation of Attitudes – Types of Attitudes – Measurement of Attitude – Change of Attitude. **Values:** Concept of Value – Types of Values – Formation of Values – Values and Behaviour. **Job Satisfaction.**

UNIT III - Learning and Motivation **12 Hours**
        Learning: Meaning and Definition – Determinants of Learning – Learning Theories – Learning Principles – Reinforcement – Punishment – Learning and Behaviour. **Motivation:** Concepts – Meaning of Motivation – Nature of Motivation – Motivation Cycle or Process – Need for Motivation – Theories of Motivation – Motivation and morale.

UNIT IV - Organizational Conflicts **12 Hours**
        Organizational Conflicts: Definition of Conflict – Sources of Conflict – Types of Conflicts – Aspects of Conflicts – Functional Conflict – Dysfunctional Conflict – Conflict Process – Conflict Management. **Job Frustration –Stress Management.**

UNIT V - Communication and Leadership **12 Hours**
Communication: Nature and Need for Communication – Communication Process –Communication Channel – Communication Networks – Communication Barriers – Effective Communication. **Leadership – Organisational Structure – Organisational Culture**.

B. TOPICS FOR SELF-STUDY:

S.No	Topics	Web Link
1	Human Resource Management	**https://open.lib.umn.edu/humanresourcemanagement/chapter/1-1-what-is-human-resources/**
2	Stress Management and Emotional Health	**https://my.clevelandclinic.org/health/articles/6409-stress-management-and-emotional-health**
3	Organizational Dynamics	**http://www.managingdynamics.com/organizational-dynamics.asp**
4	Managing for employee retention	**https://www.shrm.org/resourcesandtools/tools-and-samples/toolkits/pages/managingforemployeeretention.aspx**

C. Text Book:
   1. S.S Khanka, "Organizational Behaviour", S. Chand and Company Ltd, Revised Edition 2009.

D. Reference Books:
   1. John W Newstrom and Keith Davis, "Organizational Behaviour", TMH, 13th Edition, 2010.
   2. Hugh J Arnold and Daniel C Fieldman, "Organizational Behaviour", Mc Graw Hill, 10th Edition, 2005.

E. Web links:
   1. **https://open.umn.edu/opentextbooks/textbooks/30**
   2. **https://managementhelp.org/organizationalbehavior/**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Organizational Behavior Introduction**		
1.1	Elements of OB	Recall the key elements of OB	K1
1.2	Nature and Scope of OB	Summarize the nature and scope of OB	K2
1.3	Contributing Disciplines to OB	List out the disciplines that contribute to the understanding of OB	K4
1.4	OB in historical perspective	Outline the historic perspective of OB	K2
	Foundations of Individual Behavior		
1.5	The individual and individual differences	Analyze the factors affecting individual behavior	K4
1.6	Human behavior and its causation.	Examine human behavior	K4
1.7	OB Models	Classify the models of OB	K4
II	**Personality, Perception and Attitudes**		
2.1	Definition of Perception	Define perception	K1

2.2	Perceptual Process	Elaborate the process involved in perception	K6
2.3	Determinants of Personality	List out the determinants of Personality	K4
2.4	Types of Personality	Classify personality	K4
2.5	Theories of Personality	Criticize the theories of personality	K5
	Values and Job Satisfaction		
2.6	Concepts of Values	Explain the concepts of values on individual behavior	K5
2.7	Formation of Values	Identify the formation of values	K3
2.8	Types of Values	Categorize values	K4
2.9	Determinants of Job Satisfaction	Analyze the sources of Job Satisfaction	K4
III	**Learning**		
3.1	Definition of Learning	Define learning	K1
3.2	Determinants of Learning	Determine the factors that affect learning	K5
3.3	Theories of Learning	Analyze the theories of learning	K4
3.4	Principles of Learning	Establish relationship between learning and behavior	K6
	Motivation		
3.5	Meaning of Motivation	Explain the need for understanding motivation at work in organizations	K2
3.6	Nature of Motivation	Recall the nature of motivation	K1
3.7	Process of Motivation	Explain the process of motivation	K5
3.8	Theories based on Human Needs	Compare the various motivational theories based on human needs	K4
3.9	Theories based on Human Nature	Analyze the motivational theories based on human nature	K4
3.10	Theories based on expectancy of human beings	Categorize the motivational theories based on expectancy of human beings	K4
IV	**Organizational Conflicts**		
4.1	Definition of Conflict	Recall the definition of Conflicts	K1
4.2	Types of Conflicts	Classify conflicts	K2
4.3	Aspects of Organizational Conflicts	Compare and contrast the aspects of organizational Conflicts	K5
4.4	Management of Conflicts	Discuss the impacts of conflict management on the success of a company	K6
	Job Frustration		
4.5	Definition	Recall the definition of Job Frustration	K1
4.6	Frustration affects Behavior	Identify the reasons for frustration	K3

4.7	Frustration Management	Make use of the techniques to manage frustration	K3
		Stress Management	
4.8	Symptoms of Stress	List out the symptoms for stress	K1
4.9	Measurement of Job Stress	Measure job stress	K5
4.10	Sources of Stress	Identify the sources of stress	K3
4.11	Management of Stress	Make use of the techniques for managing stress	K3
V	**Communication**		
5.1	Nature of Communication	Recall the nature of communication	K1
5.2	Process of Communication	Explain the communication process	K2
5.3	Channels of Communication	Identify the communication channels	K3
5.4	Networks of Communication	Analyze communication networks	K4
5.5	Communication Barriers	List out the barriers for communication	K4
5.6	Effective Communication	Make use of the techniques for effective communication	K3
		Leadership	
5.7	Definition of Leadership	Recall the definition of leadership	K1
5.8	Leadership Styles	Identify the leadership style	K3
		Organizational Structure	
5.9	Definition of Organizational Structure	Outline the structure of organizations	K2
5.10	Elements of Organizational Structure	Examine the elements of organizational structure	K4
		Organizational Culture	
5.11	Types of Organizational Culture	Classify organizational culture	K4
5.12	Functions of Organizational Culture	Assess the functions of Organizational Culture	K5

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	L	-	M	-	-	M	H	H	M	L	L	M	H
CO2	M	H	M	M	L	H	M	M	M	L	L	M	M
CO3	L	M	M	L	L	H	H	M	M	L	L	M	M
CO4	L	M	M	L	-	M	H	M	H	L	L	M	M
CO5	L	M	M	L	L	M	H	M	M	M	M	H	H
CO6	M	H	M	M	H	M	H	H	M	M	M	H	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Internal Assessment Test I, II
2. Course-Embedded Assessment (e.g., Homework Assignment, Essays, Locally Developed Tests)
3. End Semester Examination Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course-End Survey
2. Student Satisfaction Survey

Course Coordinator   **Director-MCA**
Dr. M. NEWBEGIN   **Dr. R.THAMARAI SELVI**

****

SEMESTER: III   **CODE: P22CA3:B**
CREDITS: 3   **WEEK/HOURS: 4**

1. COURSE OUTCOMES
After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Identify the major frameworks of computerized decision support systems	K2	I
CO2	Categorize complex business problems in terms of analytical models	K4	II
CO3	Demonstrate ethical decision-making in structured or unstructured Problems	K2	III
CO4	Compare the impact of business reporting, information visualization, and dashboards	K2	IV
CO5	Adapt data mining tools, neural networks, web mining, web analytics in BI	K6	V
CO6	Elaborate how analytics are powering consumer applications and creating a new opportUnit Coveredy for entrepreneurship for analytics	K6	V

2A. Syllabus

UNIT I - Management Support Systems: An Overview: **12 hours**
        Managers and Decision-Making – Managerial Decision-Making and Information Systems – Managers and Computer Support – Computerized Decision Support and the Supporting Technologies- A Framework for Decision Support – The Concept of Decision Support Systems – Group Support Systems–Enterprise Information Systems-Knowledge Management Systems-Expert Systems- Artificial Neural Networks-Advanced Intelligent Decision Support Systems-Hybrid Support Systems.
.
UNIT II - Decision-Making Systems, Modeling, and Support: **12 hours**
        Decision-Making: Introduction and Definitions-Systems-Models- Phases of the Decision-Making Process-Decision-Making: The Intelligence Phase - The Design Phase- The Choice Phase-The Implementation Phase-How Decisions Are Supported-ersonality Types, Gender, Human Cognition, and Decision Styles-The Decision-Makers.

UNIT III - Decision Support Systems: An Overview: **12 hours**
        DSS Configurations-What Is a DSS?-Characteristics and Capabilities of DSS - Components of DSS-The Data Management Subsystem-The Model Management Subsystem-The User Interface (Dialog) Subsystem -The Knowledge-Based Management Subsystem-The User-DSS Hardware-DSS Classifications.

UNIT IV - Modeling and Analysis: **12 hours**
        MSS Modeling-Static and Dynamic Models-Certainty, Uncertainty, and Risk-Influence Diagrams-MSS Modeling with Spreadsheets-Decision Analysis of a Few Alternatives (Decision Tables and Decision Trees)-The Structure of MSS Mathematical Models-Mathematical Programming Optimization-Multiple Goals, Sensitivity Analysis, What-If, and Goal Seeking-Problem-Solving Search Methods-Heuristic Programming-Simulation.

UNIT V - Business Intelligence: Data Warehousing, Data Acquisition, Data Mining, Business Analytics, and Visualization: **12 hours**

The Nature and Sources of Data-Data Collection, -Database Management Systems in Decision Support Systems/Business Intelligence-Database Organization and Structures-Data Warehousing-Data Marts-Business Intelligence/Business Analytics-Online Analytical Processing (OLAP)-Data Mining -Data Visualization, Multidimensionality, and Real-Time Analytics.

B. TOPICS FOR SELF-STUDY:

S.No.	Topics	Web Links
1	Information Systems	**https://www.youtube.com/watch?v=HrrfnPVaG9Q**
2	Decision-Making Systems, Modeling, and Support	**https://slideplayer.com/slide/5193091/**
3	MSS Modeling with Spreadsheets	**https://www.scribd.com/presentation/284185476/Mss**
4	Data Warehousing	**https://docs.oracle.com/cd/E11882_01/**

C. Text Book:

1. Efraim Turban, Jay E. Aronson,Ting-Peng Liang, "Decision Support Systems and Intelligent Systems", 9th Edition, Pearson 2013.

D. Reference Books:

1. Larissa T. Moss, S. Atre, "Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making", Addison Wesley, 2003.
2. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", Wiley Publications, 2009.
3. David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Manager"s Guide", Second Edition, 2012.
4. Cindi Howson, "Successful Business Intelligence: Secrets to Making BI a Killer App", McGraw-Hill, 2007.
5. Ralph Kimball , Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, "The Data Warehouse Lifecycle Toolkit", Wiley Publication Inc.,2007.

E. Web links:

1. **https://www.youtube.com/watch?v=xFLE1_V7u6M**
2. **https://www.youtube.com/watch?v=LFnewuBsYiY**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**An Overview**		
1.1	Managers and Decision Making	Illustrate the concepts and principles of Decision Making	K2
1.2	Managerial Decision	Summarize Managerial Decision	K2
1.3	Making and Information Systems	Outline the uses of Information Systems	K2
1.4	Managers and Computer Support	Identify the efficiency of Computer Support for Decision Making	K3

1.5	Computerized Decision Support and the Supporting Technologies	Explain the Computerized Decision Support Technologies	K2
1.6	A Framework for Decision Support	Examine the Framework for Decision Support	K2
1.7	The Concept of Decision Support Systems	Utilize Decision Support Systems concepts	K3
1.8	Group Support Systems	Identify the Group Support Systems	K3
1.9	Enterprise Information Systems	Illustrate the use Enterprise Information Systems	K2
1.10	Knowledge Management Systems	Apply Knowledge Management Systems	K3
1.11	Expert Systems	Identify the Expert Systems	K3
1.12	Artificial Neural Networks	Explain the Artificial Neural Networks	K2
1.13	Advanced Intelligent Decision Support Systems	Examine the Intelligent Decision Support Systems	K2
II	**Decision-Making**		
2.1	Introduction and Definitions	Outline the uses Decision-Making	K2
2.2	Systems	Explain the Systems-Models	K2
2.3	Models	Develop the model	K6
2.4	Phases of the Decision Making Process	Illustrate Decision Making Process	K2
2.5	Decision Making :The Intelligence Phase	Examine the Intelligence Phase	K2
2.6	The Design Phase	Illustrate the Design Phase	K2
2.7	The Choice Phase	Illustrate the uses of Choice Phase	K2
2.8	The implementation phase	Explain the implementation phase	K2
2.9	How Decisions Are Supported	Determine How the Decisions Are Supported	K5
2.10	Types, Gender, Human Cognition, and Decision Styles	Compare Cognitive Style	K5
2.11	The Decision-Makers	Identify the Decision-Makers	K3
III	**Overview-DSS Configurations**		
3.1	What Is a DSS	Illustrate the concepts DSS	K2
3.2	Characteristics and Capabilities of DSS	Explain the Characteristics of DSS	K2
3.3	Components of DSS	Analysis the Components of DSS	K3
3.4	The Data Management Subsystem	Classify Data Management Subsystem	K4
3.5	The Model Management Subsystem	Identify the Management Subsystem	K3
3.6	The User Interface (Dialog) Subsystem	Apply User Interface	K3
3.7	The Knowledge Based Management Subsystem	Illustrate the Knowledge Based Management Subsystem	K2
3.8	The User	Illustrate the User	K2
3.9	DSS Hardware	Make use of DSS Hardware	K3
3.10	MSS Modelling	Explain MSS modeling	K2

3.11	DSS Classifications	Illustrate the Classifications of DSS	K2
IV	**Modeling and analysis**		
4.1	MSS Modeling	Classify he role of MSS Modeling	K4
4.2	Static and Dynamic Models	Distinguish between Static and Dynamic Models	K4
4.3	Certainty, Uncertainty, and Risk	Determine the Certainty, Uncertainty	K5
4.4	Influence Diagrams	Make use of Influence Diagrams	K3
4.5	MSS Modeling with Spreadsheets	Build effective relationship MSS Modeling with Spreadsheets	K6
4.6	Decision Analysis of a Few Alternatives (Decision Tables and Decision Trees)	Analysis of Alternatives for Decision	K4
4.7	The Structure of MSS Mathematical Models	Assess the Mathematical Models	K5
4.8	Mathematical Programming Optimization	Interpret the impact of Mathematical Programming Optimization	K5
4.9	Multiple Goals, Sensitivity Analysis, What-If, and Goal Seeking	Analysis the goals, Goal seeking	K3
4.10	Problem-Solving Search Methods	Identify the 11Problem-Solving Search Methods	K3
4.11	Heuristic Programming	Test Heuristic Programming	K6
4.12	Simulation	Illustrate the Simulation	K2
V	**Business Intelligence: Data Warehousing, Data Acquisition, Data Mining, Business Analytics, and Visualization**		
5.1	The Nature and Sources of Data	Explain the Nature and Sources of Data	K6
5.2	Data Collection, Problems, and Quality	Illustrate the Data Collection, Problems	K6
5.3	Data Collection	Identify Data Collection	K6
5.4	Database Management Systems in Decision Support Systems/ Business Intelligence	Determine Business Intelligence for DSS	K5
5.5	Database Organization and Structures	Apply Database Organization and Structures	K3
5.6	Data Warehousing	Classify Data Warehousing	K4
5.7	Data Marts	List Data Marts	K4
5.8	Business Intelligence/Business Analytics	Identify Business Analytics	K3
5.9	Online Analytical Processing (OLAP)	Classify Online Analytical Processing (OLAP)	K2
5.10	Data Mining	Make use of data mining concepts	K3
5.11	Data Visualization, Multidimensionality, and Real-Time Analytics	Examine Data Visualization, Multidimensionality	K4

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	H	M	L	M	-	M	L	-	-	-	M	L
CO2	M	H	M	M	M	-	-	L	L	-	L	M	M
CO3	H	M	M	H	H	-	H	M	M	M	M	H	M
CO4	M	M	M	M	M	L	-	M	L	L	L	L	M
CO5	H	H	H	H	H	M	-	-	M	H	-	H	M
CO6	H	H	H	H	H	L	L	-	M	L	L	M	L

                    L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Discussion, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination.

INDIRECT:

1. Course end survey (Feedback).

    Course Coordinator   **Director-MCA**
Mrs. PEARLY CHARLES   **Dr. R.THAMARAI SELVI**

SEMESTER : III   **CODE: P22CA3: C**
CREDITS : 3   **HOURS/WEEK: 4**

1. COURSE OUTCOMES
After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Outline the basic concepts, functions and processes of human resource management	K2	I
CO2	Analysis Job techniques and methods	K4	II
CO3	Build and communicate the human resources component of the organization's business plan	K3	III
CO4	Develop employability skills	K6	III
CO5	Agree to manage and plan key human resource functions within organizations	K5	IV
CO6	Determine to handle employee issues and evaluate the new trends in HRM	K5	V

2A. Syllabus

UNIT I - Human Resource Planning Overview   **12 Hours**
        Human Resource Planning: How HRP Relates to Organizational Planning or Strategic Planning, the need for Human Resource Planning, The Steps in Human Resource Planning Process, Situation Analysis, Environmental Scanning and Strategic Planning, Forecasting Human Resource Demands.

UNIT II - Job Analysis   **12 Hours**
        Job Analysis and Job Design: Purpose and uses of Job Analysis, Job Analysis Technique, Job Analysis – Methods of Data Collection, Job Design Approaches, Job Characteristic Approach to Job Design.
The Recruitment Process: Environmental Factors Affecting Recruitment Process, Recruitment Methods, Evaluating the Recruitment Process.

UNIT III - Selection Process   **12 Hours**
        The Selection Process: Step in Selection Process (Techniques of Selection Process), Ethical Standards of Testing, Types of Interviews, Evaluation of the Selection Program.
Training and Development: The Functions of Training, Assessing Training Needs, Types of Training, Evaluation of Training and Development.

UNIT IV - Career Planning and Developing   **12 Hours**
        Career Planning and Development: Career Development, Career Management. Industrial Relations: Characteristics of Industrial Relations, Significance of Harmonious Industrial Relations, Approaches to Industrial Relations, Factors Affecting Industrial Relations Strategy, Causes of Poor Industrial Relations, Effects of Poor Industrial Relations.

UNIT V - Strategic HRM 12 Hours

Strategic Human Resource Management: Strategic Human Resource Management, Strategic Planning, Need for Strategic Management, Benefits of Strategic Management, Dysfunctions of Strategic Management.

B. TOPICS FOR SELF-STUDY:

S.No	Topics	Web Link
1	Talent Management	https://www.tutorialspoint.com/talent_management/talent_management_tutorial.pdf
2	Recruitment Process	https://www.wisdomjobs.com/e-university/recruitment-and-selection-tutorial-2682/recruitment-process-27164.html
3	International HR Management	http://elearning.nokomis.in/uploaddocuments/International%20HRM%20New/chap%201%20International%20HRM%20&%20Introduction/PPT/Chapter%201%20Intro%20to%2 https://www.ftms.edu.my/images/Document/MOD001055%20-%20International%20Business/CHAPTER%208.pdf
4	Human Resource in Information Technology Organization-	https://www.analyticsinhr.com/blog/human-resources-information-system-hris/

C. Text Book:

1. B. Pattanayak, "Human Resource Management", 3rd Edition, Prentice-Hall of India, 2006.

D. Reference Books:

1. David A. Dedecenezo, Stephen P. Robbins, "Personnel/ Human Resource Management", 3rd Edition, Prentice-Hall of India, 1990.
2. Adwin B. Flippo," Personnel Management", (Mcgraw Hill Series in Management).
3. F. R. David, "Concept of Strategic Management". New York:Macmillan., 1993.
4. Narender. K. Chadha, "Human Resource Management: Issues, Challenges and Case Studies" (2nd revised ed.), Shri Sai Printographers, New Delhi, 2002.
5. Nirmal Singh. "Human Resource Management", Galgotia Publications Pvt. Ltd., New Delhi, 2004.

E. Web Links:

1. https://www.tutorialspoint.com/human_resource_management/human_resource_management_quick_guide.htm
2. https://www.wisdomjobs.com/e-university/hr-management-tutorial-69.html

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Human Resource Planning**		

1.1	Introduction: Definition of HRP	Outline the concepts of HR planning	K2
1.2	Nature and Objective of HRP	Classify the nature of HR planning	K4
1.3	Need for Human Resource Planning in Organization	Identify the need of HR planning in organization	K3
1.4	Importance and Factors Affecting HRP	Examine to gain information about different factors that affect HRP	K4
Human Resource Planning Process			
1.5	HRP Process	Explain the HRP process	K2
1.6	Requisites for successful HRP	Outline the pre requisites for successful HRP process	K2
1.7	Barriers to HRP	Categorize the barriers to HRP	K4
II	**Job Analysis and Job Design**		
2.1	Introduction to Job Analysis	Illustrate job analysis	K2
2.2	Uses of Job Analysis	Explain the uses of job analysis	K2
2.3	Steps in Job Analysis	Outline the basic steps in job analysis	K2
Job Analysis and Techniques			
2.4	Methods for collecting Job analysis data	Identify the major methods of collecting job analysis data	K3
2.5	Job Description	Analyze the major elements of job descriptions	K4
2.6	Writing Job Description	Explain how to prepare job descriptions	K2
2.7	Job Specification	Classify job specification	K4
2.8	Job Design and Methods in Job Design	Make use of job design and its various methods	K3
Recruitment Process			
2.9	Recruitment Meaning and Definition	Explain the meaning of recruitment	K2
2.10	Factors affecting Recruitment Process	Categorize the factors that affects recruitment process	K4
2.11	Recruitment Methods	Examine the methods through which prospective candidates can be recruited.	K4
2.12	Evaluation of Recruitment process	Evaluate the process of recruitment	K5
III	**Selection Process**		
3.1	Steps in Selection Process	Make use of steps in selection and its process.	K3
3.2	Ethical standards of Testing	Identify the standard in testing	K3
3.3	Types of Testing	Distinguish the various testing	K4
3.4	Evaluation of Selection Program	Determine the evaluation of selection program	K5
Training and Development			
3.5	Functioning of Training	Analyse the functions of training	K4
3.6	Assessing Training Recruitment	Evaluate the processes in training	K5

3.7	Evaluation of Training and Development	Assess the training and development	K5
IV	**Career Planning and Development**		
4.1	Career Development	Identify personal priorities, skills, interests, strengths, and values using a variety of contemporary assessment tools and reflection activities.	K3
4.2	Career Management	Identify the opportUnit Coveredy for career exploration around the globe	K3
		Industrial Relations	
4.3	Characteristic of Industrial Relation	Demonstrate descriptive knowledge in the field of industrial relations.	K2
4.4	Significance of Harmonious Industrial Relations	Identify the significance of industrial relation	K3
4.5	Approaches to Industrial Relations	Categorize the approaches in Industrial relation	K4
4.6	Factors Affecting Industrial Relations Strategy	Identify the factors affecting industrial relation	K3
4.7	Causes and Effects of Poor Industrial Relations	Examine the causes and effects of poor relations	K4
V	**Strategic Human Resource Management**		
5.1	Strategic Planning	Make use of how HR strategies are related to business strategies	K3
5.2	Need for Strategic Management	Identify relevant metrics in strategic human resource management	K3
5.3	Benefits of Strategic Management	Estimate strategic human resource management to promoting and achieving the organisation's strategic intent	K6
5.4	Dysfunctions of Strategic Management	Experiment with dysfunctions in management	K3

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	-	L	M	-	M	H	-	M	L	-	M	M	H
CO2	-	-	M	-	L	H	M	M	-	-	-	H	H
CO3	-	L	M	-	-	M	M	H	M	L	-	M	H
CO4	L	-	L	-	L	H	-	H	-	L	-	H	H
CO5	-	-	-	-	L	H	H	M	L	-	-	-	M
CO6	-	M	M	-	-	L	L	M	M	-	-	-	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

Elective V: BIG DATA ANALYTICS AND CLOUD COMPUTING

SEMESTER: III   **CODE: P21CA3: D**
CREDITS: 3   **HOURS/WEEK: 4**

1. COURSE OUTCOMES
After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit covered
CO1	Summarize the basic concepts and the components of Big Data	K2	1
CO2	Make use of the cloud as an imperative for Big Data	K3	II
CO3	Design distributed file systems using Hadoop and Map Reduce technologies	K6	III
CO4	Compare the various databases in the Big Data world	K5	III
CO5	Discuss new models and approaches evolving to support Big Data analysis.	K6	IV
CO6	Build a Big Data foundation with the Hadoop as ETL	K6	V

2A. Syllabus

UNIT – I

       Types of Digital Data: Classification of Digital Data-**Introduction to Big Data**: Characteristics of Data-Evolution of Big Data-Definition of Big Data-Challenges with Big Data-What Is Big Data-Other Characteristics of Data Which are Not Definitional Traits of Big Data-Why Big Data. **Big Data Analytics:** What Is Big Data Analytics-Classification of Analytics-Top Challenges Facing Big Data-Data Science.

UNIT – II

       The BigData Technology Landscape: Nosql-Hadoop-**Introduction To Hadoop**:Why Hadoop?-RDBMS Versus Hadoop-Distributed Computing Challenges-History of Hadoop-Hadoop Overview-Use Case of Hadoop-Hadoop Distributors-HDFS -Processing Data With Hadoop-Managing Resources and Applications With Hadoop YARN-Interacting With Hadoop Ecosystem. **Introduction To MongoDB:** What Is MongoDB?-Why MongoDB?-Terms Used In RDBMS and MongoDB-Data Types in MongoDB-MongoDBQuery Language.

UNIT – III

       Introduction To MAPREDUCE Programming: Introduction – Mapper – Reducer – Combiner – Partitioner – Searching –Sorting-Compression.**Introduction To Hive:** What Is Hive?-Hive Architecture- Hive Data Types-Hive File Format-Hive Query Language -RcfileImplementation. **Introduction To Pig:** What Is Pig?-The Anatomy of Pig- Pig on Hadoop-Data Types in Pig-Running Pig-Execution Modes of Pig-HDFS Commands-Relational Operators.

UNIT – IV

       Getting Started: Cloud Computing Basics - Cloud Computing Overview - Applications - Intranets and the Cloud – First Movers in the Cloud – **Your Organization and Cloud Computing**: When You Can Use Cloud Computing: - Benefits – Limitations -Security Concerns – Regulatory Issues – **Cloud Computing Titans:** Google, EMC, NetApp, Microsoft, Amazon, Salesforce.com, IBM.

UNIT – V

Cloud Storage: Overview-Cloud Storage providers-**Standards:**Application-Client-Infrastructure-Service.**Developing Applications :** Google – Microsoft – **Local Clouds and Thin Clients:** Virtualization in your Organization-Server Solutions-Thin Clients-**Migrating to the Cloud :** Cloud Services for individuals – Cloud Services aimed at the Mid-Market- Enterprise-Class Cloud Offerings – Migration.

B. TOPICS FOR SELF STUDY

S.No	Topics	Web Link
1	Big Data Security	**https://www.sciencedirect.com/topics/computer-science/big-data-security**
2	Twitter Sentiment Analysis Using Spark	**https://acadgild.com/blog/twitter-sentiment-analysis-using-spark**
3	Learn how to Analyse Hadoop Data using Apache Pig	**https://www.udemy.com/course/learn-how-to-analyse-hadoop-data-using-apache-pig/**
4	Cloud and IT infrastructure as success factors	**https://www.t-systems.com/id/en/cloud-and-infrastructure**

C. Text Book:

1. Seema Acharya and SubhashiniChellappan, "***Big Data and Analytics***", Wiley India Pvt. Ltd., 2019, 2nd Edition.
2. Anthony T. Velte Toby J. Velte, Robert Elsenpeter, "***Cloud Computing: A Practical Approach***", The McGraw Hill, 2017.

D. Reference Books:

1. Judith Hurwitz, Alan Nugent, Dr. Fern Halper and Marcia Kaufman,"***Big Data***" Wiley Publications, 2014.
2. Tom White, "***Hadoop: The definitive Guide***", O'Reilly Media, 2010.
3. Barrie Sosinsky, "***Cloud Computing Bible***",Wiley Publishing, 2011.
4. RajkumarBuyya, James Broberg, and AndrzejGoscinski, "***Cloud Computing Principles and Paradigms***" Published by Wiley India Pvt Ltd, 2014.

E. Web links:

1. **www.tutorialspoint.com**
2. **www.geeksforgeeks.org**
3. **www.javatpoint.com**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Introduction to Big Data**		
1.1	Types of Digital Data	Outline the types of digital data	K2
1.2	Characteristics of Data	Summarize the characteristics of big data	K2
1.3	Evolution of Big Data	Explain the evolution of big data	K2
1.4	Definition of Big Data	Define Big Data	K1
1.5	Challenges of Big Data	Identify the challenges of big data	K3

1.6	Characteristics and Need of Big Data	Outline the Characteristics and needs of big data	K2
1.7	Data environment versus Big Data environment	Compare the environmental changes in data versus Big Data	K6
II	**Big Data Analytics**		
2.1	Overview of business intelligence	Outline the importance of business intelligence	K2
2.2	Data science and Analytics	Summarize on the overview of data science and analytics	K6
	Introduction To Hadoop		
2.3	Meaning and Characteristics of Big Data Analytics	Identify role of Big Data in Analytics	K3
2.4	Need of Big Data Analytics	Identify the need of BDA	K3
2.5	Classification of Analytics	Discuss the classification of Analytics	K6
2.6	Challenges to Big Data Analytics	Criticize the challenges of Big Data	K5
2.7	Importance of big data analytics	Outline the importance of BDA	K2
2.8	Basic terminologies in big data environment	Elaborate Basic terminologies in big data environment	K6
III	**Big data technologies and Databases**		
3.1	Introduction to NoSQL	Discuss on the concepts of NOSQL.	K6
3.2	Uses	Outline the uses of NOSQL	K2
3.3	Features and Types	Discuss the and types of NOSQL databases	K6
3.4	Need, Advantages, Disadvantages and Application of NoSQL	Recall the needs, advantages and disadvantages of NOSQL.	K1`
3.5	Overview of NewSQL	Discuss on NewSQL	K6
3.6	Comparing SQL, NoSQL and NewSQL	Compare SQL with NoSQL and NewSQL	K6
	Introduction To MongoDB		
3.7	Introduction to MongoDB	Outline the concept of MongoDB	K2
3.8	Characteristics of MongoDB	Summarize on the characteristics of MongoDB	K2
3.9	Introduction of Apache Cassandra and its needs	Introduce the features of Apache Cassandra	K2
3.10	Characteristics of Cassandra	Discuss the Characteristics of Cassandra	K6
IV	**Hadoop Foundation for Analytics**		
4.1	History, Needs, Features, Key advantage and Versions of Hadoop	Outline on the needs, advantages and Versions of Hadoop	K2
4.2	Essential of Hadoop ecosystems	Recall the essential features of Hadoop Ecosystems	K1
4.3	RDBMS versus Hadoop	Compare RDBMS versus Hadoop	K2

4.4	Key aspects and Components of Hadoop	Discuss the components of Hadoop	K6
4.5	Hadoop architectures	Explain Hadoop Architecture	K6
V		Hadoop MapReduce and YARN framework	
5.1	Introduction to MapReduce	What is MapReduce Programming?	K1
5.2	Processing data with Hadoop using MapReduce	Elaborate the processing data with MapReduce model	K6
		Introduction to YARN	
5.3	Components, Need and Challenges of YARN	Summarize the components, needs and challenges of YARN	K2
5.4	Dissecting YARN	Discuss the importance of YARN	K6
5.5	MapReduce application	Develop MapReduce applications	K6
5.6	Data serialization and Working with common serialization formats	Define data serialization?	K2
5.7	Big data serialization formats	Discuss on Big Data Serialization formats	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	H	M	L	H	H	L	H	M	H	H	H	M
CO2	H	L	H	H	H	H	M	L	H	H	H	M	L
CO3	L	L	H	L	H	M	H	H	H	M	H	M	M
CO4	H	M	H	M	H	H	M	M	H	H	M	M	H
CO5	H	H	H	M	H	H	H	H	H	H	H	H	H
CO6	H	H	H	H	H	M	M	H	H	H	H	M	M

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1.   Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book

2.   Open Book Test.

3.   Assignment, Seminar

4.   Semester & End Semester Theory Examination

INDIRECT:

1.   Course end survey (Feedback)

Course Coordinator   **Director-MCA**
Dr. K. MOHAMED AMANULLAH   **Dr. R.THAMARAI SELVI**
****

Elective V: BLOCK CHAIN AND CRYPTO-CURRENCIES

SEMESTER: III **CODE: P22CA3: E**
CREDITS: 3 **HOURS/WEEK: 4**

1. COURSE OUTCOMES
After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Understand the benefits and limitations of Blockchain	K2	I
CO2	Make use of the **Cryptocurrency Bitcoin, Altcoin and Tokens**	K3	II
CO3	Examine Bitcoin features and its **Smart Contracts**	K4	III
CO4	Evaluate **Initial Coin Offering**	K5	IV
CO5	Propose security **algorithms for Blockchain**	K6	IV
CO6	Build applications using the features of Blockchain	K6	V

2A. Syllabus

UNIT I - Fundamentals of Blockchain and Blockchain Types **12 Hours**
    Fundamentals of Blockchain: The Evolution of Blockchain - Traditional vs. Blockchain Transactions - Blockchain Concepts - How Blockchain Technology Works - Components of Blockchain - Block in a Blockchain - Blockchain Layers - Pros and Cons of Blockchain - **Blockchain Types and Consensus Mechanism:** Introduction - Decentralization and Distribution -Types of Blockchain - Consensus Protocol

UNIT II - Cryptocurrency, Public Blockchain and Consortium Blockchain **12 Hours**
    Cryptocurrency: Bitcoin, Altcoin and Token: Bitcoin and the Cryptocurrency - Cryptocurrency Basics - Types of Cryptocurrency - Cryptocurrency Usage - **Public Blockchain System:**The Bitcoin Blockchain - Ethereum Blockchain - **Consortium Blockchain:** Hyperledger Platform - Overview of Ripple - Overview of Corda

UNIT III - Smart Contracts and Private Blockchain **12 Hours**
    Smart Contracts: Smart Contract - Characteristics of a Smart Contract - Types of Smart Contracts - Types of Oracles - Smart Contracts in Ethereum - Smart Contracts in Industry - **Private Blockchain System:** Key Characteristics of Private Blockchain - Why We Need Private Blockchain - E-commerce Site Example - Smart Contract in Private Environment - State Machine - Different Algorithms of Permissioned Blockchain - ByzantineFault - Multichain

UNIT IV - Initial Coin Offering and Security in Blockchain **12 Hours**
    Initial Coin Offering: Launching an ICO - Investing in an ICO - Pros and Cons of Initial Coin Offering - Successful Initial Coin Offerings - Evolution of ICO - **Security in Blockchain:** Security Aspects in Bitcoin - Security and Privacy Challenges of Blockchain in General - Performance and Scalability - Identity Management and authentication - Regulatory Compliance and Assurance - Safeguarding Blockchain Smart Contract (DApp)

UNIT V - Applications, Limitations and Challenges of Blockchain **12 Hours**
    Application of Blockchain: Blockchain in Banking and Finance - Blockchain in Education - Blockchain in Energy - Blockchain in Healthcare - Blockchain in Real-estate - Blockchain in Supply Chain - The Blockchain and IoT - Limitations **and Challenges of Blockchain:** Blockchain Implementation - Limitations - Challenges.

B. TOPICS FOR SELF-STUDY:

S.No	Topics	Web Links
1	Blockchain Foundations and Uses Cases	**https://www.youtube.com/watch?v=SSo_EIw HSd4**
2	Blockchain and Python	**https://www.youtube.com/watch?v=pZSegE XtgAE**
3	Ethereum and Solidity	**https://www.youtube.com/watch?v=M576W GiDBdQ**
4	Blockchain and Bitcoin Fundamentals	**https://www.youtube.com/watch?v=KczTgdo YuTc**

C. Text Books:
1. Chandramouli Subramanian, Asha A George, "Blockchain Technology", First Edition, Universities Press, 2021

D. Reference Books:
1. Imran Bashir, "Mastering Blockchain" PACKT Publishing-Kindle Edition,2017
2. Antony Lewis,"**The** Basics of Bitcoins and Blockchains"- Kindle Edition, 2018

E. Web links:
1. **https://www.coursera.org/learn/blockchain-basics**
2. **https://www.udemy.com/course/blockchain-101-beginners-free-course-bootcamp-crypto-currency/**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered / Section	Course Content	Learning Outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Fundamentals of Blockchain**		
1.1	The Evolution of Blockchain	Recall the history of blockchain	K1
1.2	Traditional vs. Blockchain Transactions	Compare traditional and blockchain transactions	K2
1.3	Blockchain Concepts	Explain the concepts in blockchain	K2
	How Blockchain Technology Works		
1.4	Components of Blockchain	List out the components of blockchain	K2
1.5	Block in a Blockchain	Illustrate the concept of double-spending in blockchain	K2
1.6	Blockchain Layers	Examine the structure of blockchain ecosystem	K5
1.7	Pros and Cons of Blockchain	Examine the characteristics of blockchain	K4
	Blockchain Types and Consensus Mechanism		
1.8	Decentralization and Distribution	Outline the concept of Distributed Ledger Technology (DLT)	K2

1.9	Types of Blockchain	Compare the Proof-of-Work (PoW) with Proof-of-Stake (PoS) in blockchain	K5
1.10	Consensus Protocol	Recommend consensus protocol	K5
II	**Cryptocurrency Bitcoin, Altcoin and Token**		
2.1	Bitcoin and the Cryptocurrency	Outline the evolution of currency	K2
2.2	Cryptocurrency Basics	Criticize the characteristics of cryptocurrency	K4
2.3	Types of Cryptocurrency	Compare the types of cryptocurrency	K4
2.4	Cryptocurrency Usage	Choose the cryptocurrency safety measures	K3
	Public Blockchain System		
2.5	The Bitcoin Blockchain	Summarize the characteristics of bitcoin network	K2
2.6	Ethereum Blockchain	Interpret Ethereum blockchain	K5
	Consortium Blockchain		
2.7	Hyperledger Platform	Outline the characteristics of hyperledger	K2
2.8	Overview of Ripple	Summarize the concepts of ripple	K2
2.9	Overview of Corda	Illustrate the characteristics of corda	K2
III	**Smart Contracts**		
3.1	Characteristics of a Smart Contract	Examine the characteristics of smart contract	K4
3.2	Types of Smart Contracts	Explain the Distributed Applications (DApps)	K2
3.3	Types of Oracles	Classify the types of Oracles	K3
3.4	Smart Contracts in Ethereum	Recommend smart contracts in ethereum	K5
3.5	Smart Contracts in Industry	Build smart contracts applications	K6
	Private Blockchain System		
3.6	Key Characteristics of Private Blockchain	Summarize the characteristics of private blockchain	K2
3.7	Why We Need Private Blockchain?	Make use of private blockchain	K2
3.8	Smart Contract in Private Environment	Construct smart contracts in private environments	K6
3.9	State Machine	Identify fault in a distributed environment	K3
3.10	Different Algorithms of Permissioned Blockchain	Evaluate the PAXOS algorithm of permissioned blockchain	K5
3.11	Byzantine Fault	Recommend byzantine general model for blockchain	K5

3.12	Multichain	Make use of streams and commands in multichain concepts	K3
IV	**Initial Coin Offering**		
4.1	Launching an ICO	Outline the basic stages of an ICO	K2
4.2	Investing in an ICO	Criticize the white paper of an ICO	K5
4.3	Pros and Cons of Initial Coin Offering	Compare ICO with traditional IPO	K4
4.4	Successful Initial Coin Offerings	Classify the ICO success pillars	K4
4.5	Evolution of ICO	Outline the ICO variants	K2
	Security in Blockchain		
4.6	Security Aspects in Bitcoin	Test the security in Bitcoin	K6
4.7	Security and Privacy Challenges of Blockchain in General	Classify the CIAR in blockchain	K4
4.8	Performance and Scalability	Assess the performance and scalability	K5
4.9	Identity Management and authentication	Test the authentication of transactions	K6
4.10	Regulatory Compliance and Assurance	Determine the regulatory compliance and assurance	K5
4.11	Safeguarding Blockchain Smart Contract (DApp)	Formulate measures for safeguarding blockchain smart contract (DApp)	K6
V	**Application of Blockchain**		
5.1	Blockchain in Banking and Finance	Analyze the challenges in finance sector	K4
5.2	Blockchain in Education	Assess the use of blockchain in education system	K5
5.3	Blockchain in Energy	Evaluate the impact of block chain technology in energy	K5
5.4	Blockchain in Healthcare	Test the importance of blockchain in healthcare	K6
5.5	Blockchain in Real-estate	Make use of the current initiatives in property listings	K3
5.6	Blockchain in Supply Chain	Evaluate the benefits of block chain in supply chain management	K5
5.7	The Blockchain and IoT	Propose the usage of blockchain in IoT	K6
	Limitations and Challenges of Blockchain		
5.8	Limitations	Outline the limitations in blockchain	K2
5.9	Challenges	Summarize the challenges in blockchain	K2

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	L	M	L	L	M	M	H	H	M	M	M	M
CO2	H	H	M	H	M	H	M	H	H	H	H	M	H
CO3	H	H	M	H	H	H	H	M	H	H	H	H	H
CO4	H	H	H	H	H	M	M	H	H	H	H	M	M
CO5	H	H	M	H	M	H	M	H	H	M	M	H	H
CO6	H	H	H	H	H	M	H	M	M	H	H	H	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book

2. Open Book Test.

3. Assignment, Seminar, Quiz (written).

4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

Course Coordinator   **Director-MCA**
 Dr. M.S.MYTHILI   **Dr. R.THAMARAI SELVI**

****

Elective V:PARALLEL COMPUTING

SEMESTER : III
CREDITS : 3

CODE: P22CA3: F
HOURS/WEEK: 4

1. COURSE OUTCOMES
After the successful completion of this course the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Analyze the efficiency of parallel computing system and evaluate the types of application for which parallel programming is useful	K4	I
CO2	Identify the development, analyze, and implement algorithms for parallel algorithms design	K3	II
CO3	Assess the different parallel architectures, inter-connect networks, programming models, and algorithms for common operations such as matrix-vector multiplication	K5	III
CO4	Evaluate issues of dense matrix multiplication and efficiency of solving system of linear equations	K5	III
CO5	Apply design and development principles in the construction of software systems of varying complexity	K3	IV
CO6	Choose knowledge of computing and mathematics appropriate to the graph algorithms	K5	V

2A. Syllabus

UNITI - Introduction to Parallel Computing 12 Hours

Introduction to Parallel Computing – Motivating Parallelism – Scope of Parallel Computing – Parallel Programming Platforms – Implicit Parallelism – Limitations of Memory System Performance – Dichotomy of Parallel Computing Platforms – Physical Organization of Parallel Platforms – Communication Costs in Parallel Machines – Routing Mechanisms for Inter Connection Networks – Impact of Process Mapping and Mapping Techniques.

UNIT II - Parallel Algorithm Design 12 Hours

Principles of Parallel Algorithm Design – Preliminaries – Decomposition Techniques – Characteristics of Tasks and Interactions – Mapping Techniques for Load Balancing – Methods for Containing Interaction Over Heads – Parallel Algorithm Models.

UNIT III - Matrix Algorithms 12 Hours

Dense Matrix Algorithms – Matrix Vector Multiplication – Matrix _ Matrix Multiplication – Solving a system of Linear Equations.

UNIT IV - Sorting Algorithms 12 Hours

Sorting: Issues in Sorting on Parallel Computers – Sorting Networks – Bubble Sort and its Variants – Quick Sort – Bucket and Sample Sort – Other sorting Algorithms.

UNIT V - Graph Algorithms 12 Hours

Graph Algorithms – Definitions and Representation Prim's Algorithm – Dijisktrars Algorithm – All Pairs Shortest Paths – Transitive Closure – Connected Components – Algorithm for Space Graphs.

B. TOPICS FOR SELF-STUDY:

S.No	Topics	Web Link
1	Permutation routing in mesh-based networks	http://pages.cs.wisc.edu/~tvrdik/9/html/Section9.html
2	NP Completeness Complexity Theory	https://www.youtube.com/watch?v=2cyryXRmN5Q
3	Parallel Matrix Operations	https://www.youtube.com/watch?v=vwakkGWXARw
4	Parallel Design Patterns	https://www.youtube.com/watch?v=L7sinmKkbJA

C. Text Book:

1. Ananth Grama, AnshulGuptha, George Karypis and Vipin Kumar, "Introduction to Parallel Computing ", Pearson Education, 1994.

D. Reference Book:

1. Harry F. Jordan, Gita Alaghband, "Fundamentals of Parallel Processing", Prentice Hall, 2003.

E. Web links:

1.https://www.classcentral.com/course/swayam-parallel-algorithms-12934
2.http://www.digimat.in/nptel/courses/video/106102114/L03.html

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Parallel Computing Basics**		
1.1	Introduction to parallel computing	Classify different types of parallel processing.	K4
1.2	Scope of parallel computing	Discuss the operation of pipelined vector processor system	K6
1.3	Platform for parallel computing	Describe the function of an array processor.	K2
	Parallel Machines		
1.4	Types of Communication costs	Identify the ways of reducing communication costs in parallel machines.	K1
1.5	Methods of Routing mechanisms	Discuss the methods for message routing in parallel machines.	K2
1.6	Problems in Process Mapping	Define maximum degree of concurrency and average degree of concurrency	K1
II	**Parallel Algorithms Design**		
2.1	Principles of parallel algorithm design	Outline the principles of parallel algorithm design.	K1
2.2	Characteristics of parallel algorithms	Summarize the characteristics of parallel algorithms.	K1
2.3	2.3 Decomposition Techniques to solve concurrency problems	Analyse the decomposition techniques for achieving concurrency	K2

		Mapping Techniques	
2.4	Mapping technique for Load Balancing	Classify different types of mapping techniques for load balancing	K6
2.5	Containing interaction overhead methods	Explain the methods for containing interaction overhead	K1
2.6	Models of Parallel algorithm	Compare the different models for parallel algorithm in problem solving.	K6
III	**Dense Matrix Algorithm**		
3.1	Definition of Matrix multiplication	Define matrix multiplication.	K1
3.2	Using Vector matrix multiplication	Distinguish between vector and dense matrix multiplication	K4
3.3	Applying Dense matrix multiplication	Solve the system of linear equations of n variables using dense matrix multiplication	K3
3.4	Principles of dense matrix algorithm	List out the principles of dense matrix algorithm	K1
		Solving a System of Linear Equations	
3.5	Metrics of Parallel Algorithms	Discuss the performance metrics of parallel algorithms	K6
IV	**Sorting**		
4.1	Definition of sorting	Define sorting.	K1
4.2	Issues in sorting on parallel computers	Analyse the criteria that are used to evaluate the cost and performance on sorting parallel computers.	K6
4.3	Sorting networks types	Explain completely-connected, star, linear array and Mesh networks.	K2
4.4	Sorting Management on parallel computers	Interpret the impacts of sorting management on parallel computers.	K2
		Sorting Algorithms	
4.5	Bubble sort algorithm	Examine the operations of bubble sort algorithm.	K5
4.6	Quick sort algorithm	Improve recursive decomposition technique with an example.	K2
4.7	Bucket sort algorithm	Evaluate the operations of bucket sort algorithm.	K2
V	**Graph Algorithms**		
5.1	Prim's algorithm	Apply the Prim's algorithm for solving minimum spanning tree problem in fuzzy environment.	K6
5.2	Dijisktra's algorithm	Elaborate the Dijkstra's algorithm with an example.	K5
5.3	Structure of all pairs shortest paths	Explain the structure of shortest paths.	K2
		Transitive Closure	
5.4	Definition of transitive closure	Define transitive closure	K1
5.5	Connected components of tree	Construct the connected components in a graph with an example	K5
5.6	Algorithms for space graph	Discuss Space Efficient Algorithms for optimization problems in bounded tree-width graph.	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	M	M	M	L	_	L	L	L	L	L	M	L
CO2	M	M	H	M	M	L	_	L	L	L	M	M	L
CO3	M	M	M	M	M	_	L	M	M	L	M	M	_
CO4	M	H	M	M	L	_	L	M	M	L	M	M	L
CO5	M	M	H	M	M	_	M	M	M	M	M	H	M
CO6	H	H	H	M	H	_	H	M	M	L	M	H	L

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

   1. Continuous Internal Assessment Test I, II

   2. Course-Embedded Assessment (e.g., Homework Assignment, Essays, Locally
      Developed Tests)

   3. End Semester Examination

INDIRECT:

   1. Course-End Survey

   2. Student Satisfaction Survey

****

Core Practical V: SMART DEVICES PROGRAMMING LAB

SEMESTER: III   **CODE: P22CA3P5**
CREDITS: 2   **HOURS/WEEK: 4**

1. COURSE OUTCOMES
After the successful completion of this course the students will be able to:

S.No.	Course Outcomes	Level	Exercise
CO1	Develop mobile applications using various layouts	K6	1,2,3
CO2	Create simulators such as AVD or test with mobile phone to execute the application	K6	4,5,6
CO3	Develop mobile application that integrates SMS and Call services	K6	7
CO4	Develop a mobile application by integrating an application with SQLite	K6	9, 10, 11
CO5	Build mobile web applications	K6	12,13,14
CO6	Maximize the use of HTML5, CSS3 and JavaScript to develop mobile web applications	K6	15

Ex.No.	Exercises
1	Create Hello World Application.
2	Demonstrate Life Cycle of an activity.
3	Layouts: Linear, Relative and Table
4	Create multiple activities with an application.
5	Demonstrate the use of Scroll view and List view.
6	Illustrate Menu in an application.
7	Create activity with Portrait and Landscape mode.
8	Make SMS and Phone call services.
9	Perform read, write and delete operations on SQLite Database.
10	Create an application with login and homepage.
11	Apply Geo-Location based Service in an application.
12	Real time applications: College Portal, Online Quiz.

B. TOPICS FOR SELF STUDY:

S.No	Topics	Web Link
1	Animations and Transitions	**https://developer.android.com/training/animation**
2	Sending SMS	**https://www.tutorialspoint.com/android/android_advanced_tutorial.pdf**
3	Working with Sensor data	**https://google-developer-training.github.io/android-developer-advanced-course-practicals/Unit Covered-1-expand-the-user-experience/lesson-3-sensors/3-1-p-**

		working-with-sensor-data/3-1-p-working-with-sensor-data.html#tolearn
4	Google Play's billing system	https://google-developer-training.github.io/android-developer-advanced-course-practicals/Unit Covered-1-expand-the-user-experience/lesson-3-sensors/3-1-p-working-with-sensor-data/3-1-p-working-with-sensor-data.html#tolearn

2. SPECIFIC LEARNING OUTCOMES (SLO)

Ex.No.	Lab Exercises	Learning Outcomes	Highest Bloom's Taxonomic Level of Transaction
1	Create Hello World Application.	Create Android application to display "Hello World" text	K6
2	Demonstrate Life Cycle of an activity.	Design Android application with Activities	K6
3	Layouts: Linear, Relative and Table	Construct Android application with layouts	K6
4	Create multiple activities with an application.	Build Android web application with multiple activities	K6
5	Demonstrate the use of Scroll view and List view.	Create applications with scroll and list view.	K5
6	Illustrate Menu in an application.	Improve Android application with menus	K6
7	Create activity with Portrait and Landscape mode.	Create Android application with portrait and Landscape mode.	K6
8	Make SMS and Phone call services.	Construct Android application by integrating SMS and phone call Services.	K6
9	Perform read, write and delete operations on SQLite Database.	Construct Android application for inserting, deleting and updating with SQLite	K6
10	Create an application with login and homepage.	Create Android application with Login and Homepage.	K6
11	Apply Geo-Location based Service in an application.	Design Android application with Geo-Location based services.	K6
12	Real time applications: College Portal, Online Quiz.	Create real time applications.	K6

3. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	M	H	L	H	H	H	H	H	L	L	L	-
CO2	H	M	M	M	H	H	H	M	H	L	L	L	-
CO3	H	H	H	M	H	H	H	H	H	H	H	H	H
CO4	H	H	H	M	H	H	H	H	H	H	H	H	H

CO5	H	H	H	M	H	M	H	H	H	H	H	H	H
CO6	H	H	H	M	H	H	H	H	H	H	H	H	H

<div align="right">

L-Low   **M-Moderate**   **H- High**

</div>

4. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Practical Components): Closed Book
2. Cooperative Learning Report, Assignment, Group Discussion, project Report, Field Visit Report, Seminar.
3. Pre/Post Test, Viva, Report for each Exercise.
4. Lab Model Examination & End Semester Practical Examination

INDIRECT:

1. Course end survey (Feedback)

Course Coordinator   **Director-MCA**
Dr. P.S.ELIAHIM JEEVARAJ   **Dr. R.THAMARAI SELVI**

****

Core Practical VI: PROGRAMMING IN PYTHON LAB

SEMESTER: III   **CODE: P22CA3P6**
CREDITS: 2   **HOURS/WEEK: 4**

1. COURSE OUTCOMES

After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Exercise Covered
1	Analyze text using control statements and string functions	K6	1, 2
2	Apply file operations, list functionalities, and statistical calculations to analyze data	K6	3, 4, 5
3	Comprehend dictionaries and tuples for data manipulation and problem-solving	K6	6, 7
4	Analyze code complexity, identify modularization opportunities, and create reusable functions	K6	8,9
5	Utilize NumPy arrays and Pandas for scientific computations and data visualization	K6	10, 11,12,13
6	Apply database connectivity, CRUD operations, and data visualization in Django	K6	14

2 A. Syllabus

Ex. No.	Exercise
1	Write a Python program with Control Statements.
2	Demonstrate the following functions/methods which operates on strings in Python with suitable examples: i) len( ) ii) strip( ) iii) rstrip( ) iv) lstrip( ) v) find( ) vi) rfind( ) vii) index( ) viii) rindex() ix) count( ) x) replace( ) xi) split( ) xii) join( ) xiii) upper( ) xiv) lower( ) xv) swapcase( ) xvi) title( ) xvii) capitalize( ) xviii) startswith() xix) endswith()
3	Write a Python program to perform read and write operations on a file.
4	Write a Python program to compute the number of characters, words and lines in a file.
5	Demonstrate the following functions/methods which operates on lists in Python with suitable examples: i) list( ) ii) len( ) iii) count( ) iv) index ( ) v) append( ) vi) insert( ) vii) extend() viii) remove( ) ix) pop( ) x) reverse( ) xi) sort( ) xii) copy( ) xiii) clear( )
6	Demonstrate the following functions/methods which operates on tuples in Python with suitable examples: i) len( ) ii) count( ) iii) index( ) iv) sorted( ) v) min ( ) vi)max( ) vii) cmp( ) viii) reversed( )
7	Demonstrate the following functions/methods which operates on dictionary in Python with suitable examples: i) dict( ) ii) len( ) iii) clear( ) iv) get( ) v) pop( ) vi)popitem( ) vii) keys( ) viii) values() ix) items( ) x) copy( ) xi) update( )
8	Demonstrate the following kinds of Functions used in Python i)User-defined Functions ii) Built-in Functions Iii) Lambda Functions iv) Recursion Functions
9	Write Python program using Classes and Objects.

10	Create an Employee Database and perform database connectivity with mysql
11	Create an Student Database and perform database connectivity with sqlite
12	Demonstrate a Python program to implement the basics of NumPy Arrays
13	Demonstrate a Python program to apply the Data Manipulation with Pandas
14	Demonstrate a Python program to Visualize with Matplotlib - lineplot, scatterplot
15	Demonstrate a Python program for rendering forms in Django Framework

B. TOPICS FOR SELF-STUDY:

S.No	Topics	Web Link
1	Python Program to remove punctuations from a given string	**https://www.programiz.com/python-programming/examples**
2	Mail Merge using Python	**https://www.programiz.com/python-programming/examples**
3	Python program to count number of occurrences of key-value pair in a text file	**https://www.geeksforgeeks.org/python-programming-examples/#moreprograms**
4	PyGui and PySide Frameworks	**https://blog.resellerclub.com/the-6-best-python-gui-frameworks-for-developers/**

2. SPECIFIC LEARNING OUTCOMES (SLO)

Ex.No.	Lab Exercises	Learning Outcomes	Highest Bloom's Taxonomic Level of Transaction
1	Write a Python program with Control Statements.	Design and implement a Python program that utilizes multiple nested conditional statements and loops to solve a real-world problem, such as simulating a complex game or optimizing resource allocation.	K6
2	Demonstrate the following functions/methods which operates on strings in Python with suitable examples: i) len( ) ii) strip( ) iii) rstrip( ) iv) lstrip( ) v) find( ) vi) rfind( ) vii) index( ) viii) rindex() ix) count( ) x) replace( ) xi) split( ) xii) join( ) xiii) upper( ) xiv) lower( ) xv) swapcase( ) xvi) title( ) xvii) capitalize( ) xviii) startswith() xix) endswith()	Develop a Python application that takes user input (e.g., a paragraph or poem) and manipulates it creatively through a sequence of string functions.	K6
3	Write a Python program to perform read and write operations on a file.	Implement a Python script that reads data from multiple files, analyzes it based on specific criteria, and writes the results to a new file.	K6

4	Write a Python program to compute the number of characters, words and lines in a file.	Design and build a Python program that extracts specific information from various file formats (e.g., PDF, CSV) and creates a structured database or generates interactive visualizations to reveal hidden patterns or trends within the data.	K6
5	Demonstrate the following functions/methods which operates on lists in Python with suitable examples: i) list( ) ii) len( ) iii) count( ) iv) index ( ) v) append( ) vi) insert( ) vii) extend() viii) remove( ) ix) pop( ) x) reverse( ) xi) sort( ) xii) copy( ) xiii) clear( )	Implement a Python algorithm that utilizes advanced list manipulations (e.g., sorting, filtering, recursion) to solve a computational problem efficiently.	K6
6	Demonstrate the following functions/methods which operates on tuples in Python with suitable examples: i) len( ) ii) count( ) iii) index( ) iv) sorted( ) v) min ( ) vi)max( ) vii) cmp( ) viii) reversed( )	Design a data structure using nested tuples to represent a complex relationship between entities (e.g., family tree, network connections)	K6
7	Demonstrate the following functions/methods which operates on dictionary in Python with suitable examples: dict( ) ii) len( ) iii) clear( ) iv) get( ) v) pop( ) vi)popitem( ) vii) keys( ) viii) values() ix) items( ) x) copy( ) xi) update( )	Build a Python program that implements a custom dictionary-based database with user-defined keys and values, handling data storage, retrieval, and updates efficiently.	K6
8	Demonstrate the following kinds of Functions used in Python i)User-defined Functions ii) Built-in Functions Iii) Lambda Functions iv) Recursion Functions	Design and develop a library of reusable Python functions, each tackling a specific task or sub-problem related to a larger project, ensuring modularity, code organization, and ease of future maintenance.	K6
9	Write Python program using Classes and Objects.	Implement a Python application that utilizes classes and objects to model real-world entities and their relationships, defining custom methods and attributes to handle specific functionalities and interactions.	K6
10	Create an Employee Database and perform database connectivity with mysql	Develop a Python program that connects to a real-world database and performs CRUD operations on stored data, demonstrating practical application of database integration for data management.	K6
11	Create an Student Database and perform database connectivity with sqlite	Build a Python app that stores student data in an sqlite database	K6

		and lets you add, find, update, and remove student information.	
12	Demonstrate a Python program to implement the basics of NumPy Arrays	Write a Python program that uses NumPy arrays to store and manipulate numbers in different ways, like calculating averages, plotting graphs, and doing simple math.	K6
13	Demonstrate a Python program to apply the Data Manipulation with Pandas	Design a Python script that reads data from various sources, cleans and transforms it using Pandas functionalities, and generates insightful reports or visualizations.	K6
14	Demonstrate a Python program to Visualize with Matplotlib - lineplot, scatterplot	Develop a Python program that analyzes data and generates interactive visualizations using Matplotlib libraries.	K6
15.	Demonstrate a Python program for rendering forms in Django Framework	Implement a complete web application using Django Framework, designing forms for user input, validating data, and processing information to deliver a meaningful user experience.	K6

3. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	H	H	M	M	H	M	M	M	H	H	M	L
CO2	H	H	H	M	M	L	L	L	M	H	M	L	H
CO3	H	M	H	M	M	L	L	L	M	H	M	L	L
CO4	H	M	H	M	M	L	L	L	M	H	M	L	L
CO5	H	H	H	H	L	L	L	L	L	H	L	L	L
CO6	H	H	H	H	H	M	M	M	M	H	M	M	L

L-Low   M-Moderate   H- High

4. COURSE ASSESSMENT METHODS

DIRECT:
1. Continuous Assessment Test: T1, T2 (Practical Components): Closed Book
2. Assignment, Group Discussion, project Report, Field Visit Report, Seminar.
3. Pre/Post Test, Viva, Report for each Exercise.
4. Lab Model Examination & End Semester Practical Examination

INDIRECT:
1. Course end survey (Feedback)

  Course Coordinator   **Director-MCA**
Dr.A. FLORENCE DEEPA   **Dr. R.THAMARAI SELVI**
                                  ****

SEMESTER: III   **CODE: P22CA3G1**
CREDITS: 1   **HOURS/WEEK: 1**

1. COURSE OUTCOMES
After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
1	Develop real time projects	K6	I
2	Describe the basic elements of the research	K2	II
3	Identify and define the problem statement	K3	III
4	Choose the right sources of literature and the right tools for analysis and interpretation	K2	IV
5	Understanding the ethics of research	K1	V

2 A. Syllabus

UNIT I: Project Development and Documentation
Identifying the Real Time Applications: Types of Applications – Stand-alone Applications – Web Applications – Mobile Applications- IoT Applications– Aim and Objectives of the Project - Pros and Cons of Existing and Proposed work – Software Requirements – Hardware Requirements - Acknowledgement – Abstract Writing – Tables and Figures – Bibliography – Appendix

UNIT II – Elements of Research
Basic Elements of Research – Objectives – Types of Research – Steps involved in Research – Identifying the problem statement – Evolving strategies for solving – Designing Feasible experiments – Planning and Scheduling – Developing hypothesis.

UNIT III – Research Design
Preparing the research design – Determining Simple Design – Collecting the data – Execution of the Project – Analysis of data – Hypothesis Testing – Generalizations and interpretation – Preparation of the report

UNIT IV– REVIEW OF LITERATURE
Literature review-Primary and Secondary sources - Reviews – Monograph - Patents - Research databases - web as a source - Searching the web - Critical literature review - Identifying gap areas from literature and research database - Development of working hypothesis.

UNIT V –RESEARCH ETHICS
Ethical issues - Ethical committees - Commercialization - Copy right – royalty - Intellectual property rights and patent law- Trade Related aspects of Intellectual Property Rights – Reproduction of published material – Plagiarism - Citation and acknowledgement - Reproducibility and accountability - Software for detection of Plagiarism.

B. TOPICS FOR SELF-STUDY:

S.No.	Topics	Web Links
1	Research Methods Definitions, Types	**https://www.scribbr.com/category/methodology/**
2	IoT Projects	**https://www.simplilearn.com/internet-of-things-iot-projects-article**
3	Android Projects	**https://nevonprojects.com/project-ideas/android-project-ideas/**
4	Web Applications	**https://codeshoppy.com/web-application-ideas-for-students.html**

C. Text Books:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
3. Wadehra, B.L. 2000. Law relating to patents, Trademarks, copyright designs and geographical indications. Universal Law Publishing.

D. Reference Books:

1. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Publications. 2 volumes.
2. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.

E. Web links:

1. **https://docs.microsoft.com/en-us/aspnet/mvc/overview/getting-started/introduction/getting-started**
2. **https://www.tutorialsteacher.com/mvc/asp.net-mvc-tutorials**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Project Development and Documentation**		
1.1	Identifying the Real Time Applications	Identify the real time applications	K3
1.2	Types of Application	Identify the Types of Applications	K3
1.3	Stand-alone Applications	Develop Stand alone applications	K6
1.4	Web Applications	Develop web applications	K6
1.5	Mobile Applications	Develop Mobile Applications	K6
1.6	IoT Applications	Build IoT applications	K6
1.7	Aim and Objectives of the Project	Write aim and objectives of the Project	K2
1.8	Pros and Cons of Existing and Proposed work	Compare Pros and cons of Existing and Proposed Work	K4
1.9	Software Requirements	Summarize Software Requirements	K3
1.10	Hardware Requirements	Outline hardware Requirements	K2
1.11	Acknowledgement	Tell about acknowledgement writing	K2
1.12	Abstract Writing	Tell about Abstract writing	K2

1.13	Tables and Figures	Illustrate the use of Tables and Figures in Project Development	K2
1.14	**B**ibliography – Appendix	Write down the format of bibliography and Appendix	K2
II	**Elements of Research**		
2.1	Basic Elements of Research	Decide the role of	K5
2.2	Objectives	Analyze the process of storing data within fields	K4
2.3	Types of Research	Interpret the basics of collections into applications	K5
2.4	Steps involved in Research	Design applications with methods	K6
2.5	Identifying the problem statement	Identify the research problem	K2
2.6	Evolving strategies for solving	Outline the evolving strategies for problem solving	K2
2.6	Planning and Scheduling	Outline the Strategies of Project planning and Scheduling	K2
2.7	Developing hypothesis.	Decide the role of Hypothesis	K5
III	**Research Design**		
3.1	Preparing the research design	Prepare research design	K5
3.2	Determining Simple Design	Develop Simple Design	K6
3.3	Collecting the data	Interpret the basics of collecting data	K5
3.4	Execution of the Project	Design projects	K6
3.5	Analysis of data	Illustrate the use of analysis of data	K2
3.6	Hypothesis Testing	Illustrate Hypothesis Testing	K2
3.7	Generalizations and interpretation	Summarize generalizations and interpretation	K3
3.8	Preparation of the report	Prepare project report	K6
IV	**REVIEW OF LITERATURE**		
4.1	Literature review	Compare various papers	K2
4.2	Primary and Secondary sources	Design Primary and Secondary Sources	K6
4.3	Reviews	Examine review of Literature	K4
4.4	Monograph	Classify Monograph	K4
4.5	Research databases	Design Research Databases	K6
4.6	web as a source	Elaborate web as a source	K6
4.7	Searching the web	Interpret the searching of the web	K5
4.8	Critical literature review	Classify Literature Review	K4
4.9	Identifying gap areas from literature and research database	Identify the gap between the literature and research database	K3
4.10	Development of working hypothesis.	Develop hypothesis	K6
V	**RESEARCH ETHICS**		
5.1	Ethical issues	Improve web application with Blazor basics	K6
5.2	Ethical committees	Assess the components using Blazor server	K5
5.3	Commercialization	Develop a service for a Blazor component	K6

5.4	Copy right	Build components using Blazor Web Assembly	K6
5.5	Royalty	Construct Web assembly applications	K6
5.6	Intellectual property rights and patent law	Summarize the intellectual property rights and patent law	K3
5.7	Trade Related aspects of Intellectual Property Rights	Outline the trade related aspects of IPR	K3
5.8	Reproduction of published material	Explain reproduction of published material	K5
5.9	Plagiarism	Tell about Plagiarism	K1
5.10	Citation and acknowledgement	Write about Citation and acknowledgement	K5
5.11	Reproducibility and accountability	Elaborate reproducibility and accountability	K6
5.12	Software for detection of Plagiarism.	Explain software for detection of Plagiarism	K5

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	-	-	M	L	-	M	H	H	L	-	M	-
CO2	H	-	L	-	M	L	H	M	H	H	-	H	-
CO3	H	-	M	-	H	H	H	M	L	H	-	H	-
CO4	H	M	H	L	H	M	H	H	M	M	-	H	M
CO5	M	-	H	M	H	M	M	H	M	L	-	H	H
CO6	H	-	H	M	H	H	M	H	H	M	-	H	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Discussion, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

  Course Coordinator   **Director-MCA**
Dr. K.MOHAMED AMANULLAH   **Dr. R.THAMARAI SELVI**
         ****

Course Coordinator
Dr. K.MOHAMED AMANULLAH

Director-MCA
Dr. R.THAMARAI SELVI

****

BRIDGE COURSE VII: DIGITAL COMPUTER FUNDAMENTALS AND ARCHITECTURE

SEMESTER: III   **CODE: PB22CA37**
CREDITS: 4   **HOURS/WEEK: …**

1. COURSE OUTCOMES
After the successful completion of this course the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
1	Apply Number Systems-to convert numbers from one form to another	K3	I
2	Recall all binary codes	K1	I
3	Develop k-map to design Boolean expression	K6	II
4	Create the basic building blocks	K6	III
5	Design RS flipflops, JK flipflops, D-flipflops, registers and n-modcounters	K6	IV
6	Determine the central processing unit	K5	V

2A. Syllabus

UNIT I
        Number Systems – Binary Arithmetic – Binary codes.

UNIT II
        Logic Gates and Logic Circuits – Boolean Algebra – Karnaugh Map.

UNIT III - Arithmetic Building Blocks:
        Half Adder – Full Adder – Controlled Inverter –The Adder–Subtracter. **Data Processing Circuits:** Multiplexer – Demultiplexer – Decoder – Encoder.

UNIT IV - Flip–Flops:
        RS Flip Flop – Edge Triggered RS Flip Flop – Edge Triggered D Flip Flop – JK Flip Flop – JK Master Slave Flip Flop. **Registers:** Types of Registers – **Counters:** Asynchronous Counters – Synchronous Counters – MOD Counters – Decade Counters – Pre–Settable Counters.

UNIT V - Central Processing Unit
        Central Processing Unit: General Register Organization – Stack Organization – Instruction Formats – Addressing Modes – Data Transfer And Manipulation – Program Control – Reduced Instruction Set Computer – CISC characteristics – RISC Characteristics.

B. TOPICS FOR SELF-STUDY:

S.No	Topics	Web Link
1	Distributed Computing	**www.wiley.com**
2	Digital Systems	**www.geeksforgeeks.org**
3	Data communication	**https://www.tutorialspoint.com/**
4	Gate Level Minimization	**www.geeksforgeeks.org**

C. Text Books:

1. V.Vijayendran, "Digital Fundamentals", S.ViswanathanPvt.,Ltd., 2008.
2. Donald P Leach., Albert Paul Malvino, "Digital Principles and Applications", TMH, Fifth Edition 2005.
3. Morris Mano M, "Computer System Architecture", Prentice Hall of India, Third Edition, 2008.

D. Reference Book:

1. ThomasL.Floyd, "Digital Fundmentals",Eleventh Edition ,Pearson publication,2015,

E. Web Links:

1. https://onlinecourses.nptel.ac.in/noc18_ee33
2. **https://nptel.ac.in/courses/106103180/W1A1**
3. https://www.tutorialspoint.com/computer_logical.../digital_number_system.htm

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit/ Section	Course Content	Learning outcomes	Blooms Taxonomy Level of Transaction
I	**Number System**		
1.1	Number Systems- Decimal, Binary, Octal and Hexa decimal	Classify the various number systems	K4
1.2	Binary Arithmetic Addition, Subtraction Multiplication, Division	Solve using binary arithmetic	K6
1.3	Complements	Illustrate 2's complement with an example	K2
1.4	Binary codes.	Elaborate on binary codes	K6
II	**Logic Gates**		
2.1	Logic Gates	List out the basic logic gates	K4
2.2	Logic Cirsuits	Simplify the logic circuit using gates	K4
2,3	Boolean Algebra,	Apply Boolean algebra for simplifying a circuit	K3
2.4	Karnaugh Map	Construct a karnaugh map for the given expression	K6
III	**Arithmetic Building Blocks and Circuits**		
3..1	Arithmetic Building Blocks	Elaborate on the basic arithmetic building blocks	K6
3.2	Half Adder	Explain about half adders	K5
3.3	Full Adder	Design a full adder using the logic gates	K6
3.4	Controlled Inverter, The Adder–Subtracter.	Illustrate the use of a controlled inverter	K2
3.5	The Adder-Subtractor	Build an adder-subtractor using logic gates	K6
3.6	Data Processing Circuits: Multiplexer	Explain Multiplexer	K5
3.7	Demultiplexer	Discuss on demultiplexers	K6
3.8	Decoder , Encoder	Construct a 4*16 decoder	K6

IV	**Flip-Flops,Registers and Counters**		
4.1	**Flip–Flops** RS Flip Flop	Discuss on RS Flip-Flops	K6
4.2	Edge Triggered RS Flip Flop	Illustrate on edge triggered RS flip flop	K2
4.3	D Flip Flop	Construct D flip flop using gates	K6
4.4	JK Flip Flop	Explain JK Flip Flop	K5
4.5	Master Slave Flip Flop	Elaborate on JK Master Slave flip flop	K6
4.6	**Registers** Types of Registers	Design a parallel in parallel out register.	K6
47	**Counters** Asynchronous Counters	Compare synchronous and asynchronous counters	K5
4.8	Synchronous Counters	Illustrate on synchronous counters	K2
4.9	MOD Counters	Classify MOD counters	K2
4.10	Decade Counters	Explain about decade counter	K5
4.11	Pre–Settable Counters.	Discuss on pre-settable counters	K6
V	**Central Processing Unit**		
5.2	**Stack organization**	Distinguish between memory stack and register stack	K4
5.3	Instruction Formats	Classify the basic computer instruction formats	K4
5..4	Addressing Modes	Discuss the addressing modes	K6
5.5	Data Transfer And Manipulation , Program control	Elaborate on the types of interrupts	K6
5.6	RISC characteristics	Elaborate on RISC characteristics	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	M	L	L	-	-	M	H	L	M	H	-	M
CO2	H	H	M	H	M	H	M	L	H	H	H	M	M
CO3	H	H	M	H	H	M	H	M	H	H	L	L	L
CO4	H	H	H	M	H	M	M	H	H	L	L	M	M
CO5	H	H	M	H	M	H	M	L	H	M	M	L	L
CO6	H	H	H	H	H	M	H	M	M	H	M	H	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book

2. Open Book Test.

3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).

4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

Course Coordinator   **Director-MCA**
Mr. A.SANDANASAMY   **Dr. R.THAMARAI SELVI**

****

BRIDGE COURSE VIII: PHP AND MYSQL

SEMESTER: III   **CODE: PB22CA38**
CREDITS: 4   **HOURS/WEEK: …**

1. COURSE OUTCOMES:
After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Unit covered
CO1	Develop a PHP program using variables and basic statements	K6	I
CO2	Utilize the different types of arrays	K3	I
CO3	Create custom functions using PHP built-in functions	K6	II
CO4	Distinguish POST and GET in form submission	K4	III
CO5	Create sessions and cookies	K6	IV
CO6	Design Dynamic web site using server-side PHP and MYSQL Database	K6	V

2A. Syllabus

UNITI - Introduction to PHP   **12 Hours**
   PHP BASICS: Introduction - PHP Getting Started - Syntax - PHP Variables, Predefined Variables: super globals, server variables - Constants - Echo and Print - Data Types - String Functions - Operators - Control Structures: - Arrays - Sorting Arrays - Loops

UNIT II - PHP   Functions and   File System   **12 Hours**
   PHP Functions - Math Operations - Date and Time -Classes and Objects - Forms: GET and POST -Include Files - File system- Parsing Directories- File Upload- File Download

UNIT III - Cookies   and Session   **12 Hours**
   State Management: Cookies - Sessions - Form Handling - Form Validation - Filters - Error Handling - Send Email - PHP Magic Constants - JSON Parsing - Regular Expressions - Exception Handling

UNIT IV - MYSQL Database   **12 Hours**
   PHP & MySQL DATABASE : MySQL Introduction:MySQLi (object-oriented, MySQLiprocedural,PDO) - MySQL Connect - MySQL Create Database - MySQL Create Table - MySQL Insert - MySQL Prepared - MySQL Last Inserted ID - MySQL Select - MySQL Where - MySQL Limit - MySQL Order By - MySQL Update - MySQL Delete.

UNIT V - Ajax and MVC   **12 Hours**
   MySQL CRUD Application - MySQL Ajax Search - MySQL Login System – MVC - Simple PHP MVC Example

B. TOPICS FOR SELF STUDY:

S.No	Topics	Web Link
1	PHP XML parser	www .w3schools.com
2	Directory in PHP	www .w3schools.com
3	PHP Calendar	www .w3schools.com
4	PHP with Backup Database	www.tutorialspoint.com

C. Text Books:

1.Antonio Lopez, "Learning PHP 7", PACKT Open Source Publication, 2016

2.Dennis Popel, "Learning PHP Data Objects: A Beginner's Guide to PHP Data Objects, Database Connection Abstraction Library for PHP 5", Packt Publishing, 2009. (UNIT V)

D. Reference Books:

1.Adrian W. West, "Practical PHP and MySQL Website Databases", Apress, 2016

2.Leon Atkinson, "Core PHP Programming", Pearson Education, 2004.

3. www.jkmaterials.yolasite.com/resources/labmanuals/BTech/WT-PHP-Record.pdf

4. MySQL® Notes for Professionals, GoalKicker.com

5. PHP Notes for Professionals, GoalKicker.com

E. Web links:

1. **www.tutorialspoint.com**
2. **www.w3school.com**
3. **www.javatpoint.com**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Introduction to PHP**		
1.1	Basics of PHP	Recall the basic concepts of PHP	K1
1.2	PHP Variables	List out thePHP Variables	K2
1.3	super global, server variables	Explain about super global, server variables	K2
1.4	Echo and Print	Compare Echo and Print	K4
1.5	Data Types	Classify Data types	K4
	Control Structures and Arrays		
1.6	Operators	Explain about Operators	K2
1.7	String Functions	Apply String functions	K3
1.8	Control Structures	Explain Control Structures	K2
1.9	Arrays	Illustrate Arrays	K2
II	**Functions and Classes**		
2.1	PHP Functions	Create functions in PHP	K6
2.2	Math Operations	Apply Math operations in program	K3
2.3	Date and Time	Explain Date and Time	K3
2.4	Classes and Objects	Discuss Classes and Objects	K6
	Forms and File systems		
2.5	2.3 Forms	Utilize Forms to get data	K3
2.6	2.4 GET and POST	Make use of GET and POST methods	K3
2.7	2.5 File system	Discuss the File System	K6
2.8	2.6 Parsing Directories	Explain Parsing Directories	K2
2.9	2.7 File Upload	Utilize File Upload Controls	K3
2.10	2.8 File Download	Make use of File Download operations	K3
III	**Cookies and Sessions**		
3.1	Cookies and Sessions	Explain Cookies and Sessions	K2

3.2	Form Handling	Create and handle forms	K6
3.3	Filters	Illustrate the use of Filters	K2
3.4	Send Email	Discuss about Email	K6
	Constants and Regular Expressions		
3.5	PHP Magic Constants	Recall the basic concepts of Magic constant	K1
3.6	Regular Expressions	Explain Regular expressions	K2
3.7	Exception Handling	Apply Exception Handling	K3
IV	**PHP & MySQL Database**		
4.1	MySQL Connect	Construct database connectivity	K6
4.2	MySQL Create Database	Create tables, views and index	K6
4.3	MySQL Insert	Apply Insert statementin table	K3
4.4	MySQL Prepared	CreateMySQL Prepared statement	K6
	MYSQL Operations		
4.5	MySQL Select	Make use of select statement	K3
4.6	MySQL Where	Apply Where Clause in SQL statement	K3
4.7	MySQL Order By	Categorize Order Byclause	K4
4.8	MySQL Update	Utilize Update statement	K3
4.9	MySQL Delete	Apply Delete Statement	K3
V	**Ajax and MVC**		
5.1	5.1MySQL CRUD Application	Summarize CRUD Application	K2
5.2	5.2 MySQL Ajax Search	Explain Ajax Search	K2
5.3	5.3 MySQL Login System	List out the Built-in functions	K1
5.4	5.4 MVC	Discuss Model View Controller	K6
5.5	5.5 Simple PHP MVC Example	Design simple Model View Controller	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	M	M	L	-	H	H	-	M	M	M	-	M
CO2	M	H	M	H	M	H	H	L	M	M	H	M	L
CO3	H	M	H	M	H	H	H	M	M	M	L	L	M
CO4	M	L	H	H	H	H	H	M	H	L	H	H	M
CO5	H	H	L	H	M	L	M	H	H	M	H	M	L
CO6	H	M	M	M	H	H	H	M	M	H	M	H	H

L-Low   **M-Moderate**   **H- High**

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book

2. Open Book Test.

3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).

4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

Course Coordinator   **Director-MCA**
Dr.R.THAMARAI SELVI   **Dr. R.THAMARAI SELVI**

****

BRIDGE COURSE IX: PHP AND MYSQL LAB

SEMESTER: IV   **CODE: PB22CA3P**
CREDITS: 2   **HOURS/WEEK: …**

1. COURSE OUTCOMES:
After the successful completion of this course, the students will be able to:

S.No.	Course Outcomes	Level	Exercise covered
CO1	Develop PHP programs using Control structures	K6	1,2
CO2	Apply various functions on arrays, Math, String	K3	3,4
CO3	Design PHP programs using Class and Object	K2	5
CO4	Design PHP programs using Form Handling and Files	K6	6,7
CO5	Apply cookies, sessions in PHP program Sending Mail	K3	8,9,10
CO6	Develop web application PHP programing and Database using MySQL	K6	11,12,13

2A. Syllabus

Ex. No.	Exercise
1	Write a PHP program using Control structures
2	Write a PHP program to read an integer Array and sorting the array in Ascending order
3	Write a PHP program using functions
4	(a) Write a PHP program using date and time objects (b) Write a PHP program using string objects
5	Write a PHP program using class and objects
6	Write a PHP program to design form to get student information using POST and GET
7	Write a PHP program to upload and down load a files
8	Write a PHP program to create cookies and sessions
9	Write a PHP program to create cookies and sessions
10	Write a PHP program to Handle runtime Exception
11.	Write a PHP program to send Email
12.	Write a PHP program to Create Database and tables using MySQLi
13.	Write a PHP program to Create simple CRUD Application

B. TOPICS FOR SELF STUDY:

S.No	Topics	Web Link
1	Use XML parser in PHP	www .w3schools.com
2	Develop PHP Program using Directory	www .w3schools.com
3	Develop PHP Program using Calendar	www .w3schools.com
4	Develop PHP Program to Backup database	www.tutorialspoint.com

3. SPECIFIC LEARNING OUTCOMES (SLO)

Ex.No	Lab Exercises	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
1	Control structures	Develop PHP Program using control structures	K6
2	Arrays and strings	Develop PHP Program using arrays and strings	K6
3	PHP Functions	Apply Functions in PHP program	K6
4	Math, String and Date and Time objects	Apply Math, Date and Time functions in PHP Program	K6
5	PHP programs using Objects and classes	Create a PHP program using Class and Object	K6
6	Form Handling (POST & GET)	Create A Form using GET and POST	K6
7	File upload and download	Apply File upload and download in a program	K6
8	Statemanagement using cookies, sessions	Create cookies, sessions in a program	K6
9	Error Handling	Build simple Program using Error Handling	K6
10	Sending Email	Develop PHP programto send Email	K6
11	Data base Connectivity using MySQLi	Create Database and tables using MySQLi	K6
12	Create CRUD Application	Create simple CRUD Application	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	H	H	L	M	M	H	H	H	H	M	H	M
CO2	H	H	M	H	H	M	M	M	H	H	L	H	M
CO3	H	H	M	H	M	M	M	M	H	L	H	H	H
CO4	H	M	H	H	M	M	H	M	L	L	L	H	M
CO5	H	H	M	H	M	M	H	L	L	M	L	H	M
CO6	H	M	H	M	M	H	H	L	H	M	H	M	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Practical Components): Closed Book
2. Cooperative Learning Report, Assignment, Group Discussion, project Report, Field Visit Report, Seminar.
3. Pre/Post Test, Viva, Report for each Exercise.
4. Lab Model Examination & End Semester Practical Examination

INDIRECT:

1. Course end survey (Feedback)

Course Coordinator	**Director-MCA**
Dr. R.THAMARAI SELVI	**Dr. R.THAMARAI SELVI**

****

Core XI: MACHINE LEARNING FOR DATA SCIENCE

SEMESTER: IV **CODE: P22CA411**
CREDITS: 4 **HOURS/WEEK: 4**

1. COURSE OUTCOMES
After the successful completion of this, course the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
CO1	Understand the statistical terminologies for building a model	K2	I
CO2	Categorize and explore data using R	K4	II
CO3	Compare the various classification algorithms	K5	III
CO4	Identify the patterns and association in a dataset using association rules	K3	1V
CO5	Build models for forecasting	K6	V
CO6	Evaluate the performance of the developed model	K5	V

2A. Syllabus

UNIT I - Journey from Statistics to Machine Learning **9 Hours**
Statistical terminology for model building and validation- machine learning-major differences between statistical modeling and machine learning-steps in machine learning model development and deployment-statistical fundamentals and terminology for model building and validation.

UNIT II - Using R for Machine Learning Managing and Understanding Data **9 Hours**
R Data Structures – Vectors-Factors-Managing data with R. **Exploring and understanding data:** Exploring the structure of data-exploring numerical variables-exploring categorical variables-Exploring relationships between variables.

UNIT III - Lazy learning – Classification using Nearest Neighbors **9 Hours**
Understanding classification using nearest neighbors. **Probabilistic Learning- Classification using Naives Bayes:** Understanding Naïve Bayes. **Divide and Conquer- Classification using Decision trees and rules:** Understanding Decision Trees-Understanding Classification Rules.

UNIT IV - Forecasting Numeric Data- Regression Methods **9 Hours**
Understanding Regression -Understanding Regression Trees and Model Trees. **Black Box Methods- Neural Networks And Support Vector Machines:** Understanding Neural Networks-Understanding Support Vector Machines. **Finding Patterns-Market Basket Analysis Using Association Rules**. **Finding Groups of Data:** Clustering With K-Means.

UNIT V - Evaluating Model Performance **9 Hours**
Measuring performance for classification – Estimating future performance. **Improving Model Performance:** Tuning stock models for better performance-improving model performance with meta-learning.

B. TOPICS FOR SELF-STUDY:

S.No.	Topics	Web Links
1	Generative models	**https://www.youtube.com/watch?v=sucqskXRkss**
2	Model selection and learning	**https://machinelearningmastery.com/a-gentle-introduction-to-model-selection-for-machine-learning/**
3	Deep generative models	**http://www.cs.toronto.edu/~slwang/generative_model.pdf**
4	Probabilistic programming	**https://livebook.manning.com/book/practical-probabilistic-programming/chapter-1/7**

C. Text Books:

1. Brett Lanz, Machine Learning with R, PACKT publishing Ltd., Third Edition
2. Pratap Dangeti, Statistics for Machine Learning, Packt Publishing Ltd., July 2017.

D. Reference Book:

1. SaikutDutt, Subramanian Chandramouli, Amit Kumar Das, Machine Learning, Pearson Education, 2019

E. Web links:

1. **https://www.javatpoint.com/machine-learning**
2. **https://www.youtube.com/watch?v=G7fPB4OHkys**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Journey from Statistics to Machine Learning**		
1.1	Statistical terminology for model building and validation	Outline the statistical model for building and validation	K2
1.2	Machine learning - Major differences between statistical modeling and machine learning	Compare the difference between machine learning and statistical model	K5
1.3	Steps in machine learning model development and deployment	Examine the steps in machine learning model	K4
1.4	Statistical fundamentals and terminology for model building and validation	Make use of statistical terminology for building models	K3
1.5	Bias versus variance trade-off 32 Train and test data	Experiment with Trained and Test data sets	K3
	Machine learning terminology for model building and validation		
1.6	Linear regression versus gradient descent -Machine learning losses	Distinguish Linear regression and gradient descent model	K4
1.7	When to stop tuning machine learning models -Train, validation, and test data	Discuss on how to tune the machine learning model for trained and test data set	K6

1.8	Cross-validation -Grid search	Explain cross validation on grid search	K5
II	**Using R for Machine Learning Managing and Understanding Data**		
2.1	R Data Structures	Explain the Data structure in R	K2
2.2	Vectors-Factors	Examine the vectors and factors in R	K4
2.3	Data frames-Matrices and Arrays	Classify the data frames, matrices and arrays	K3
2.4	Managing data with R	Inference the data in R tool	K5
	Exploring and understanding data		
2.4	Exploring the structure of data	Analyze the structure of data	K4
2.5	Exploring numerical variables	Analyze the numerical variable	K4
2.6	Exploring categorical variables	Analyze the categorical variable	K4
2.7	Exploring relationships between variables.	Compare and analyze the variables in data	K5
III	**Lazy learning – Classification using Nearest Neighbours**		
3.1	Understanding classification using nearest neighbors	Illustrate the classification using nearest neighbor	K2
3.2	The KNN Algorithm	Analyze the KNN algorithm	K4
3.3	Case Study for k-NN Algorithm	Test a problem for k-NN algorithm	K6
	Probabilistic Learning- Classification using Naives Bayes		
3.5	Basic concepts of Bayesian methods	Examine the concepts of Bayesian methods	K4
3.6	Classification with Naive Bayes	Interpret the classification with naive bayes	K5
3.7	Case study for Naive Bayes Algorithm	Test a problem for Naive Bayes algorithm	K6
	Divide and Conquer- Classification using Decision trees and rules		
3.8	Understanding Decision trees	Explain the Decision tree	K5
3.9	Understanding Classification Rules.	Analyze the classification using decision tree rules	K5
3.10	Case study for Decision tress	Test a problem for Decision trees	K6
IV	**Forecasting Numeric Data- Regression Methods**		
4.1	Understanding Regression	Evaluate the Regression model	K5
4.2	Understanding Regression Trees and Model Trees	Compare the regression and model tree	K4
	Black Box Methods- Neural Networks and Support Vector Machines		
4.3	Understanding Neural Networks	Outline the concept of neural network	K2
4.3	Case Study for ANN	Test a problem for ANN	K6
4.4	Understanding Support Vector	Explain the support Vector Machine	K5
4.5	Case Study for SVM	Test problem for SVM	K6
	Finding Patterns-Market Basket Analysis Using Association Rules		
4.7	Understanding Association Rules	Explain the Association Rule	K5
4.8	Case study for Finding Patterns	Test problem for finding pattern	K6
4.9	Clustering with K means	Examine the clustering with K means	K4
V	**Evaluating Model Performance**		
5.1	Measuring performance for classification	Determine the performance for classification	K5
5.2	Estimating future performance	Measure the performance	K5

	Improving Model Performance		
5.3	Tuning stock models for better performance	Design the model for stock data for effective performance	K6
5.4	Improving model performance with meta-learning	Develop a model using meta learning for effective performance	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	H	M	M	M	L	-	L	M	L	H	M	L
CO2	H	H	M	H	H	M	L	L	L	H	H	L	M
CO3	H	H	H	M	M	L	L	L	H	H	H	M	-
CO4	H	H	H	H	M	-	L	-	M	H	H	H	L
CO5	H	H	M	M	M	-	-	L	M	M	H	H	L
CO6	M	H	M	H	M	L	-	-	M	M	H	M	L

L-Low   **M-Moderate**   **H- High**

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

Core XII: INTERNET OF THINGS

SEMESTER: IV   **CODE: P22CA412**
CREDITS: 4   **HOURS/WEEK: 4**

1. COURSE OUTCOMES

After the successful completion of this course the students will be able to

S.No.	Course Outcomes	Level	Unit Covered
1	Discriminate the physical and logical design of Internet of Things (IoT)	K5	I
2	Categorize Domain specific IoTs	K4	II
3	Illustrate IoT system management with NETCONF-YANG	K2	III
4	Analyze the various M2M and IoT system management	K5	III
5	Discuss IoT Platform Design Methodology and Develop IoT solutions using IoT data analytics	K6	IV
6	Discuss the building blocks of IoT physical devices and end points	K3	V

2 A Syllabus

UNIT- I   **9 Hours**
       Introduction& Concepts: Introduction to Internet of Things- Physical Design of IoT- Logical Design of IoT- IoT Enabling Technologies- IoT Levels & Deployment Templates

UNIT- II   **9 Hours**
       Domain Specific IoTs: Home Automation- Cities- Environment- Energy- Retail- Logistics- Agriculture- Industry- Health & Life style. **IoT and M2M**: M2M-Difference between IoT and M2M- SDN and NFV for IoT- Software Defined Networking- Network Function Virtualization.

UNIT- III   **9 Hours**
       IoT System Management with NETCONF-YANG: Need for IoT Systems Management- Simple Network Management Protocol- Limitations of SNMP- Network Operator Requirements- NETCONF- YANG- IoT Systems Management with NETCONF-YANG-NETOPEER

UNIT- IV   **9 Hours**
       IOT Platform Design Methodology: Purpose & Requirements- Purpose specification - Domain model specification- Information model specification-Service level specification- Functional view specification- Operational view specification- Device & Component Integration-Application Development. **Data Analytics for IoT:** Introduction-Apache Hadoop-Apache Oozie - Apache Spark- Apache Storm-Using Apache Storm for Real-time Data Analysis.

UNIT- V   **9 Hours**
IoT Physical Devices & Endpoints: What is an IoT Device - Exemplary Device: Raspberry Pi- About the Board-Linux on Raspberry Pi-Raspberry Pi Interfaces-Programming Raspberry Pi with Python - Other IoT Devices.**Getting to Know the Arduino Uno** : Discovering Other Arduino Boards - Arduino Technical Details - Kitted Out: Starting with a Beginner's Kit - Preparing a Workspace - Installing Arduino - Surveying the Arduino Environment - Using Arduino Web Editor

.

B. TOPICS FOR SELF-STUDY:

S.No.	Topics	Web Links
1	IoT solution architecture models	**https://www.javatpoint.com/iot-architecture-models**
2	IoT analytics-Reaping value from IoT data	**https://www.cio.com/article/3542670/iot-analytics-reaping-value-from-iot-data.html**
3	Multi-tier IoT deployment	**https://cs.ucsb.edu/research/tech-reports/2019-11**
4	IoT Cloud application development	**https://www.embitel.com/iot-cloud-application-development**

Text Books:
1. ArshdeepBahga and Vijay Madisetti, "Internet of Things: A HANDS-ON APPROACH", First Edition, Universities Press, 2020
2. Arduino for dummies a wiley brand by John Nussey , Copyright © 2018 by John Wiley & Sons, Inc., (UNIT 5)

Reference Books:
1. Francis DaCosta, "Rethinking the Internet of Things-A scalable approach to connecting everything", First edition, Apress open publication, 2013.
2. Peter Waher, "Learning Internet of Things", PACKT Publishing-First Edition, 2015.
3. Cuno Pfister, "Getting started with the internet of things", O'Rielly Publication, First Edition, 2014, Kindle Edition Publication.

Web links:
1. **www.tutorialspoint.com**
2. **www.geeksforgeeks.org**
3. **www.javatpoint.com**

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit Covered/ Section	Course Content	Learning outcomes	Highest Bloom's Taxonomic Level of Transaction
I	**Introduction to IoT**		
1.1	Introduction	Define IoT	K1
1.2	Physical design of IoT	Summarize the physical design of IoT	K2
1.3	Logical design of IoT	Discuss the logical design of IoT	K6
1.4	IoT enabling technologies	Identify the technology of the IoT	K3
1.5	IoT levels and deployment templates	Discuss various levels in IoT	K6
II	**Domain specific IoT**		
2.1	Introduction	Recall the definition of IoT domains	K1
2.2	Home Automation	Identify the techniques in home automation	K2

2.3	Cities	Analyze the role of IoT in cities	K4
2.4	Environment	Discuss the applications of various environments	K4
2.5	Energy	Summarize the uses of energy in IoT	K3
2.6	Retail	Interpret the components of IoT in retail industry	K2
2.7	Logistics	Identify the fleet tracking in IoT	K3
2.8	Agriculture	Apply the concepts of IoT in agriculture	K3
2.9	Industry	Deduct the conditions for machine diagnosis	K1
2.10	Health and Lifestyle	Examine the importance of health and lifestyle devices	K6
III	**IoT and M2M**		
3.1	Introduction	Recall the machine interface in IoT	K1
3.2	M2M	Analyze the various M2M devices	K4
3.3	Difference between IoT and M2M	Distinguish IoT and M2M	K4
3.4	SDN and NFV for IoT	Choose the SDN and NFV for IoT devices	K6
	IoT System Management with NETCONF-YANG		
3.5	Need for IoT system management	Explain the need for IoT system management	K2
3.6	Simple Network Management Protocol	Elaborate on SNMP	K6
3.7	Network operator requirements	Discuss the requirements of network operator	K6
3.8	NETCONF	Illustrate operations of NETCONF	K2
3.9	YANG	Examine the features of YANG	K4
3.10	System management with NETCONF and YANG	Simplify the system management process using NETCONF and YANG	K4
IV	**IOT Platform Design Methodology**		
4.1	Purpose & Requirements	Define the Purpose and Requirements	K1
4.2	Purpose specification	Outline the Purpose Specification	K2
4.3	Domain model specification	Construct Domain model specification	K3
4.4	Information model specification	Develop Information model specification	K3
4.5	Service level specification	Determine Service Level specification	K5
4.6	Functional view specification	Explain functional view specification	K5
4.7	Operational view specification	Construct operational view specification	K6
4.8	Device & Component Integration	Compile Device & Component integration	K6

4.9	Application Development	Develop Application	K6
	Data Analytics for IoT		
4.10	Introduction	Outline the purpose of data analytics	K2
4.11	Apache Hadoop	Develop the data processing model using Apache Hadoop	K6
4.12	Using Apache Hadoop for batch data analysis	Critically examine the role of Apache Hadoop in batch data analysis	K6
4.13	Apache Oozie	Develop work flows for Apache Oozie	K6
4.14	Apache Spark	Explain the significance of "Stage Skipped" in *Apache Spark* web UI?	K2
4.15	Apache Storm	Design Apache Storm Architecture	K6
4.16	Using Apache Storm for Real-time Data Analysis	Explain how data is stream flow in Apache Storm.	K2
V	**IoT Physical devices and end points**		
5.1	IoT device	Define IoT device	K1
5.2	Raspberry Pi	Explain intelligence near the edge	K2
5.3	About the board	Build legacy devices	K6
5.4	Linux on Raspberry Pi	Develop the concepts of staying in the loop	K6
5.5	Raspberry Pi interfaces	Apply the concepts of IoT in agriculture	K3
5.6	Programming in Raspberry Pi with Python	Design home healthcare devices	K6
5.7	Other IoT devices	Explain efficient process control	K2
5.8	**Getting to Know the Arduino Uno**		
5.9	Discovering Other Arduino Boards	Design Arduino Boards	K6
5.10	Arduino Technical Details	Explain Arduino Technical Details	K2
5.11	Kitted Out: Starting with a Beginner's Kit	Develop application	K6
5.12	Preparing a Workspace	Create workspace	K6
5.13	Installing Arduino	Compile Arduino environment	K6
5.14	Surveying the Arduino Environment	Testing Arduino Environment	K6
5.15	Using Arduino Web Editor	Build Application using Arduino web editor	K6

4. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	M	L	-	M	-	M	H	L	M	M	-	L
CO2	M	H	M	H	M	H	M	L	L	H	H	M	L
CO3	H	M	M	L	H	L	-	M	L	H	L	L	L
CO4	H	M	H	M	H	M	M	H	M	H	H	M	-
CO5	H	H	M	H	M	H	M	L	H	M	M	L	L
CO6	M	H	M	H	L	M	H	M	M	H	L	H	M

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Seminar, Quiz.
4. Pre-Semester & End Semester Theory Examination

INDIRECT:

1. Course end survey (Feedback)

****

Core Practical VII: MACHINE LEARNING FOR DATA SCIENCE LAB

SEMESTER: IV   **CODE: P22CA4P7**
CREDITS: 3   **HOURS/WEEK: 4**

1. COURSE OUTCOMES
After the successful completion of this, course the students will be able to:

S.No.	Course Outcomes	Level	Exercise
CO1	Apply various operations in vectors, lists, matrices and arrays	K5	1,2
CO2	Evaluate the dataset	K6	3
CO3	Choose the visualization technique	K5	4,5,6
CO4	Predict the patterns using association rules	K5	7,8,10
CO5	Build models using logistic regression	K6	9
CO6	Test the performance of the developed model	K6	11

Ex. No.	Exercise
1	Vectors and List operations in R
2	Matrices and Array operations in R
3	Saving, loading and removing R datastructes
4	Visualizing numeric data – scatterplot, boxplot, piechart, histograms
5	Measuring the central tendency
6	Pre-processing methods
7	Build model using K-Nearest Neighbour
8	Construct model using Decision Trees
9	Develop a model using logistic regression
10	Identify patterns using Association Rules
11	Evaluation of models

B. TOPICS FOR SELF-STUDY:

S.No	Topics	Web Link
1	dplyr	**https://www.rdocumentation.org/packages/dplyr/versions/0.7.8**
2	Random Forest	**https://www.geeksforgeeks.org/random-forest-approach-in-r-programming/**
3	Dimensionality Reduction	**https://www.listendata.com/2015/06/simplest-dimensionality-reduction-with-r.html**

| 4 | Stochastic Gradient Descent | https://www.geeksforgeeks.org/ml-stochastic-gradient-descent-sgd/ |

2. SPECIFIC LEARNING OUTCOMES (SLO)

Ex.No.	Lab Exercises	Learning Outcomes	Highest Bloom's Taxonomic Level of Transaction
1	Vectors and List operations in R	Develop a R Program to list the data in vector	K6
2	Matrices and Array operations in R	Develop a R program to operate on matrices and arrays	K6
3	Saving, loading and removing R datastructes	Develop a R program to load and remove data in R data structures	K6
4	Visualizing numeric data – scatterplot, boxplot, pie chart, histograms	Develop a R program to visualize the data with different chart	K6
5	Measuring the central tendency	Develop a R program to measure the central tendency	K6
6	Pre-processing methods	Develop a R program to preprocessing stages	K6
7	Build model using K-Nearest Neighbour	Develop a R to model K-nearest neighbor	K6
8	Construct model using Decision Trees	Develop a R to construct model for Decision tree	K6
9	Develop a model using logistic regression	Develop a R to model for logistic regression	K6
10	Identify patterns using Association Rules	Develop a R to identify the pattern using association rule	K6
11	Evaluation of models	Develop a R program to evaluate the models	K6

3. MAPPING (CO, PO, PSO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	H	M	M	M	L	-	L	M	L	H	M	L
CO2	H	H	M	H	H	M	L	L	L	H	H	L	M
CO3	H	H	H	M	M	L	L	L	H	H	H	M	-
CO4	H	H	H	H	M	-	L	-	M	H	H	H	L
CO5	H	H	M	M	M	-	-	L	M	M	H	H	L
CO6	M	H	M	H	M	L	-	-	M	M	H	M	L

L-Low   M-Moderate   H- High

4. COURSE ASSESSMENT METHODS

DIRECT:

1. Continuous Assessment Test: T1, T2 (Practical Components): Closed Book
2. Assignment, Group Discussion, project Report, Seminar.
3. Pre/Post Test, Viva, Report for each Exercise.
4. Lab Model Examination & End Semester Practical Examination

INDIRECT:

1. Course end survey (Feedback)

****

SEMESTER:	CODE: PX2CAISA
CREDITS: 3	HOURS/WEEK: …

Course Objective:

The main objective of this course is to make the students to understand the basics of information retrieval to modelling query operations and indexing and also to understand various applications of information retrieval.

1. COURSE OUTCOMES

After the successful completion of this, course the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
1	Build an Information Retrieval system using the available tools.	K3	I
2	Explain and design the various components of an Information Retrieval system	K5	II
3	Compose an information retrieval system	K4	III
4	Adapt machine learning techniques to text classification and clustering which is used for efficient Information Retrieval	K6	IV
5	Design an efficient search engine and analyze the Web content structure	K6	V

2 A Syllabus

UNIT I: MOTIVATION

Basic Concepts – Practical Issues - Retrieval Process – Architecture - Boolean Retrieval – Retrieval Evaluation – Open Source IR Systems–History of Web Search – Web Characteristics– The impact of the web on IR —IR Versus Web Search–Components of a Search engine

UNIT II: MODELING

Taxonomy and Characterization of IR Models – Boolean Model – Vector Model - Term Weighting – Scoring and Ranking –Language Models – Set Theoretic Models - Probabilistic Models – Algebraic Models – Structured Text Retrieval Models – Models for Browsing

UNIT III: INDEXING

Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching-Sequential Searching and Pattern Matching. Query Operations -Query Languages– Query Processing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency

UNIT IV: CLASSIFICATION AND CLUSTERING

Text Classification and Naïve Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering – Matrix decompositions and latent semantic indexing – Fusion and Meta learning

UNIT V: SEARCHING THE WEB AND RETRIEVAL

Searching the Web –Structure of the Web –IR and web search – Static and Dynamic Ranking – Web Crawling and Indexing – Link Analysis - XML Retrieval Multimedia IR: Models and Languages – Indexing and Searching Parallel and Distributed IR – Digital Librarie.

Text Books:
1. Implementing andEvaluating Search Engines, The MIT Press, Cambridge, Massachusetts London, England, First Edition2010.
2. Ricardo Baeza – Yates, BerthierRibeiro – Neto, ―Modern Information Retrieval: The concepts and Technology behind Search‖ (ACM Press Books), Second Edition, 2011.
3. David A. Grossman, Ophir Frieder, "Information Retrieval: Algorithms and Heuristics", Springer, 2nd Edition, 2004.

References Books:
1. Bruce Croft, Donald Metzler,Trevor Strohman, "Search Engines: Information Retrieval in Practice", Pearson, 2009.
2. Manning D. Christopher, Raghavan Prabhakar & Schutz Hinrich, " Introduction to Information Retrieval", Cambridge University Press, Online Edition,2009.
3. Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, ―Information Retrieval: Implementing and Evaluating Search Engines (The MIT Press), Illustrated Edition, 2016.

Self-Study: SOCIAL NETWORK ANALYTICS

SEMESTER: **CODE**: PX2CAISB
CREDITS: 3   **HOURS/WEEK: …**

Course Objective:
The main objective of this course is to make the students to gain knowledge about social network and its data sources and to analyse the data left behind in social networks with data visualization.

1. COURSE OUTCOMES
After the successful completion of this, course the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
1	Model and represent knowledge for social semantic Web.	K3	I
2	Choose appropriate extraction and mining tools for analyzing Social networks	K6	II
3	Create entities and relationships of data as network and do analysis	K6	III
4	Categorize data from various social media resources and analyze.	K4	IV
5	Develop personalized visualization for Social networks.	K6	V

2 A Syllabus

UNIT I: INTRODUCTION TO SEMANTIC WEB
The development of Semantic Web – Emergence of the Social Web – The Development of Social Network Analysis – Basic Graph Theoretical Concepts of Social Network Analysis – Electronic Sources for Network Analysis – Electronic Discussion Networks, Blogs and Online Communities

UNIT II : KNOWLEDGE REPRESENTATION ON THE SEMANTIC WEB
Semantic Web: RDF and OWL

UNIT III : SOCIAL NETWORK MINING
Detecting Communities in Social Network – Evaluating Communities –Methods for Community Detection – Applications of Community Mining Algorithms – Tools for detecting communities – Application: Mining Facebook

UNIT IV: COMMUNITY MAINTAINED SOCIAL MEDIA RESOURCES
Community Maintained Resources – Supporting technologies for community maintained resources– User motivations-Location based social interaction – location technology– mobile location sharing – Automated recommender system

UNIT V: VISUALIZATION OF SOCIAL NETWORKS
Visualization of Social Networks - Node-Edge Diagrams – Random Layout – Force-Directed Layout – Tree Layout – Matrix Representations –Matrix and Node-Link Diagrams– Visualizing Online Social Networks.

Text Books:
1. Matthew A. Russell,"Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, Google+, Githuband more", O'REILLY, Third Edition, 2018.
2. CharuAggarwal, "Social Network Data Analytics," Springer, First Edition, 2014
3. Jennifer Golbeck, "Analyzing the social web", Waltham, MA: Morgan Kaufmann (Elsevier), First Edition, 2013.

Reference Books:
1. BorkoFurht, "Handbook of Social Network Technologies and Applications", Springer, First Edition, 2010
2. Peter Mika, "Social Networks and the Semantic Web", Springer, First Edition, 2007

Self-Study: PRINCIPLES OF MULTI MEDIA

SEMESTER: **CODE**: PX2CAISC
CREDITS: 3   **HOURS/WEEK: …**

Course Objective:
The main objective of this course is to make the students to develop multimedia skills in respect to many application including business, schools, home, education and virtual reality and also to learn the cost involved in multimedia planning, designing and producing.

1. COURSE OUTCOMES
After the successful completion of this, course the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
1	Explain the fundamentals of multimedia	K2	I
2	Identify the various techniques in audio, video and graphics	K3	II
3	Choose appropriate tools to design, development and creation of digital media artifacts	K6	III
4	Create narrative environments, stories and characters associated with games	K6	IV
5	Adapt the principles of video game design and analyze the issues in game creation	K6	V

2 A Syllabus

UNIT-I: MULTIMEDIA-AN OVERVIEW
Introduction- Multimedia Presentation and Production- Characteristics of a Multimedia Presentation- Uses of Multimedia- Analog and Digital Representations- Digitization- Text-Introduction-Types of texts-Unicode standards-Font-Insertion of Text-Text compression-Text file format. Images-Image Data Representation-Image Acquisition-Image Processing-Binary Image Processing-Grayscale Image Processing-Image Processing Software

UNIT-II: GRAPHICS, AUDIO AND VIDEO
Introduction- Advantages of Graphics- Uses of Graphics- Components of a Graphics System- 2D Coordinate Systems- 2D Modeling- 3D Transformations- Projection- 3D Modeling- 3D Surface Characteristics and Lights- Audio- Introduction- Acoustics- Sound Waves-Types and Properties of Sounds- Musical Instrument Digital Interface- Digital Audio Processing- Audio-Processing Software- Video- Introduction- Motion Video- Analog Video Camera- Digital Video- Video Recording and Storage Formats- Video-Processing Software

UNIT-III: ANIMATION
Historical Background-Uses of Animation-Traditional Animation-Principles of Animation-Computer based Animation-Animation on the Web-3D Animation-Rendering Algorithm-Animation file formats-Animation software.

UNIT-IV: MULTIMEDIA ARCHITECTURE
Introduction-User Interface-OS multimedia support-Multimedia support- Multimedia Extensions-Hardware support-Distributed multimedia Applications-Real time protocols-What is multimedia database-Content-based storage and retrieval- Designing a basic Multimedia Database-Audio and Video Features-classification of Data .Multimedia Document-Introduction-Document and Document Architecture-Hypermedia concepts and design-Digital rights and Library.

UNIT-V: VIRTUAL REALITY

Introduction-Forms of Virtual reality-AR Applications-Software requirements-Peripheral Devices-Virtual reality modelling Language

Text BookS;

1. Ranjan Parekh, "Principles of Multimedia" Tata McGraw Hill Education Private Limited,2nd Edition 2013
2. Tay Vaughan - 1999– Multimedia: Making it work – Fourth Edition – Tata McGraw – Hill Edition.

References Books:

1. Walterworth john A– 1991- Multimedia Technologies and Application - Ellis Horwood Ltd. – London.
2. John F koegel Buford – Multimedia Systems – Addison Wesley – First Indian Reprint.

SEMESTER: **CODE**: PX2CAISD
CREDITS: 3   **HOURS/WEEK: …**

Course Objective:
The main objective of this course is to make the students to understand quality management processes, distinguish between the various activities of quality assurance, quality planning and quality control.

1. COURSE OUTCOMES
After the successful completion of this, course the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
1	Explain the various models and measurement in software quality metrics	K2	I
2	Explain the quality task and documentation	K5	II
3	Discuss on tools for quality and models for quality assessment	K6	III
4	Analyze customer satisfaction	K5	IV
5	Explain the origins and rationale behind the ISO 9000 standards.	K5	V

2 A Syllabus

UNIT I: INTRODUCTION TO SOFTWARE QUALITY
Software Quality – Hierarchical models of Boehm and McCall – Quality measurement – Metrics measurement and analysis – Gilb's approach – GQM

UNIT II: SOFTWARE QUALITY ASSURANCE
Quality tasks – SQA plan – Teams – Characteristics – Implementation – Documentation – Reviews and Audits

UNIT III: QUALITY CONTROL AND RELIABILITY
Tools for Quality – Ishikawa's basic tools – CASE tools – Defect prevention and removal – Reliability models – Rayleigh model – Reliability growth models for quality assessment

UNIT IV: QUALITY MANAGEMENT SYSTEM
Elements of QMS – Rayleigh model framework – Reliability Growth models for QMS – Complexity metrics and models – Customer satisfaction analysis.

UNIT V: QUALITY STANDARDS
Need for standards – ISO 9000 Series – ISO 9000-3 for software development – CMM and CMMI – Six Sigma concepts.

Text Book:
1. Allan C. Gillies, "Software Quality: Theory and Management", Thomson Learning, 2003. (2. Stephen H. Kan, "Metrics and Models in Software Quality Engineering", Pearson Education (Singapore) Pte Ltd., 2002.

References Books:
1. Norman E. Fenton and Shari Lawrence Pfleeger, "Software Metrics" Thomson, 2003
2. Mordechai Ben – Menachem and Garry S.Marliss, "Software Quality", Thomson Asia Pte Ltd, 2003.

Self-Study: DEEP LEARNING

SEMESTER: **CODE**: PX2CAISE
CREDITS: 3   **HOURS/WEEK: …**

Course Objective:
The main objective of this course is to make the students to learn the fundamentals of deep learning, and the main research activities in this field. Moreover, students will learn to implement, train, and validate their own neural network, and they will improve their understanding of the on-going progress in computer vision and multimedia field.

1. COURSE OUTCOMES
After the successful completion of this, course the students will be able to:

S.No.	Course Outcomes	Level	Unit Covered
1	Identify the basics of neural networks	K3	I
2	Examine the algorithms in deep learning	K5	II
3	Analyze the different layers in convolution neural networks	K5	III
4	Determine the architectures in deep learning	K5	IV
5	Adapt various deep learning applications	K6	V

2 A Syllabus

UNIT I: BASICS OF NEURAL NETWORKS
Basic concept of Neurons – Perceptron Algorithm – Feed Forward and Back Propagation Networks

UNIT II: INTRODUCTION TO DEEP LEARNING
Feed Forward Neural Networks – Gradient Descent – Back Propagation Algorithm – Vanishing Gradient problem – Mitigation – RelU Heuristics for Avoiding Bad Local Minima – Heuristics for Faster Training – Nestors Accelerated Gradient Descent – Regularization – Dropout

UNIT III: CONVOLUTIONAL NEURAL NETWORKS
CNN Architectures – Convolution – Pooling Layers – Transfer Learning – Image Classification using Transfer Learning

UNIT IV: MORE DEEP LEARNING ARCHITECTURES
LSTM, GRU, Encoder/Decoder Architectures – Autoencoders – Standard- Sparse – Denoising – Contractive- Variational Autoencoders – Adversarial Generative Networks – Autoencoder and DBM

UNIT V: APPLICATIONS OF DEEP LEARNING
Image Segmentation – Object Detection – Automatic Image Captioning – Image generation with Generative Adversarial Networks – Video to Text with LSTM Models – Attention Models for Computer Vision – Case Study: Named Entity Recognition – Opinion Mining using Recurrent Neural Networks – Parsing and Sentiment Analysis using Recursive Neural Networks – Sentence Classification using Convolutional Neural Networks – Dialogue Generation with LSTMs.

Text Books:
1. Ian Good Fellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2017.
2. Amlan Chakrabarti Amit Kumar Das, Saptarsi Goswami, Pabitra Mitra," Deep Learning", Pearson, June 2021
3. Phil Kim, "Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence", Apress , 2017.

References Books:
1. Francois Chollet, "Deep Learning with Python", Manning Publications, 2018.
2. Ragav Venkatesan, Baoxin Li, "Convolutional Neural Networks in Visual Computing", CRC Press, 2018.
3. Navin Kumar Manaswi, "Deep Learning with Applications Using Python", Apress, 2018.