ACADEMIC CURRICULA

POSTGRADUATE DEGREE PROGRAMME

MASTER OF COMPUTER APPLICATIONS

(M.C.A)

Two Years(Full-Time)

Learning Outcome Based Education

Choice Based Flexible Credit System

Academic Year

2020 - 2021

SRM INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University u/s 3 of UGC Act, 1956)

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

(Deemed to be University u/s 3 of UGC Act, 1956)

Kattankulathur, Chengalpattu District 603203, Tamil Nadu, India

// This page is intentionally left blank

DEPARTMENT OF COMPUTER APPLICATIONS

1. Department Vision Statement	
Stmt - 1	*Creating the most conducive environment for imparting quality education in Computer Applications*
Stmt - 2	*Contributing effectively to produce globally competent quality professionals in the field of IT*
Stmt - 3	*Contributing towards preparing young minds to serve community*

2. Department Mission Statement	
Stmt - 1	*Impart student's essential knowledge and skills required for a successful career in Information Technology*
Stmt - 2	*Instill confidence in the students to take up new challenges by grooming them appropriately*
Stmt - 3	*Inculcate in the students a sense of commitment to professional ethics, moral values with emphasis on team work and leadership qualities*
Stmt - 4	*Instill the students with a clear awareness of environmental issues and their relevance to their profession*
Stmt - 5	*Impress upon the students the impact of their work on the nation's economic and social progress*

3. Program Education Objectives (PEO)	
PEO - 1	*Offer the students those skill sets and domain knowledge based on needs of IT and dynamic business environment*
PEO - 2	*Provide the students with the capabilities in the areas of analysis, design, development and testing*
PEO - 3	*Kindle the minds of students to take up research and development in Computer Applications with missionary zeal*
PEO - 4	*Train the students to become effective communicators in professional as well as general aspects of life*
PEO - 5	*Prepare the students into balanced individuals who are keen to leave a mark by excelling in their profession*

4. Consistency of PEO's with Mission of the Department

	Mission Stmt. - 1	Mission Stmt. - 2	Mission Stmt. - 3	Mission Stmt. - 4	Mission Stmt. - 5
PEO - 1	H	H	M	H	M
PEO - 2	H	M	H	H	H
PEO - 3	M	H	M	H	H
PEO - 4	H	H	H	L	M
PEO - 5	L	H	M	H	H

H – High Correlation, M – Medium Correlation, L – Low Correlation

5. Consistency of PEO's with Program Learning Outcomes (PLO)

	Program Learning Outcomes (PLO)														
	1. Disciplinary Knowledge	2. Critical Thinking	3. Problem Solving	4. Analytical Reasoning	5. Research Skills	6. Team Work	7. Scientific Reasoning	8. Reflective Thinking	9. Self-Directed Learning	10. Multicultural Competence	11. Ethical Reasoning	12. Community Engagement	13. ICT Skills	14. Leadership Skills	15. Life Long Learning
PEO - 1	H	H	H	H	H	L	M	L	M	M	H	H	M	H	H
PEO - 2	H	H	H	H	H	L	M	L	M	H	M	M	H	H	M
PEO - 3	H	H	H	H	H	M	H	M	M	M	H	H	H	M	M
PEO - 4	H	M	M	H	H	H	M	H	H	H	H	L	M	M	H
PEO - 5	M	M	H	H	M	H	M	H	H	H	M	M	H	M	M

H – High Correlation, M – Medium Correlation, L – Low Correlation

6. M.C.A Programme Structure (Total Credits:80)

1. Professional Core Courses (C)
(7 Courses)

Course Code	Course Title	Hours/ Week			
		L	T	P	C
PCA20C01J	Programming Using Java	3	0	2	4
PCA20C02J	Operating System	3	0	2	4
PCA20C03J	Database Technology	3	0	2	4
PCA20C04J	Python Programming	3	0	2	4
PCA20C05J	Computer Networks	3	0	2	4
PCA20C06T	Optimization Techniques	4	0	0	4
PCA20C07J	Object Oriented Analysis and Design	3	0	2	4
Total Learning Credits					**28**

2. Discipline Elective Courses (D)
(3 Courses)

Course Code	Course Title	Hours/ Week			
		L	T	P	C
PCA20D01J	Advanced Web Application Development	3	0	2	4
PCA20D02J	Cyber Security				
PCA20D03J	Software Engineering				
PCA20D04J	Android Applications Development	3	0	2	4
PCA20D05J	Programming using C#				
PCA20D06J	Software Testing				
PCA20D07J	Artificial Intelligence and Machine Learning	3	0	2	4
PCA20D08J	Cloud Computing				
PCA20D09J	Internet of Things (IoT)				
Total Learning Credits					**12**

3. Generic Elective Courses (G)
(Any 1 Course)

Course Code	Course Title	Hours/ Week			
		L	T	P	C
PCA20G01T	Software Project Management	3	0	0	3
PCA20G02T	Data Warehouse and Data Mining				
PCA20G03T	Organizational Behavior and Professional Ethics				
PCA20G04T	Social Network Analysis				
Total Learning Credits					**3**

4. Skill Enhancement Courses(S)
(2 Courses)

Course Code	Course Title	Hours/ Week			
		L	T	P	C
PCA20S01J	IT Infrastructure Management	3	0	2	4
PCA20S02J	Data Analysis Using R	0	3	2	4
Total Learning Credits					**8**

5. Project Work, Internship In Industry / Higher Technical Institutions(P)

Course Code	Course Title	Hours/ Week			
		L	T	P	C
PCA20P01L	Internship	-	-	-	2
PCA20P02L	Mini Project Work	0	0	12	6
PCA20P03L	Project Work	0	0	24	12
Total Learning Credits					20

6. Ability Enhancement Courses (AE)
(3 Courses)

Course Code	Course Title	Hours/ Week			
		L	T	P	C
PCA20AE1T	Career Advancement– I	3	0	0	**3**
PCA20AE2T	Career Advancement - II	3	0	0	**3**
PCA20AE3T	Career Advancement– III	3	0	0	**3**
Total Learning Credits					**9**

Course Structure								
Semester	**Professional Core Courses (PCC)**	**Discipline Electives Courses (DEC)**	**Generic Electives Courses (GEC)**	**Skill Enhancement Courses (SEC)**	**Ability Enhancement Courses (AEC)**	**Project Work, Internship (P)**	**Total Credits**	**Total Hours**
Sem I	PCC-1(4) PCC-2 (4) PCC-3(4)	DEC-1 (4)		SEC 1 (4)	AEC 1 (3)		**23**	**30**
Sem II	PCC-4 (4) PCC-5 (4) PCC-6 (4)	DEC-2 (4)-		SEC 2 (4)	AEC 2 (3)		**23**	**30**
Sem III	PCC-7 (4)	DEC-3(4)	GEC-(3)		AEC 3 (3)	P (2) P (6)	**22**	**30**
Sem IV						P (12)	**12**	**30**
Total Credits	**28**	**12**	**3**	**8**	**9**	**19**	**80**	**120**

7. Implementation Plan

Semester - I

Course Code	Course Title	Hours/ Week			C
		L	T	P	
PCA20C01J	Programming Using Java	3	0	2	4
PCA20C02J	Operating System	3	0	2	4
PCA20C03J	Database Technology	3	0	2	4
PCA20D01J	Advanced Web Application Development	3	0	2	4
PCA20D02J	Cyber Security				
PCA20D03J	Software Engineering				
PCA20S01J	IT Infrastructure Management	3	0	2	4
PCA20AE1T	Career Advancement– I	3	0	0	3
Total Learning Credits					23

Semester - II

Course Code	Course Title	Hours/ Week			C
		L	T	P	
PCA20C04J	Python Programming	3	0	2	4
PCA20C05J	Computer Networks	3	0	2	4
PCA20C06T	Optimization Techniques	4	0	0	4
PCA20D04J	Android Applications Development	3	0	2	4
PCA20D05J	Programming using C#				
PCA20D06J	Software Testing				
PCA20S02J	Data Analysis Using R	0	3	2	4
PCA20AE2T	Career Advancement– II	3	0	0	3
Total Learning Credits					23

Semester – III

Course Code	Course Title	Hours/ Week			C
		L	T	P	
PCA20C07J	Object Oriented Analysis and Design	3	0	2	4
PCA20D07J	Artificial Intelligence and Machine Learning	3	0	2	4
PCA20D08J	Cloud Computing				
PCA20D09J	Internet of Things (IoT)				
PCA20P01L	Internship	-	-	-	2
PCA20P02L	Mini Project Work	0	0	12	6
PCA20G01T	Software Project Management	3	0	0	3
PCA20G02T	Data Warehouse and Data Mining				
PCA20G03T	Organizational Behavior and Professional Ethics				
PCA20G04T	Social Network Analysis				
PCA20AE3T	Career Advancement– III	3	0	0	3
Total Learning Credits					22

Semester - IV

Course Code	Course Title	Hours/ Week			C
		L	T	P	
PCA20P03L	Project Work	0	0	24	12
Total Learning Credits					12

Total Learning Credits :80

8. Program Articulation Matrix

Course Code	Course Name	Programme Learning Outcomes														
		Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
PCA20C01J	*Programming Using Java*	H	H	H	H	H	L	M	L	M	M	H	H	M	H	H
PCA20C02J	*Operating System*	H	H	H	H	H	L	M	L	M	H	M	M	H	H	M
PCA20C03J	*Database Technology*	H	H	H	H	H	M	H	M	M	M	H	H	H	M	M
PCA20C04J	*Python Programming*	H	M	M	H	H	H	M	H	H	H	H	L	M	M	H
PCA20C05J	*Computer Networks*	M	M	H	H	M	H	M	H	H	H	M	M	H	M	M
PCA20C06T	*Optimization Techniques*	H	H	H	H	H	L	M	L	M	M	H	H	M	H	H
PCA20C07J	*Object Oriented Analysis and Design*	H	H	H	H	H	L	M	L	M	H	M	M	H	H	M
PCA20D01J	*Advanced Web Application Development*	H	H	H	H	H	M	H	M	M	M	H	H	H	M	M
PCA20D02J	*Cyber Security*	H	M	M	H	H	H	M	H	H	H	H	L	M	M	H
PCA20D03J	*Software Engineering*	H	M	M	H	H	H	M	H	H	H	H	L	M	M	H
PCA20D04J	*Android Applications Development*	H	H	H	H	H	L	M	L	M	M	H	H	M	H	H
PCA20D05J	*Programming using C#*	H	H	H	H	H	L	M	L	M	H	M	M	H	H	M
PCA20D06J	*Software Testing*	H	H	H	H	H	M	H	M	M	M	H	H	H	M	M
PCA20D07J	*Artificial Intelligence and Machine Learning*	H	M	M	H	H	H	M	H	H	H	H	L	M	M	H
PCA20D08J	*Cloud Computing*	M	M	H	H	M	H	M	H	H	H	M	M	H	M	M
PCA20D09J	*Internet of Things (IoT)*	H	H	H	H	H	L	M	L	M	M	H	H	M	H	H
PCA20S01J	*IT Infrastructure Management*	H	H	H	H	H	L	M	L	M	H	M	M	H	H	M
PCA20S02J	*Data Analysis Using R*	H	H	H	H	H	M	H	M	M	M	H	H	H	M	M
PCA20G01T	*Software Project Management*	M	M	H	H	M	H	M	H	H	H	M	M	H	M	M
PCA20G02T	*Data Warehouse and Data Mining*	M	M	H	H	M	H	M	H	H	H	M	M	H	M	M
PCA20G03T	*Organizational Behavior and Professional Ethics*	H	H	H	H	H	L	M	L	M	M	H	H	M	H	H
PCA20G04T	*Social Network Analysis*	H	H	H	H	H	L	M	L	M	H	M	M	H	H	M
PCA20P01L	*Internship*	H	H	H	H	H	M	H	M	M	M	H	H	H	M	M
PCA20P02L	*Mini Project Work*	M	M	H	H	M	H	M	H	H	H	M	M	H	M	M
PCA20P03L	*Project Work*	H	H	H	H	H	L	M	L	M	M	M	H	M	H	H
PCA20AE1T	*Career Advancement– I*	H	H	H	H	H	M	H	M	M	M	H	H	H	M	M
PCA20AE2T	*Career Advancement - II*	H	M	M	H	H	H	M	H	H	H	H	L	M	M	H
PCA20AE3T	*Career Advancement– III*	M	M	H	H	M	H	M	H	H	H	M	M	H	M	M
	Program Average	H	H	H	H	H	L	M	L	M	H	M	M	H	H	M

H – High Correlation, M – Medium Correlation, L – Low Correlation

SEMESTER – I

Course Code	PCA20C01J	Course Name	PROGRAMMING USING JAVA	Course Category	C	Professional Core Course	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	*An overview of Java and Buzz words*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLR-2 :	*Understand the object oriented features in Java*																		
CLR-3 :	*Create and understand the Java program structure*																		
CLR-4 :	*Understand the Java packages and Interfaces*																		
CLR-5 :	*Use the multithreading programming scenario*																		
CLR-6 :	*Create applet and use AWT tools*																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	*Understand the difference between C++ and Java*	2	85	80	H	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-2 :	*Develop Java program using JVM*	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-3 :	*Use the various kinds of packages and interfaces*	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-4 :	*Apply the Exception handling methods in Java program.*	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-5 :	*Identify applet and application programming*	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-6 :	*Understand the Java I/O classes and collections interfaces.*	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	*The Genesis of Java*	*Introducing classes- Class fundamentals- Declaring Objects*	*Inheritance Basics*	*Introduction to Java Thread model*	*Introduction to Event Handling - Understanding ActionEvent & ItemEvent*
	SLO-2	*How java changed the internet- Java's magic: Byte Code*	*Assigning object Reference variables- Introducing method*	*Understanding Types of Inheritance: Single, Multilevel, Hierarchical Inheritance*	*Creating a Thread by Extending Thread Class*	*Understanding KeyEvent & MouseEvent*
S-2	SLO-1	*Introduction to Java Buzzword- Understanding Java Buzzwords*	*What are Constructors? What are the Characteristics of constructors?*	*How does java support multiple inheritance? - using Super keyword*	*Creating a Thread by implementing Runnable Interface.*	*TextEvent,WindowEvent,ComponentEvent- Introduction to Event Listener Interfaces*

	SLO-2	*Simple, Object Oriented, Robust, Multithreaded, Architecture*	*Understanding Types of Constructors -Using this Keyword*	*What is Method Overriding?*	*Thread Class*	*Working with ActionListener &, AdjustmentListener*
S-3	SLO-1	*Neutral, Interpreted and high performance, Distributed, Dynamic*	*Introduction to Garbage Collection*	*Understanding Dynamic method dispatch - Introduction to Abstract keyword*	*Creating multiple threads*	*Working with ContainerListener, ItemListener, ComponentListener*
	SLO-2	*Evolution of Java*	*Using Finalize() method*	*Working with Abstract class and Method & Using final with inheritance*	*Assigning Thread priorities*	*Working with KeyListener & MouseListener*
S-4 to S-5	SLO-1	***Lab1: Learning to work with Java IDE and Writing Simple Conversion Programs***	***Lab 4: Classes and Objects***	***Lab 7: Inheritance, Method Overriding, Abstract classes and methods***	***Lab 10: Multithreading***	***Lab 13: Event Handling***
S - 6	SLO-1	*Introduction to Object Oriented Concepts of Java*	*Overloading methods- Overloading constructors*	*Introduction to Package - Creating a Package*	*Applying Synchronization- Inter-thread communication*	*Introduction AWT Controls - Working with Label controls*
	SLO-2	*Understanding Encapsulation, Polymorphism, Inheritance*	*Using objects as parameters- Argument Passing*	*Understanding Access Protection- Importing packages*	*Introduction to Legacy Classes- Working with Vector class*	*Working with Buttons controls- Working with CheckBoxes*
S-7	SLO-1	*Introduction to Lexical Issues of Java*	*Returning Objects-*	*Introduction to Interfaces- Defining an interface*	*Examples using Vector class*	*Working with CheckBoxGroup controls*
	SLO-2	*Understanding Whitespaces, Identifiers,Literals Comments, Separators, Keywords*	*Recursion*	*Implementing Interfaces*	*Understanding Stack class*	*Working with Choice controls controls*
S-8	SLO-1	*Introduction to Data types of Java, Understanding byte,short,int,long, float,double,chars,boolean*	*Introducing Access Control*	*How Interfaces are extended?*	*Examples using Stack class - Introduction to Legacy Interfaces*	*Working with Lists controls*
	SLO-2	*What is variable?, Declaring a variable, dynamic initialization of variables, Scope and lifetime of variables*	*Understanding Static variables and methods*	*What is Exception?*	*Understanding Enumeration Interface- Examples using Enumeration interface*	*Working with TextField controls*
S-9 to S-10	***SLO-1***	***Lab2: Operators***	***Lab 5: Overloading Methods and Constructors, finalize() method***	***Lab 8: Packages and Interfaces***	***Lab 11: Legacy Classes and Interfaces***	***Lab 14: AWT Controls***
S-11	SLO-1	*Introduction to Operators,*	*Understanding Final variables and methods*	*Understanding Exception Types- Introduction to Exception handling*	*Introduction to Utility classes*	*Introduction to Layout Manager- Understanding Flow Layout*
	SLO-2	*Working with Arithmetic, Relational, Logical, Bitwise, Conditional, Assignment operators*	*Working with Nested Class*	*Working with try and catch*	*Working with StringTokenizer*	*Understanding Border Layout- Understanding Grid Layout*

S-12	SLO-1	*What is Array?, Initialization of Arrays, Understanding Types of Arrays*	*Understanding Inner Class*	*Using multiple catch clauses*	*Working with Date class- Working with Calendar*	*Introduction to I/O Streams*
	SLO-2	*Introduction to Control Statements - Working with Selection Statements- All forms of if & Switch*	*Introduction to String Class*	*Working with Finally, Throw and throws*	*Working with GregorianCalendar- Working with Random Class*	*Byte Streams classes*
S-13	SLO-1	*Introduction to Iterative Statements, Working with while, do-while, for, for each statements*	*Working with String Handling Methods*	*Understanding Built-in Exceptions*	*Working with Scanner Class*	*Character Streams classes*
	SLO-2	*Introduction to Jump Statements- Working with break, continue and return statements*	*Command Line arguments*	*Creating user defined Exceptions*	*Examples using utility classes*	*Examples using Byte and Character Streams*
S-14 to S-15	SLO-1	***Lab 3: Arrays, Control Statements***	***Lab 6: String Class, Command Line Arguments***	***Lab 9: Exception Handling***	***Lab 12: Utility Classes***	***Lab 15: Layout Managers, Byte and Character Streams***

Learning Resources	1. Herbert Schildt (2007), Java: The Complete Reference, Tata McGraw-Hill, Seventh Edition, New Delhi.	1. Horstmann S., Gray Cornell (2001), Core Java 2 Volume In, Fundamentals, Addition Wesley, New York. 2. Amold and Gosling, J. (2000), The Java Programming Language, Addition Wesley, 2nd Edition, New Delhi. 3. Art Gittleman (2002), Ultimate Java Programming, Wiley Publications, New York.

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	20%	20%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	10%	10%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**

Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	*Dr.S.Gopinathan, Professor, University of Madras, Chennai*	*1. Dr. Agusthiyar Ramu SRMIST*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		*2. Dr.S.Albert Antony Raj, SRMIST*

Course Code	*PCA20C02J*	Course Name	OPERATING SYSTEM	Course Category	C	Professional Core Course	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,
CLR-1 :	*Introduce the key role of an Operating system*
CLR-2 :	*Insist the Process Management functions of an Operating system*
CLR-3 :	*Emphasize the importance of Memory Management concepts of an Operating system*
CLR-4 :	*Realize the significance of Device Management part of an Operating system*
CLR-5 :	*Comprehend the need of File Management functions of an Operating system*
CLR-6 :	*Explore the services offered by the Operating system practically*

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLO-1 :	*Identify the need of an Operating system*	2	85	80	H	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-2 :	*Know the Process management functions of an Operating system*	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-3 :	*Understand the need of Memory Management functions of an Operating system*	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-4 :	*Find the significance of Device management role of an Operating system*	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-5 :	*Recognize the essentials of File Management part of an Operating system*	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-6 :	*Gain an insight of Importance of an Operating system through practical*	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	*Operating System Objectives and functions- Gaining the role of Operating systems*	*Overview of Process scheduling- Understand the process concepts*	*PROCESS SYNCHRONIZATION: Background, Critical section Problem*	*MEMORY MANAGEMENT: Memory Management: Logical Vs Physical address space, Swapping*	*STORAGE MANAGEMENT : Mass storage structure – Overview of Mass storage structure – Magnetic Disks*
	SLO-2	*The evolution of operating system*	*Operations on Process – Process creation, Process termination*	*Understanding the race conditions and the need for the Process synchronization*	*Understanding the basics of Memory management*	*Understanding the Basics in storage management*

S-2	SLO-1	*Understanding the evolution of Operating systems from early batch processing systems to modern complex systems*	*Understanding the system calls – fork(),wait(),exit()*	*PROCESS SYNCHRONIZATION : Peterson's solution, Synchronization hardware*	*Contiguous Memory allocation – Fixed and Dynamic partition*	*FILE SYSTEM INTERFACE: File concept, File access methods*
	SLO-2	*Architecture of OS*	*Inter process communication*	*Understanding the two-process solution and the benefits of the synchronization hardware*	*Getting to know about Partition memory management and issues: Internal fragmentation and external fragmentation problems*	*Understanding the file basics*
S-3	SLO-1	*Understanding the architecture*	*Thread*	*Process synchronization: Semaphores, usage, implementation*	*Paged memory management*	*File sharing and Protection*
	SLO-2	*Operating system operations-*	*Understanding the importance of thread*	*Gaining the knowledge of the usage of the semaphores for the Mutual exclusion mechanisms*	*Understanding the Paging technique. PMT hardware mechanism*	*Emphasis the need for the file sharing and its protection- FILE SYSTEM IMPLEMENTATION: : File system structure*
S-4 to S-5	**SLO-1**	***Lab 1 : Understanding the booting process of Linux***	***Lab 4 : Understanding various phases of compilation and System admin commands – Simple task automations***	***Lab 7: Shell Programs – Basic level***	***Lab 10: Programs using file system***	***Lab13:Program to implement file system interface***
S - 6	SLO-1	*Real time understanding of operations*	*Inter process communication - Learn the thread concepts*	*Classical Problems of synchronization – Readers writers problem, Bounded Buffer problem- Good understanding of synchronization mechanisms*	*Segmented memory management -Understanding the users view of memory with respect to the primary memory*	*To get the basic file system structure- Directory Implementation*
S-7	SLO-1	*Operating system services*	*Inter Process communication : Shared memory*	*Classical Problems of synchronization - Dining Philosophers problem (Monitor)*	*Paged segmentation Technique*	*Understanding the various levels of directory structure*
	SLO-2	*Learning of services*	*Understanding the need for IPC*	*Understanding the synchronization of limited resources among multiple processes*	*Understanding the users view of memory with respect to the primary memory*	*FILE SYSTEM IMPLEMENTATION :Free space Management*
S-8	SLO-1	*System calls*	*message passing, Pipe()*	*DEADLOCKS: Necessary conditions, Resource allocation graph, Deadlock prevention methods-*	*VIRTUAL MEMORY – Basic concepts – age fault handling*	*Understanding the methods available for maintaining the free spaces in the disk*
	SLO-2	*Examples*	*Understand the message passing, Pipe()*	*Understanding the deadlock scenario -Deadlocks : Deadlock Avoidance*	*Understanding , how an OS handles the page faults- Performance of Demand paging*	*FILE SYSTEM IMPLEMENTATION*

S-9 to S-10	**SLO-1**	***Lab 2:understand the behavior of the OS and get the CPU type and model***	***Lab 5: System admin commands – Basics***	***Lab 8:Process Creation and Overlay concept***	***Lab 11: Programs to implement shared memory***	***Lab14: Understand the basic methods of free space management***
S-11	SLO-1	*Types*	*CPU Scheduling: Round robin, Multilevel queue Scheduling, Multilevel feedback Scheduling*	*Detection and Recovery*	*Understanding the relationship of effective access time and the page fault rate*	*Allocation methods*
	SLO-2	*Understanding of different types*	*Understanding the scheduling techniques*	*Understanding the deadlock avoidance, detection and recovery mechanisms*	*Thrashing*	*Understanding the pros and Cons of various disk allocation methods*
S-12	SLO-1	*System programs*	*Real Time scheduling: Rate Monotonic Scheduling and Deadline Scheduling and Deadline Scheduling*	*Deadlocks characterization*	*,Causes of Thrashing*	*FILE SYSTEM IMPLEMENTATION :Free*
	SLO-2	*Learn with examples*	*Understanding the real time scheduling*	*Understand the characterization*	*Understanding the Thrashing*	*Understanding the methods available for maintaining the free spaces in the disk*
S13	SLO-1	*System Design and implementation*	*Scheduling Algorithms, Multiprocessor Scheduling*	*Deadlock detection and Recovery*	*Working set Model*	*Disk Scheduling algorithms*
	SLO-2	*Implementation with design process*	*Understand the scheduling criteria and algorithms*	*Killing the process and resource preemption*	*Understanding the working set model for controlling the Working set model*	*Scheduling Algorithms*
S-14 to S-15	**SLO-1**	***Lab 3: Understanding the Linux file system***	***Lab 6 : Linux commands***	***Lab 9: File system and working with test programs***	***Lab 12: understand the paging operations***	***Lab15:programs to implement the various CPU Scheduling Algorithms***

Learning Resources	*1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating systems, 9th ed., John Wiley & Sons, 2013*	*3. Andrew S.Tanenbaum, Herbert Bos, Modern Operating systems, 4thed., Pearson, 2015*
	2. William Stallings, Operating Systems-Internals and Design Principles, 7th ed., Prentice Hall, 2012	*4. Bryant O'Hallaxn, Computer systems- A Programmer's Perspective,Pearson, 2015*

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	20%	20%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	10%	10%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	*Dr.S.Gopinathan, Professor, University of Madras, Chennai*	*1. Ms.D. Kanchana, SRMIST*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		*2. Dr.S.Albert Antony Raj, SRMIST*

Course Code	*PCA20C03J*	Course Name	DATABASE TECHNOLOGY	Course Category	C	Professional Core Course	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning		
		1	2	3
CLR-1 :	To understand the basic concepts and terminology related to DBMS and Relational Database Design	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	To the design and implement Relational Algebra			
CLR-3 :	To understand advanced DBMS techniques to construct tables and write effective queries, forms, and reports			
CLR-4 :	To understand advanced Database Application Development			
CLR-5 :	To understand Internet Applications & Database Tuning			
CLR-6 :	To understand Database Administration & Database Recovery			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
CLO-1 :	Acquire the knowledge of providing a reliable, consistent, secure, and available corporate-wide data	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-2 :	Acquire the capabilities of distinguish database administration and data administration	2	85	80
CLO-3 :	Acquire the skills of several database operation and maintenance issues	3	85	80
CLO-4 :	Obtain the knowledge of enabling the learner to become a Data Base technology Expert	3	85	80
CLO-5 :	Exposure for students to write complex queries including full outer joins, self-join, sub queries, and set theoretic queries	3	85	80
CLO-6 :	Know-how of the file organization, Query Optimization, Transaction management, and database administration techniques	3	85	80

		Program Learning Outcomes (PLO)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLO-1 :	Acquire the knowledge of providing a reliable, consistent, secure, and available corporate-wide data	*L*	*H*	*H*	*H*	-	*H*	*H*	*L*	*H*	*L*	*H*	*M*	*H*	*H*	*H*
CLO-2 :	Acquire the capabilities of distinguish database administration and data administration	*M*	*H*	*H*	*L*	*L*	*H*	*M*	*L*	*L*	*L*	-	*L*	*H*	*L*	*H*
CLO-3 :	Acquire the skills of several database operation and maintenance issues	*M*	*L*	*H*	*L*	*M*	*H*	*H*	*M*	*M*	*L*	*L*	*H*	*L*	*L*	*H*
CLO-4 :	Obtain the knowledge of enabling the learner to become a Data Base technology Expert	*M*	*M*	*H*	*M*	*M*	*H*	*H*	*M*	*M*	*L*	*L*	*M*	-	*M*	*H*
CLO-5 :	Exposure for students to write complex queries including full outer joins, self-join, sub queries, and set theoretic queries	*H*	*M*	*H*	*M*	*M*	*H*	*H*	*L*	*L*	*L*	*M*	*M*	-	*H*	*L*
CLO-6 :	Know-how of the file organization, Query Optimization, Transaction management, and database administration techniques	*L*	*H*	*H*	*H*	-	*M*	*H*	*H*	*H*	*L*	*H*	*L*	*M*	*H*	*H*

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Introduction to Database systems –Overview- File systems Vs DBMS- Advantages of DBMS	Selection And Projection	Accessing Databases From Applications	XML Documents	Oracle Server Architecture
	SLO-2	Database Design And ER Diagrams -Entities, Attributes, And Entity Sets	Set Operations	Embedded SQL	Introduction to XML	Connect Users to Servers

S-2	SLO-1	Describing and storing data in a DBMS-	Renaming	Declaring Variables and Exceptions	XML DTDs	Processing queries, changes and commits
	SLO-2	Relationships And Relationship Sets	Joins	Embedding SQL Statements	Domain-Specific DTDs	Oracle Universal Installer
S-3	SLO-1	Key Constraints -Participation Constraints, Weak Entities	Condition Joins	Cursors- Basic Cursor Definition and Usage	The Three-Tier Application Architecture	Setting up OS and Password File Authentication
	SLO-2	Aggregation- Case Study: The Internet Shop- Introduction To The Relational Model-	Equijoin- Natural Join- Division	Properties of Cursors- Dynamic SQL	Single-Tier and Client-Server Architectures-	Starting and Shutting an Instance
S-4 to S-5	**SLO-1**	**Lab 1:Case study submission for ER Diagrams**	**Lab 4: Execution of join operations**	**Lab 7: Sample programs for cursors**	**Lab 10:Create an XML document for employee information**	**Lab 13: Case study submission for database administration**
	SLO-2					
S-6	SLO-1	Creating And Modifying Relations Using SQL	The Form of A Basic SQL Query	An Introduction To JDBC	Advantages of the Three-Tier Architecture	Logical Structure of the Database
S-7	SLO-1	Example: create the Students relation	Examples of Basic SQL Queries	Architecture	Normal Forms	Managing Database Use- Creating Database Users
	SLO-2	Integrity Constraints Over Relations-	Nested Queries	JDBC Classes And Interfaces	Third Normal Form	Altering and Monitoring Existing Users
S-8	SLO-1	Key Constraints- Foreign Key Constraints	Triggers And Active Databases	JDBC Driver Management	Properties of Decompositions	Backup Considerations
	SLO-2	Specifying Foreign Key Constraints in SQL	Triggers And Active Databases- Examples of Triggers in SQL	Connections	Lossless-Join Decomposition- Dependency	Recovery Considerations
S-9to S-10	**SLO-1**	**Lab 2: SQL queries for students database**	**Lab 5: Practice of triggers-SQL Trigger | Student Database**	**Lab 8: Case study for JDBC**	**Lab 11: Simple program for joins**	**Lab 14: Case study submission for recovery**
	SLO-2					
S-11	SLO-1	General Constraints	Constraints versus Triggers	SQLJ	Preserving Decomposition	Components for Backup and Recovery
	SLO-2	Example table	Constraints versus Triggers	Executing SQL Statements	Normalization	Types of Failures
S-12	SLO-1	Simple examples Querying Relational Data	Other Uses of Triggers	Writing SQLJ Code	Decomposition into BCNF	Performing Offline backups
	SLO-2					
S-13	SLO-1	Querying Relational Data	Other Uses of Triggers	SQLJ example	Decomposition into 3NF	Performing Online Backups
	SLO-2					
S-14 to S-15	**SLO-3**	**Lab 3: SQL queries for employee database**	**Lab 6: Practice of triggers-SQL Trigger | Employee Database**	**Lab 9: Creating a Student database**	**Lab 12 :Study of normalization techniques**	**Lab 15:Case study submission for database backups**

Learning Resources	1. R. Ramakrishnan, J. Gehrke, Database Management Systems, McGraw Hill, 2004 2. A. Silberschatz, H. Korth, S. Sudarshan, Database system concepts, 5/e, McGraw Hill, 2008. 3. Kevin Loney (Fifth RePrint-2007), Oracle Database 10G: The Complete Reference, McGraw Hill, New Delhi.

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	20%	20%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	10%	10%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	*Dr.S.Gopinathan, Professor, University of Madras, Chennai*	*1. Mr.N.KRISHNAMOORTHY, SRMIST*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		*2.*

Course Code	*PCA20D01J*	Course Name	ADVANCED WEB APPLICATION DEVELOPMENT	Course Category	D	*Discipline Elective* Course	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,
CLR-1 :	*Learn fundamental Javascript concepts that power AngularJS.*
CLR-2 :	*Write quicker, better AngularJS code by discovering how AngularJS itself is built.*
CLR-3 :	*Become fluent in AngularJS terminology, such as dependency injection, services, directives, transclusion, and more.*
CLR-4 :	*Realize the power of dependency injection, and how AngularJS accomplishes it*
CLR-5 :	*Design custom directives and save time and energy with easily reusable components. Understand what a Single Page Application (SPA) is, and how they work.*
CLR-6 :	*Build a Single Page Application (SPA) in AngularJS. Be the coder that explains AngularJS to everyone else, because you understand it better than anyone else.*

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning: Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	PLO 1 Disciplinary Knowledge	PLO 2 Critical Thinking	PLO 3 Problem Solving	PLO 4 Analytical Reasoning	PLO 5 Research Skills	PLO 6 Team Work	PLO 7 Scientific Reasoning	PLO 8 Reflective Thinking	PLO 9 Self-Directed Learning	PLO 10 Multicultural Competence	PLO 11 Ethical Reasoning	PLO 12 Community Engagement	PLO 13 ICT Skills	PLO 14 Leadership Skills	PLO 15 Life Long Learning
CLO-1 :	Understand the design of single-page applications and how AngularJS facilitates their development	2	85	80	*L*	*H*	-	*H*	*L*	-	-	-	*L*	*L*	-	*H*	-	-	-
CLO-2 :	Properly separate the model, view, and controller layers of your application and implement them using AngularJS	3	85	80	*M*	*H*	*L*	*M*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-3 :	Master AngularJS expressions, filters, and scopes	3	85	80	*M*	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-4 :	Build Angular forms	3	85	80	*M*	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-5 :	Elegantly implement Ajax in your AngularJS applications	3	85	80	*H*	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-6 :	Write AngularJS directives, Unit test and end-to-end test your AngularJS application	3	85	80	*L*	*H*	-	*H*	*L*	-	-	-	*L*	*L*	-	*H*	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Introducing Full-Stack Development	Creating and setting up a MEAN Project	Building a data model with MongoDB and Mongoose	REST API- POST Methods: Adding data to MongoDB	Building a single-page application with Angular: Foundations
	SLO-2	Why learn the full stack?	A brief look at Express, Node, and npm	Connecting the Express application to MongoDB	PUT Methods: Updating data in MongoDB	Setting the groundwork for an Angular SPA
S-2	SLO-1	Introducing Node.js: The web server/platform	Creating an Express project	Why model the data?	Updating an existing subdocument in MongoDB	Switching from Express routing to Angular routing
	SLO-2	Introducing Express: The framework	Modifying Express project	Defining Simple Mongoose schemas	Deleting method: Deleting data from MongoDB	Adding the first views, Controllers, and services

S-3	SLO-1	Introducing MongoDB: The database	Import Bootstrap for quick, responsive layouts	Creating more complex schemas with subdocuments	Deleting a subdocument from MongoDB	Improving browser performance
	SLO-2	Introducing AngularJS: The front-end framework	Make it Live on Heroku	Final schema	How to call an API from Express	Manually injecting dependencies to protect against minification
S-4 S-5	SLO-1	**Lab 1: Sample application**	**Lab 4: How to move data from view to the controller**	**Lab 7: Pushing up the data**	**Lab 10: Building the API request**	**Lab 13: Passing Data into Modal**
	SLO-2					
S-6	SLO-1	Supporting cast	Getting Heroku set up	Compiling Mongoose schemas into models	Using the request module	Using Uglify JS to minify and concatenate scripts
	SLO-2	Hosting with Heroku	Pushing the site live using Git	Using the MongoDB shell to create a MongoDB database and add data	Using list of data from an API: The Loc8r homepage	Building an SPA with Angular: The next level
S-7	SLO-1	Designing a MEAN stack architecture	Defining the routes in Express	MongoDB shell basics	Separating concerns: Moving the rendering into a named function	A full SPA: Removing reliance on the server-side application
	SLO-2	A Common MEAN stack architecture	Building basic controllers	Creating a MongoDB database	Catching errors returned by the API	Adding additional pages and dynamically injecting HTML
S-8	SLO-1	Looking beyond SPAs	Creating some views	Getting our database live	Adding Angular components to an Express application	Creating a filter to transform the line breaks
	SLO-2	Designing a flexible MEAN architecture	A look at Bootstrap	Setting up Mongo Lab and getting the database URI	Uncovering two-way data binding	Sending HTML through an Angular binding
S-9 S-10	SLO-1	**Lab 2: Planning a real application**	**Lab 5: Setting up the HTML framework with Jade templates and Bootstrap**	**Lab 8: Making the application use the right database**	**Lab 11: Displaying and filtering the homepage list**	**Lab 14: More complex views and routing parameters**
	SLO-2	**Breaking the development into stages**	**Jade templates and Bootstrap**	**Pushing up the data**	**Using Angular filters to format data**	**Using URL parameters in controllers and services**
S-11	SLO-1	The Steps to built Loc8r	Building a Template	Writing a REST API" Exposing the MongoDB database to the application	Adding HTML geolocation to find places near you	Building the Details page view
	SLO-2	Hardware architecture	Adding the rest of the views	The rules of a REST API	Using services for data	Using Angular UI components to create a modal popup
S 12-13	SLO-1	How the MEAN stack components work together	How to more data from the view to the controller	Deleting document in MongoDB	Modifying data before displaying it: Fixing the distances	Creating Modal using Angular UI Components
	SLO-2					
S-14	SLO-1	**Lab 3: Development hardware**	**Lab 6: Take the data out of the views and make them smarter**	**Lab 9: Setting up the API in Express**	**Lab 12: Making HTTP requests from Angular to an API**	**Lab 15: Adding and using a click handler**
S-15	SLO-2	**Production hardware.**	**Updating the rest of the views and controllers**	**GET methods : Reading data from MongoDB**	**Ensuring forms work as expected**	**Using the form to submit a review.**

Learning Resources	*Text Book: Getting MEAN with Mongo, Express Angular and Node, Simon Holmes* *Practical Node JS: Building a Real World Scale Web Apps, Basarat Syed, A Press, 2014.* *Learning Angular JS: A Guide to Angular JS Development, Ken Williamson, O' Reilly, 2015*	*Reference Book:* *1. MEAN Web Development, AMOS Q. HAVIV* 2. AngularJS: https://angular.io/docs 3. MongoDB: https://docs.mongodb.com/manual/tutorial/getting-started/

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	20%	20%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	10%	10%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	*Dr.S.Gopinathan, Professor, University of Madras, Chennai*	*Mr.N.KRISHNAMOORTHY*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		

Course Code	PCA20D02J	Course Name	CYBER SECURITY	Course Category	D	*Discipline Elective* Course	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning
CLR-1 :	*Have an overview of cyber crime scenario and legal perspective on cyber crime.*	
CLR-2 :	*Understand different types of cyber attacks*	
CLR-3 :	*Understand about tools and methods used in cyber crime.*	
CLR-4 :	*Understand the need of cyber laws*	
CLR-5 :	*Understand and know how cyber forensics is used in cyber crime investigations*	
CLR-6 :	*Create/ setup methodologies for understand and avoid becoming victims of cyber crime*	

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1 Level of Thinking (Bloom)	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Disciplinary Knowledge	2 Critical Thinking	3 Problem Solving	4 Analytical Reasoning	5 Research Skills	6 Team Work	7 Scientific Reasoning	8 Reflective Thinking	9 Self-Directed Learning	10 Multicultural Competence	11 Ethical Reasoning	12 Community Engagement	13 ICT Skills	14 Leadership Skills	15 Life Long Learning
CLO-1 :	*Identify different classification of cybercrimes.*	*3*	*80*	*70*	*L*	*H*	*H*	*H*	*H*	*M*	-	*H*	*M*	*H*	-	*H*	*H*	-	*M*
CLO-2 :	*Apply the logic of Performing cyber forensics.*	*3*	*85*	*75*	*M*	*M*	*H*	*H*	*H*	-	-	*M*	*M*	*M*	-	*H*	*M*	-	*L*
CLO-3 :	*Analyze about the various kinds of vulnerabilities and scanning them.*	*3*	*75*	*70*	*M*	*M*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	*M*	-	*H*
CLO-4 :	*Apply the various types of firewalls to effective ensure security of the premises*	*3*	*85*	*80*	*L*	*L*	*H*	*H*	*H*	*M*	-	*M*	*L*	*H*	*M*	*H*	*M*	-	-
CLO-5 :	*Identify and solve Web Treats for Organizations: The Evils and Perils*	*3*	*75*	*70*	*H*	*H*	*H*	*H*	*H*	*L*	-	*M*	*H*	*L*	*L*	*H*	-	*L*	-
CLO-6 :	*Apply tools and methods of cyber-crime concepts to solve security problems & Learn about providing Security solutions*	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	*H*	-	*M*	*M*	*L*	*H*	*H*	-	*L*	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Cybercrime definition and origins	Proxy Servers- Anonymizers	The Legal Perspectives	Historical Background of Cyber forensics, Digital Forensics Science	Organizational Implications, Cost of Cybercrimes and IPR Issues ,
S-2	SLO-1	Cybercrime and information security	Phishing- Password Cracking	Need of Cyberlaw:	The Need for Computer Forensics- Cyber forensics and Digital Evidence	Lesson for Organizations, Web Treats for Organizations:
S-3	SLO-1	Classifications of cyber crime-	Keyloggers and Spywares-	The Indian Context	Forensics Analysis of Email, Digital Forensics Lifecycle	The Evils and Perils, Security and Privacy Implications from Cloud Computing
S-4-5	**SLO-1**	**Lab 1: Cyber security attacks-case study Submission**	**Lab 4: TCP / UDP connectivity using Netcat**	**Lab 7 : Demonstrate how to provide secure data storage,**	**Lab 10: Perform an experiment how to use dumpsec**	**Lab 13:Setup a honey pot on network.**

				secure data transmission and for creating digital signatures (GnuPG)		
S-6	SLO-1	Cybercrime and the Indian ITA 2000	Virus and Worms	The Indian IT Act	Chain of Custody Concept, Network Forensics	Social Media Marketing:Security Risk and Perils for Organization
S-7	SLO-1	A global Perspective on cybercrimes	Steganography	Digital Signature and the Indian IT Act	Approaching a Computer Forensics Investigation	Social Computing and the Associated Challenges for Organizations
S-8	SLO-1	How criminal plan the attacks	DoS -DDoS Attacks	Amendments to the Indian IT Act	Computer Forensics and Steganography	Protecting People's Privacy in the Organization
S-9 to S-10	**SLO-1**	**Lab 2: Cyber security attacks-case study Submission**	**Lab 5: TCP / UDP connectivity using Netcat**	**Lab 8 : Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG)**	**Lab 11: Perform an experiment how to use dumpsec**	**Lab 14: Monitor the honey pot on network.**
S-11	SLO-1	Social Engineering- Cyber stalking	SQL Injection, Buffer Over Flow	Cybercrime and Punishment	Relevance of the OSI 7 Layer Model to the Computer Forensics and Social Networking Sites	Organizational Guidelines for Internet Usage
S-12	SLO-1	Cybercafe- Cybercrimes- Botnets	Attacks on Wireless Networks, Phishing	Cyberlaw	The Security/Privacy Threats	Safe Computing Guidelines
S-13	SLO-1	Attack vector- Social Engineering-Cloud Computing	Identity Theft (ID Theft)	Technology and Students: Indian Scenario	Forensics Auditing, Anti Forensics	Computer Usage Policy Incident Handling
S-14 to S-15	**SLO-1**	**Lab 3: TCP scanning using NMAP Port scanning using NMAP**	**Lab 6: Perform an experiment to demonstrate sniffing of router traffic by using the tool Wireshark**	**Lab 9:Perform an experiment to sniff traffic using ARP Poisoning**	**Lab 12: Implementing the Secure Sockets Layer (SSL v2/v3) and Transport Layer Security (TLS v1) network protocols**	**Lab 15: Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)**

Learning Resources	1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and SunitBelpure, Publication Wiley	2. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication McGraw Hill. 3. Nina Godbole, Information Systems Security, Wiley India, New Delhi 4. Cyrus Piekari, Anton Chuvakin, "Security Warrior", 2nd ed., Oreilly Publishers, 2005.

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	20%	20%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	10%	10%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	*Dr.S.Gopinathan, Professor, University of Madras, Chennai*	*Mr.N.KRISHNAMOORTHY, SRMIST*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		

Course Code	PCA20D03J	Course Name	SOFTWARE ENGINEERING	Course Category	D	*Discipline Elective* Course	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning		
		1	2	3
CLR-1 :	Familiarize the software lifecycle models and software development process			
CLR-2 :	Understand the various techniques for requirements, planning and managing a technology project			
CLR-3 :	Examine basic methodologies for software design, development, testing, closure and implementation			
CLR-4 :	Understand manage users expectations and the software development team			
CLR-5 :	Acquire the latest industry knowledge, tools and comply to the latest global standards for project management			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Identify the process of life cycle model and process project	3	80	70
CLO-2 :	Analyze and specify software requirements through a productive working Relationship with project stakeholders	3	85	75
CLO-3 :	Design the system based on Functional Oriented and Object Oriented Approach for Software Design.	3	75	70
CLO-4 :	Develop the correct and robust code for the software products	3	85	80
CLO-5 :	Perform by applying the test plan and various testing techniques	3	85	75

Program Learning Outcomes (PLO)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLO-1 :	*L*	*H*	-	*H*	*L*	-	-	-	*L*	*L*	-	*H*	-	-	-
CLO-2 :	*M*	*H*	*L*	*M*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-3 :	*M*	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-4 :	*M*	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-5 :	*H*	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-

Duration (Hour)		15	15	15	15	15
S-1	*SLO-1*	*Introduction to software Engineering*	*System Engineering*	*Introduction to Testing*	*Project Management Spectrum*	*Risk Management*
	SLO-2	*Characteristics of software*	*Components of System Engineering*	*Definition , Characteristics of Testing*	*Four P's*	*Reactive and Proactive Risk Strategies*
S-2	*SLO-1*	*The Changing Nature of software*	*Requirements Engineering Tasks*	*Testing Strategies for Conventional Software*	*The People and the Product*	*Software Risks*

	SLO-2	*Legacy Software and Software myths*	*Process, Initiating and Eliciting requirements.*	*Unit testing and Integration testing*	*Role of People*	*Risk Identification and Risk Projection*
S-3	*SLO-1*	*A Generic view of process Software Engineering*	*Building the Analysis Model*	*Validation Testing*	*The Process and the Project*	*Risk refinement*
	SLO-2	*A layered Technology*	*Analysis Modeling Approaches*	*Verification Vs Validation*	*Role of Process*	*Risk Mitigation*
S-4 to S-5	***SLO-1***	***Lab 1:Identifing Project Objective and Scope***	***Lab 4:Project Planning***	***Lab 7: Function Oriented Diagram***	***Lab 10:Test Case design for unit testing***	***Lab 13: Preparation of Timeline charts and Tracking the Scheduling***
S-6	*SLO-1*	*A process framework*	*Data Modeling Concepts*	*System Testing*	*Metrics for Process and Projects-Estimation*	*Monitoring and Management*
	SLO-2	*Capability Maturity Model Integration*	*Example Diagram*	*Non-Functional testing*	*LOC, FP, Object Oriented.*	*Example*
S-7	*SLO-1*	*Process Models*	*Scenario based Modeling*	*Debugging Process*	*Estimation*	*Quality Concepts*
	SLO-2	*Water fall , RAD model*	*USE-CASE Diagram*	*Testing Tactics*	*Estimation models*	*SQA Activities*
S-8	*SLO-1*	*Iterative Process Models*	*Flow Oriented Modeling*	*White Box Testing, Basic-Path testing*	*The Project Planning Process*	*Software Reviews and FTR*
	SLO-2	*Incremental ,Prototype and Spiral*	*Data Flow Diagram*	*Cyclomatic complexity calculation*	*Resources*	*Statistical Quality Assurance*
S-9 to S-10	***SLO-1***	***Lab2:Selection of Suitable software process Model of the suggested system***	***Lab 5:Performing Various Requirement Analysis***	***Lab 8:User's View Analysis***	***Lab 11:Test Case design for Integration testing***	***Lab 14: Estimation of Effort and Risk Identification***
S-11	*SLO-1*	*Prescriptive models*	*Design Engineering*	*Black Box Testing*	*Decomposition Techniques*	*The Software Configuration Management*
	SLO-2	*Phases of the model*	*Example*	*Equivalence Partitioning*	*calculations of Decomposition techniques*	*SCM Repository*
S-12	*SLO-1*	*Specialized Process Models*	*Software Design Concepts*	*BVA , Error Guessing*	*Empirical Estimation Models*	*Business Process Reengineering*
	SLO-2	*The Unified Process Model*	*Example Diagrams*	*Cause-Effect Graphing*	*COCOMO model*	*Reengineering Diagram and Example.*
S-13	*SLO-1*	*An agile view of Process*	*The Design Model*	*Testing for Specialized Environments*	*Project Scheduling Concepts*	*Reverse Engineering*
	SLO-2	*Case study on Best SDLC selection based on the Scenario*	*Examples for all designs*	*Preparation of Test case Plan and Report*	*Examples*	*Forward Engineering*
s-14 to s-15	***SLO-1***	***Lab3:Problem Statement Preparation***	***Lab 6 :Develop Software Requirement Specification Sheet (SRS)***	***Lab 9:Structure view diagram***	***Lab 12:Perforing Testing and Debugging for a sample code***	***Lab 15:Software Quality Assurance Components.***

Learning Resources	1. Roger, S. Pressman (2004), Software Engineering: A Practitioner Approach, McGraw Hill International Edition, Sixth Edition, New Delhi 2. Waman, S Jawadekar (2004), Software Engineering: Principles and Practice, McGraw Hill Education Pvt. Limited, New Delhi.	3. Rohit Khurana (2011), Software Engineering-Principles and Practices, Vikas Publishing House Pvt. Ltd., Second Edition, New Delhi. 4. Chairperson, Counting Practices Committee, Valerie Marthaler, EDS, Troy, Michigan, Function Point Counting Practices Manual Release 4.1.1, The International Function Point User Group, April 2000. 5. Carlo Ghezzi, Mehdi Jazayari, Dino Mandrioli (1991), Fundamentals of Software Engineering, Prentice Hall of India, New Delhi.

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	20%	20%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	10%	10%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	Dr.S.Gopinathan, Professor, University of Madras, Chennai	*Mrs.J.Shobana, SRMIST*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		

Course Code	PCA20S01J	Course Name	IT INFRASTRUCTURE MANAGEMENT	Course Category	S	Skill Enhancement Course	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning

		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	IT Infrastructure has become pervasive, to handle everyday task and complex situations			
CLR-2 :	To improve the organizational and managerial capability of providers			
CLR-3 :	To reduce the financing burden on governments			
CLR-4 :	To protect user's interests			
CLR-5 :	To allow early benefits of new technologies			

Course Learning Outcomes (CLO):	To facilitate access to funding for long-term investment needs	1	2	3	Program Learning Outcomes (PLO)														
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
					Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLO-1 :	Understand the design factors and challenges in IT Infrastructure Management.	2	85	80	L	H	H	H	H	M	-	H	M	H	-	H	-	-	-
CLO-2 :	Understand service delivery and associated processes.	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-3 :	Understand storage and security management related to IT Infrastructure	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-4 :	Understand performance and tuning processes and associated case studies.	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-5 :	On-line workshops of leading-edge North American practitioners to fine tune the case studies accessible to the public;	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-6 :	Database of key innovators focusing especially on infrastructure investors.	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-

Duration (hour)		15	15	15	15	15
S1	SLO1	Introduction	Service Level Management	Backup and Storage	Introduction, Difference between	Asset Network Corporation case,
S2	SLO1	Challenges in IT Infrastructure Management	Incident Management	Disaster	Performance and Tuning processes	Radio Shack case
S3	SLO1	Design Factors for IT	Financial Management	Space Management	other Infrastructure processes	Business Process Outsourcing (BPO),
	SLO2					
S4	SLO1	Organizations	IT Service	Bare Machine	Definition Preferred characteristics	Infrastructure Planning
S5	SLO1	IT Infrastructures	Continuity Management	Recovery (BMR)	Performance	Management e-Commerce

S6	**SLO1**	*IT Systems*	*Capacity Management*	*Data Retention*	*tuning applied to major resource environments*	*Business Infrastructure Planning*
S7	**SLO1**	*Service Management Process*	*Configuration Management*	*Computer Security*	*Assessing an Infrastructure's performance*	*Management Enron case*
S8	**SLO1**	*Information systems Design Process*	*Availability management*	*Identity Management*	*tuning process*	*Tycocase*
S9	**SLO1**	IT Infrastructure Library	Release Management	Access control, system-Intrusion Detection	Measuring and streamlining the P and T process	Worldcom case
S10-S15	**SLO1**	Lab 1: Case Study and Hands-on training.	Lab 2: Case Study and Hands-on training.	Lab 3: Case Study and Hands-on training.	Lab 4: Case Study and Hands-on training.	Lab 5: Case Study and Hands-on training.

Learning Resources	*1.Rich Schiesser, " IT Systems Management", 2nd edition, 2010, Pearson Education,I SBN: 978-0137025060*	*1.P.Gupta, " IT Infrastructure and Its Management" 2nd Reprint, 2010, Tata McGraw Hill, ISBN: 978-0070699793* *2.SjaakLaan , "IT Infrastructure Architecture : Infrastructure Building Blocks and Concepts",2011 , Lulu Press Inc, ISBN 978-1-4478-8128-5.* *3.Leonard Jessup, Joseph Valacich,"Information System Today: Managing Digital World", 3rd Edition, 2007, Prentice Hall, ISBN: 0-13-233506-9.*

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	40%	-
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	40%	-
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	Dr.S.Gopinathan, Professor, University of Madras, Chennai	***Dr. J.Dhilipan , SRMIST***
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		

Course Code	PCA20AE1T	Course Name	CAREER ADVANCEMENT– I	Course Category	AE	Ability Enhancement Course	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Career Guidance and Development	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
CLR-1 :	Demonstrate various principles involved in solving mathematical concepts	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	Develop interest and awareness in students regarding profit/ loss, interest calculations and average			
CLR-3 :	Critically evaluate basic mathematical concepts related to mixtures and alligations, permutation and combination and Statistics			
CLR-4 :	Provide students with skills necessary to generate and interpret data and concepts related to Series, Direction Sense and blood relation.			
CLR-5 :	Enable students to understand reasoning skills			
CLR-6 :	Create awareness in students regarding the various concepts in quantitative aptitude and reasoning skills and also its importance in various competitive exams			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Understand, analyze and solve questions based on numbers, logarithms.	3	80	70	H	H	M	H	L	M	-	H	-	H	-	H	M	-	H
CLO-2 :	Create, solve, interpret and apply basic mathematical models which are applicable in our day to day life	3	80	75	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-3 :	Understand the concepts of mixtures and alligations, permutation and combinations, probability, time and work and to approach questions in a simpler and innovative method	3	85	70	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-4 :	Understand the concept in Word Series, Number Series, Symbol Series and Direction Sense	3	85	80	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-5 :	Ability to solve the problems on Logical Reasoning	3	85	75	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-6 :	Able to face different competitive exams	3	80	70	M	H	M	H	-	M	-	H	H	M	-	H	M	-	H

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Classification of numbers	Profit and Loss-Introduction	Permutation –Introduction& Basics	Word problems on Line equations-Introduction	Number Puzzles
	SLO-2	Tests of divisibility	Profit and Loss- Basic Problems	Permutation – Problems	Word problems on Line equations- Basic problems	Number Puzzles - Problems
S-2	SLO-1	Unit digit	Statistics-Introduction	Combination-Introduction& Basics	Syllogisms - Basics	Number Puzzles - Problems

	SLO-2	Tailed zeroes	Statistics-Mean, Median, Mode	Combination- Problems	Syllogisms - Problems	Number Puzzles – Tricky Problems
S-3	SLO-1	Series Formulae	Averages-Introduction & Basics	Probability- Introduction &Basics	Word series - Introduction	Logical Puzzles
	SLO-2	Arithmetic Progression Geometric Progression	Averages- Problems	Probability- Basics	Word series – Problems	Logical Puzzles - Problems
S-4	SLO-1	Highest Common Factor (HCF) Greatest Common Measure	Averages- Problems	Probability- Problems	Number series - Introduction	Logical Puzzles –Problems
	SLO-2	Least Common Multiples (LCM)	Averages-Tricky Problems	Probability- Tricky Problems	Number series - Problems	Logical Puzzles - Tricky Problems
S-5	SLO-1	HCF, LCM	Averages-Tricky Problems	Set Theory Introduction	Symbol Series - Introduction	Sequential output tracing- Basics
	SLO-2	HCF, LCM - Solving problems	Averages-Tricky Problems	Set Operation	Symbol Series - Problems	Sequential output tracing- Problems
S-6	SLO-1	Simplification	Ratio – Basics and Formulas	Set - Problems	Direction Sense - Introduction	Sequential output tracing- Problems
	SLO-2	Simplification - Problems	Ratio - Problems	Set - Tricky Problems	Direction Sense - Problems	Sequential output tracing- Tricky Problems
S-7	SLO-1	Virnaculum	Proportions – Basics and Formulas	Time and work-Introduction	Blood relation-Introduction	Inductive, Logical, Abstract
	SLO-2	Virnaculum - Problems	Proportions - Problems	Time and work-Men and Work	Blood relation-Problems	Inductive, Logical, Abstract-Problems
S-8	SLO-1	Logarithm –Introduction of log rules	Mixtures and Alligations-Introduction	Time and work - Problems	Coding – Decoding-Introduction	Diagrammatic Reasoning
	SLO-2	Logarithm – Problems	Mixtures and Alligations-Problems	Time and work - Tricky Problems	Coding – Decoding-Different types	Diagrammatic Reasoning-Problems
S-9	SLO-1	Logarithm –Applications of log rules	Boats and Streams	Pipes &Cisterns- Introduction	Coding – Decoding - Problems	Spatial Reasoning
	SLO-2	Logarithm Application – Problems	Boats and Streams- Problems	Pipes &Cisterns-Problems	Coding – Decoding – Tricky Problems	Spatial Reasoning- Problems

Learning Resources	1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata McGraw Hill, 5th Edition 2. Dr. Agarwal.R.S, Quantitative Aptitude for Competitive Examinations, S. Chand and Company Limited, 2018 Edition 3. Archana Ram, PlaceMentor: Tests of Aptitude for Placement Readiness, Oxford University Press, Oxford, 2018	4. Edgar Thrope, Test Of Reasoning for Competitive Examinations, Tata McGraw Hill, 6th Edition 5. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for competitive examinations, Pearson, 3rd Edition *6. P A Anand, Quantitative Aptitude for competitive examinations, Wiley publications, e book, 2019*

Learning Assessment					
Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA-1 (20%)	CLA-2 (20%)	CLA-3 (30%)	CLA-4 (30%) ##
		Theory	Theory	Theory	Theory
Level 1	Remember	10%	10%	30%	15%
	Understand				
Level 2	Apply	50%	50%	40%	50%
	Analyze				
Level 3	Evaluate	40%	40%	30%	35%
	Create				
	Total	100 %	100 %	100 %	100 %

CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Mock interviews, etc.

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers	
Experts from Industry	Internal Experts
1. Ajay Zener, Director, Career Launcher	*1. Dr P Madhusoodhanan, HoD, CDC, E&T, SRMIST*
	2. Dr M Snehalatha, Assistant. Professor, CDC, E&T, SRMIST

SEMESTER – II

Course Code	PCA20C04J	Course Name	PYTHON PROGRAMMING	Course Category	C	Professional Core Course	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLR-1 :	To understand why Python is a useful scripting language for developers.																		
CLR-2 :	To learn how to use lists, tuples, and dictionaries in Python programs.																		
CLR-3 :	To learn how to design and program Python applications.																		
CLR-4 :	To learn how to identify Python object types.																		
CLR-5 :	To learn how to design object-oriented programs with Python classes.																		
CLR-6 :	To learn how to use exception handling in Python applications for error handling.																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	Appreciate the basic and advanced features of core language built ins	2	85	80	*L*	*H*	*H*	*H*	*H*	*M*	-	*H*	*M*	*H*	-	*H*	-	-	-
CLO-2 :	Handle and control system/OS level features	3	85	80	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-3 :	Communicate using sockets	3	85	80	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-4 :	Write client and server side scripts.	3	85	80	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-5 :	Design and implement basic applications with database connectivity.	3	85	80	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-6 :	Extensive support libraries	3	85	80	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	*Introduction to Python*	*Iterations and Comprehensions*	*System tools*	*Socket Programming*	*Introduction to tkinter*
S-2	SLO-1	*Python Interpreter and its working*	*Handling text files Modules*	*OS and Sys modules*	*Handling Multiple Clients*	*Top Level Windows*
S-3	SLO-1	*Syntax and Semantics*	*Classes*	*Directory Traversal tools*	*Client side scripting*	*Dialogs, Message and Entry*
S-4-S-5	**SLO-1**	***Lab 1:Python Numbers, List***	**Lab 4: Creating Class in Python**	***Lab7: process standard streams.***	***Lab10: Client Socket Methods***	***Lab 13: Represent compound data using Python***
S-5	SLO-1	*Data Types*	*OOP Exception Handling*	*Parallel System tools*	*urlib Server Side Scripting*	*Event handling, Menus*

S-6	SLO-1	*Assignments*	*Exception Handling Strings*	*threading and queue*	*CGI Scripts with User Interaction*	*List boxes and Scrollbars*
S-7	SLO-1	*Expressions*	*Regular Expressions*	*Program Exits*	*Passing Parameters*	*Text, SQL Database interfaces with sqlite3*
S-9-S10	**SLO-1**	***Lab 2: Tuple, Strings, Set***	***Lab 5: Creating Object in Python***	***Lab 8 :Command-line arguments, shell variables***	***Lab 11: General Socket Methods***	***Lab 14: Lists, tuples, dictionaries.***
S-11	SLO-1	*Control Flow Statements*	*try statement in Python*	*system interfaces by focusing on tools and techniques*	XML Parser Architectures and APIs	*Basic operations and table load scripts.*
S-12	SLO-1	*Sequences, Dictionaries*	User-Defined Exception in Python	*binary files, tree walkers*	Parsing XML with SAX APIs	*SQLite database from your Python program.*
S-13	SLO-1	*Functions and lambda expressions*	*Use of Inheritance in Python*	*Python's library support for running programs in parallel.*	The parse Method	*Design and implement basic applications*
S-14-S15	**SLO-1**	***Lab 3: Lambda & Filter in Python Examples***	***Lab 6:* Creating Methods in Python**	***Lab 9: Python scripts here perform real tasks.***	***Lab 12:Creating Thread Using Threading Module***	***Lab 15: Read and write data from/to files in Python Programs***

Learning Resources	*1.Mark Lutz ,"Learning Python", O Reily, 4thEdition, 2009, ISBN: 978-0-596-15806-4.*	*1.Mark Lutz ,"Programming Python ", O Reily, 4thEdition, 2010, ISBN 9780596158118* *2.Tim Hall and J-P Stacey ,"Python 3 for Absolute Beginners" , 2009, ISBN:9781430216322* *3.Magnus Lie Hetland , "Beginning Python: From Novice to Professional", 2nd Edition, 2009, ISBN:9781590599822.*

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
Level 2	Apply Analyze	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Level 3	Evaluate Create	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	*Dr.S.Gopinathan, Professor, University of Madras, Chennai*	*Mr.D.B.Shanmugam SRMIST*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		

Course Code	PCA20C05J	Course Name	COMPUTER NETWORKS	Course Category	C	Professional Core Course	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	*Understand the evolution of computer networks using the layered network architecture*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLR-2 :	*Understand the addressing concepts and learn networks devices*																		
CLR-3 :	*Design computer networks using subnetting and routing concepts*																		
CLR-4 :	*Understand the error types , framing, flow control*																		
CLR-5 :	*Understand the various Medium Access Control techniques and also the characteristics of physical layer functionalities*																		
CLR-6 :	*Understand basic network administration*																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	*Acquire the basics of computer network and its architecture*	*3*	*80*	*70*	*L*	*H*	*H*	*H*	*H*	*M*	-	*H*	*M*	*H*	-	*H*	*H*	-	*M*
CLO-2 :	*Acquire the knowledge of various networks devices and addressing methods*	*3*	*85*	*75*	*M*	*M*	*H*	*H*	*H*	-	-	*M*	*M*	*M*	-	*H*	*M*	-	*L*
CLO-3 :	*Abilty to design the network routing methods*	*3*	*75*	*70*	*M*	*M*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	*M*	-	*H*
CLO-4 :	*Acquire the various error codes and framing concepts*	*3*	*85*	*80*	*L*	*L*	*H*	*H*	*H*	*M*	-	*M*	*L*	*H*	*M*	*H*	*M*	-	-
CLO-5 :	*Ability to understand the physical layer functions and components*	*3*	*75*	*70*	*H*	*H*	*H*	*H*	*H*	*L*	-	*M*	*H*	*L*	*L*	*H*	-	*L*	-
CLO-6 :	*Ability to design a computer network using a switch and router*	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	*H*	-	*M*	*M*	*L*	*H*	*H*	-	*L*	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	A Communications Model	*Transmission Terminology*	*Asynchronous Transmission*	*Frequency Division Multiplexing*	*Local Area Network Overview- Background*
	SLO-2	A Data Communications Model- Networks	*Frequency, Spectrum, And Bandwidth*	*Synchronous Transmission*	*Synchronous Time Division Multiplexing*	*Topologies And Transmission Media*
S-2	SLO-1	The Need For A Protocol Architecture	*Analog And Digital Data Transmission*	*Types Of Errors*	*Statistical Time Division Multiplexing*	*Bus And Tree Topologies- Ring Topology- Star Topology*
	SLO-2	The TCP/IP Protocol Architecture	*Analog And Digital Data- Analog And Digital Signals*	*Parity Check- Cyclic Redundancy Check (CRC)*	*Circuit Switching And Packet Switching- Switched Communications Networks*	*Choice Of Topology - Choice Of Transmission Medium*

S-3	SLO-1	Operation of TCP and IP	*Data And Signals- Analog And Digital Transmission-*	*Error Correction- Block Code Principles*	*Circuit-Switching Networks*	*IEEE 802 Reference Model*
	SLO-2	TCP and UDP	*Transmission Impairments*	*Flow Control*	*Circuit-Switching Concepts- Packet-Switching Principles*	*Logical Link Control- LLC Protocol- BRIDGES- Functions Of A Bridge- Bridge Protocol Architecture*
S-4to S-5	SLO-1	*Lab!:Familiarization with configuring and installing a LAN using packet tracer*	*Lab4: To study different types of transmission media*	Lab7: Error Detecting Code Using CRC-CCITT (16-bit)-Java /C/C++ Program	Lab10:Study of switches, bridges using Cisco packet tracer	Lab 13: Designing various topologies using cisco packet tracer
	SLO-2					
S-6	SLO-1	*TCP/IP Applications*	*Attenuation And Attenuation Distortion*	*Stop-And-Wait Flow Control*	*Comparison Of Circuit Switching And Packet Switching*	*Fixed Routing- The Spanning Tree Approach-*
S-7	SLO-1	*The OSI Model*	*Delay Distortion*	*Sliding-Window Flow Control*	*X.25*	*Frame Forwarding-*
	SLO-2	*Role play and activity based learning for understanding OSI model*	*Noise*	*Error Control*	*Frame Relay- Background*	*Electronic Mai*
S-8	SLO-1	*Standardization within a Protocol Architecture - Standardization within the OSI Framework*	*Guided Transmission Media*	*Stop-And-Wait ARQ*	*Frame Relay Protocol Architecture-*	*SMTP And MIME-*
	SLO-2	*Service Primitives and Parameters- Traditional Internet-Based Applications*	*Twisted Pair-Physical Description-Applications-Unshielded And Shielded Twisted Pair*	*Go-Back-N ARQ*	*User Data Transfer*	*Simple Mail Transfer Protocol (SMTP)*
S-9 to S-10	SLO-1	*Lab2:Experimenting with network protocols for achieving communication between computers using packet tracer*	*Lab 5: Interconnection software for communication between two different network architectures-using packet tracer*	Lab 8: Case study submission for: Sliding-Window Flow Control & Stop-And-Wait Flow Control	*Lab 11:To configure network security using two routers by blocking ICMP ping request.- CISCO packet tracer*	*Lab 14 :To configure Internet Access/Implementation using CISCO packet tracer*
	SLO-2					
S-11	SLO-1	*Multimedia-Media Types*	*Coaxial Cable- Physical Description-Applications-Transmission Characteristics*	*HDLC*	*Routing In Switched Networks*	*Basic Electronic Mail Operation-*
	SLO-2	*Multimedia Applications*	*Optical Fiber- Physical Description Applications-Transmission Characteristics*	*High-Level Data Link Control (HDLC)*	*Routing Strategies*	*SMTP Overview-*
S-12	SLO-1	*Standardization within a Protocol Architecture*	Noise- Guided Transmission Media	*Basic Characteristics*	*Fixed Routing*	*Connection Setup-*
	SLO-2	*Standardization within the OSI Framework*	Wireless Transmission-	*Frame Structure*	*Flooding*	*Mail Transfer*
S-13	SLO-1	*Service Primitives and Parameters*	Antennas-	Address Field-	Random Routing	*Multipurpose Internet Mail Extensions (MIME)*

	SLO-2	*Traditional Internet-Based Applications*	Terrestrial Microwave- Physical Description-Applications	Control Field	Adaptive Routing	Request Messages- Response Messages
S-14 to S-15	SLO-1 SLO-2	*Lab 3:Creating a LAN using packet tracer*	*Lab 6: Using packet tracer to connect a network with different types of media connection*	Lab 9: SIMULATION OF STOP AND WAIT PROTOCOL using NS/2 or any other tool	*Lab 12: Case study submission for routing*	*Lab15 :Web programming using HTML*

Learning Resources	1. "Data And Computer Communications" - William Stallings -Eighth Edition 2. "DataCommunicationsandNetworking"BehrouzA.Forouzan,"5thedition,July1,2010,ISBN:9780073376226.

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	*Dr.S.Gopinathan, Professor, University of Madras, Chennai*	*1. Mr.N.KRISHNAMOORTHY*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		*2. Dr.S.Albert Antony Raj, SRMIST*

Course Code	PCA20C06T	Course Name	OPTIMIZATION TECHNIQUES	Course Category	C	*Professional Core Course*	L	T	P	C
							4	0	0	4

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Mathematics and Statistics*			Data Book / Codes/Standards	*Graph sheet Need*

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning

		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	To impart the overall view of the subject of operations Research			
CLR-2 :	To apply mathematical models for solving real life problems			
CLR-3 :	To develop the students ability and help to solve quantitative issues in information technology			
CLR-4 :	This mathematical modelling, provides the knowledge in planning, controlling and scheduling to the network analysis			
CLR-5 :	To develop the decision making knowledge.			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1:	To understand the mathematical models and its limitations.	*3*	*85*	*80*
CLO-2 :	To have skill in analysis of data by graphical and other methods.	*3*	*80*	*70*
CLO-3 :	To enable the student to apply the technique in solving problem	*3*	*70*	*65*
CLO-4 :	To provide the students with opportunity of using various software package for solving linear programming and integer programming models	*3*	*70*	*70*
CLO-5 :	To introduce the students to the use of basic methodology for the solution of linear programs and integer programs	*3*	*80*	*70*

Program Learning Outcomes (PLO)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLO-1:	*M*	*L*	*L*	*-*	*L*	*-*	*L*	*-*	*M*	*L*	*L*	*L*	*M*	*M*	*L*
CLO-2 :	*-*	*L*	*H*	*-*	*H*	*-*	*L*	*-*	*H*	*M*	*H*	*M*	*L*	*M*	*L*
CLO-3 :	*M*	*M*	*H*	*-*	*H*	*-*	*M*	*-*	*M*	*M*	*H*	*M*	*L*	*M-*	*M*
CLO-4 :	*H*	*H*	*M*	*-*	*M*	*-*	*M*	*-*	*H*	*L*	*M*	*L*	*M*	*H*	*H*
CLO-5 :	*-*	*M*	*M*	*-*	*M*	*-*	*M*	*-*	*H*	*M*	*H*	*M*	*M*	*H*	*M*

Duration (hour)		12	12	12	12	12
S-1	SLO-1	*Introduction to operations research*	*Introduction of Transportation*	*Introduction of game theoryBasic definitions and Examples.*	*Introduction of Network Analysis*	*Introduction of Queuing theory , Basic Definitions*
	SLO-2	*Basic Definitions*	*Basic Definitions*	*Characteristics of Game theory and Uses of Game theory,*	*Objectives of Network Analysis and Main function of Network*	*Uses of Queuing theory, Meaning of Queuing System*
S-2	SLO-1	*Meaning of Operations Research*	*Mathematical formulation of LPP*	*Pure Strategies: Maximin - Minimax Principle*	*Advantages of Network Analysis*	*Elements of Queuing System*

	SLO-2	*Advantages of Operations Research*	*Finding initial Solution by Row-minima Method & Column-minima Method*	*Problems based on saddle point*	*limitations of Network Analysis*	*Kendal's Notation for representing Queuing models*
S-3	**SLO-1**	*Uses of Operations Research*	*Finding initial Solution by matrix-minima Method*	*Mixed strategy based problems*	*Rules for constructing a project network*	*The average number of units in the system*
	SLO-2	*Nature of Operations Research*	*Finding initial Solution by North-West Corner Method*	*Finding value of the games with saddle points*	*Constructing project network*	*Finding probability of waiting time in the Queue*
S-4	***SLO-1***	*Role of Operations Research in computer science*	*Finding initial Solution by VAM Method*	*Finding value of the games without saddle points*	*Network computations by Critical path method*	*. Problems on (M/M/1)*
	SLO-2	*Role of Operations Research in Information technology*	*Find the initial solution for unbalanced transportation problem*	*Solving 2X2 games*	*Earliest start time of a project network*	*Introduction to Inventory , Types of Inventory*
S-5 to S-8	**SLO-1**	*Formulating the problem*	*Finding the optimum solution to maximize the profit*	*Solving 2X2 games*	*Earliest completion time of a project network*	*Application of Inventory*
	SLO-2	*Some Basic Assumptions*	*Calculating Optimum Solutions by MODI method*	*Matrix oddment method for nxn games*	*Latest start time of a project network*	*Some basic formulas*
S-9	**SLO-1**	*Standard form of LPP and Canonical form of LPP*	*Optimum Solution without Loop, ii) Optimum Solution with Loop*	*Matrix oddment method for nxn games*	*Latest completion time of a project network*	*Cost involved in inventory problem*
	SLO-2	*Graphical solution of a LPP*	*Introduction of Assignment problem*	*Introduction of Dominance property, Rules of Dominance*	*Network computations by PERT*	*Deterministic inventory models*
S-10	**SLO-1**	*Working Procedure for Graphical method*	*Hungarian procedure for solving Assignment Problem*	*Solving Games by Dominance property*	*Basic difference between PERT and CPM*	*Economic order quantity(E.O.Q)*
	SLO-2	*Solving LPP by Graphically*	*Mathematical Form & Difference between Transportation and Assignment Problems*	*Solving Games by Dominance property*	*Time estimates-Expected duration of each activity*	*Purchasing model with no shortages*
S-11	**SLO-1**	*Graphical Method, (i)Feasible Solution*	*Unbalanced Assignment Problem*	*solving game- Graphical method,*	*Time estimates-Expected variance of each activity and variance of project lengh*	*Problems on Purchasing model with no shortages*
	SLO-2	*, ii)Infeasible Solution, ii)Unbounded Solution*	*Finding the optimum solution to Restriction assignment method*	*Graphical Solutions of 2xM*	*Total float*	*Manufacturing model with no shortages*
S-12	**SLO-1**	*Simplex Method*	*Finding the optimum assignment to maximize the profit*	*Graphical Solutions of N x2*	*Free float and Independent float*	*Manufacturing model with no shortages*
	SLO-2	*Simplex Method*	*Solving the Travelling Salesmen Problem*	*.Limitations of Game Theory*	*Problems on Total float Free float and Independent float*	*Problems on Manufacturing model with no shortages*

Learning Resources	1. C.R.Kothari, (2013)"Quantitative Techniques" Third Revised Edition S.Chand Ltd, New Delhi. 2. V.Sundaresan, K.S.Ganapathy Subramanian, K. Ganesan (2017) "Resource Management Techniques" Eleventh Edition, A.R Publication. 3. Kallavathy.S, (2014) "Operations Research" Fourth Edition, Vikas publishing house.

Learning Assessment											
Level	**Bloom's Level of Thinking**	**Continuous Learning Assessment (50% weightage)**								**Final Examination (50% weightage)**	
		CLA – 1 (10%)		**CLA – 2 (10%)**		**CLA – 3 (20%)**		**CLA – 4 (10%) #**			
		Theory	**Practice**	**Theory**	**Practice**	**Theory**	**Practice**	**Theory**	**Practice**	**Theory**	**Practice**
Level 1	Remember Understand	*30%*	-	*30%*	-	*30%*	-	*30%*	-	*30%*	-
Level 2	Apply Analyze	*40%*	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-
Level 3	Evaluate Create	*30%*	-	*30%*	-	*30%*	-	*30%*	-	*30%*	-
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers	
Experts from Higher Technical Institutions	**Internal Experts**
Dr.M.A.Baskar, Professor & Head, Dept. Of Mathematics, Loyola college, Chennai	*S.LAKSHMI PRIYA SRMIST* Assistant Professor, Dept. Mathematics and Statistics, FSH, SRMIST
Dr.P.Dhanavanthan, Professor & Head, Dept. Of statistics, Pondicherry University	

Course Code	PCA20D04J	Course Name	ANDROID APPLICATIONS DEVELOPMENT	Course Category	D	*Discipline Elective* Course	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3
CLR-1 :	*To understand mobile application development trends and Android platform*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	*To analyze the need of simple applications, game development, Location map based services*			
CLR-3 :	*To enable the learner for aspiring careers in Android Mobile application development areas*			
CLR-4 :	*To Utilize Android Studio to create simple and complex applications*			
CLR-5 :	*To Plan, prepare and build an original Android from concept to working program*			
CLR-6 :	*To Publish an application to the Android Market*			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLO-1 :	*Identify different classification of cybercrimes.*	*3*	*80*	*70*	*L*	*H*	*-*	*H*	*L*	*-*	*-*	*-*	*L*	*L*	*-*	*H*	*-*	*-*	*-*
CLO-2 :	*Apply the logic of Performing cyber forensics.*	*3*	*85*	*75*	*M*	*H*	*L*	*M*	*L*	*-*	*-*	*-*	*M*	*L*	*-*	*H*	*-*	*-*	*-*
CLO-3 :	*Analyze about the various kinds of vulnerabilities and scanning them.*	*3*	*75*	*70*	*M*	*H*	*M*	*H*	*L*	*-*	*-*	*-*	*M*	*L*	*-*	*H*	*-*	*-*	*-*
CLO-4 :	*Apply the various types of firewalls to effective ensure security of the premises*	*3*	*85*	*80*	*M*	*H*	*M*	*H*	*L*	*-*	*-*	*-*	*M*	*L*	*-*	*H*	*-*	*-*	*-*
CLO-5 :	*Identify and solve Web Treats for Organizations: The Evils and Perils*	*3*	*85*	*75*	*H*	*H*	*M*	*H*	*L*	*-*	*-*	*-*	*M*	*L*	*-*	*H*	*-*	*-*	*-*
CLO-6 :	*Apply tools and methods of cyber-crime concepts to solve security problems & Learn about providing Security solutions*	*3*	*80*	*70*	*L*	*H*	*-*	*H*	*L*	*-*	*-*	*-*	*L*	*L*	*-*	*H*	*-*	*-*	*-*

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Getting started with android programming-Introduction	Understanding the component of a screen	Data persistence	Messaging and networking	Location based services
	SLO-2	Android versions and its feature set	Views and viewgroups	Saving and loading user preferences	SMS messaging	Displaying maps
S-2	SLO-1	Android architecture	Absolute layout, table layout, relative layout, frame and scrollview	Using getSharedPreferences() and getPreferences()	Sending SMS messages programmatically	Creating the project
	SLO-2	Android devices in the market	Adapting to display orientation	Persisting data to files	Getting feedback after sending the message	Obtaining the maps API key
S-3	SLO-1	Obtaining the required tools	Managing changes to screen orientation	Saving to internal storage	Sending SMS messages using intent	Displaying the map

	SLO-2	Eclipse, Android SDK, Android Development Tools(ADT)	Detecting orientation changes, Controlling the orientation activity, Creating the user interface programmatically	Saving to external storage,	Receiving SMS messages, Updating an activity from BroadcastReceiver,	Displaying the Zoom control
S-4-5	**SLO-1**	**Lab1:Login page creation with Toast message**	**Lab 4:implement implicit Intent**	**Lab 7: Student Registration form using Listview**	**Lab 10:Shared preferences**	**Lab 13:Simulate paintbrush applications**
S-6	SLO-1	Creating Android Virtual Devices(AVD)	Listening for UI notifications	SQLite database	Invoking an activity from Broadcast Receiver	Changing views
	SLO-2	Example: Creating android application	designing user interface using views	SQLite database Creating and using databases,	Example program: SMS messages	Satelite View
S-7	SLO-1	Anatomy of an Android Application	Basic views	Insert,display and delete	Sending E-mail	Navigating to a specific location
	SLO-2	Real time applications	Picker views	Creating the DBAdapter helper class	Example: How to send email in android application	Adding markers
S-8	SLO-1	Linking activities using intents	List views	Using the database programmatically	Networking	Getting the location that was touched
	SLO-2	Resolving intent filter collision	Displaying pictures and menus with views	Example: Add, retrieve, update, delete a contact	Binary data and Text data	Get coding and reverse geocoding
S-9-10	**SLO-1** **SLO-2**	**Lab 2:Student registration form with Toast message**	**Lab 5:Implement Time Picker**	**Lab 8: Implement Context menu**	**Lab 11:SQLite database**	**Lab 14:Draw an object**
S-11	SLO-1	Returning results from an intent	Using menus with views	Content providers	Accessing Web services	getting location data
	SLO-2	Passing data using an intent object	Some additional views	Sharing data in android using content provider	Performing Asynchronous Calls	Monitoring a location
S-12	SLO-1	Implicit Intent	Context Menu	Predefined query string constants	Downloading text files	Preparing for publishing APK files
	SLO-2	Example program for Implicit Intent	Example program for Context menu	Projections,Filtering,sorting	Example program for downloading textfiles	Deploying apk files
S-13	SLO-1	Explicit Intent	Option menu	Creating your own content providers	downloading binary data	Using adb.exe tool and web server
	SLO-2	Example program for Explicit	Example program for Optional Menu	Using the content providers	Example program for downloading binary data	Android market
S-14-15	**SLO-1** **SLO-2**	**Lab3: Implement Explicit Intent**	**Lab 6:Implement Date Picker**	**Lab 9: Implement Option Menu**	**Lab 12:SQLite database**	**Lab 15:Implement Webview**

Learning Resources	*1.WeiMeng Lee (2012), "Beginning Android Application Development", Wrox Publications (John Wiley, New York) (For 1 to 5 units).*	1.Ed Burnette (2010), "Hello Android: Introducing Google's Mobile Development Platform", The Pragmatic Publishers, 3rd edition, North Carolina USA 2.Reto Meier (2012), "Professional Android 4 Application Development", Wrox Publications (John Wiley, New York). 3.ZigurdMednieks, Laird Dornin, Blake Meike G, Masumi Nakamura (2011), "Programming Android: Java Programming for the New Generation of Mobile Devices", OReilly Media, USA

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	*Dr.S.Gopinathan, Professor, University of Madras, Chennai*	*Dr.S.Umarani, SRMIST*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		

Course Code	PCA20D05J	Course Name	PROGRAMMING USING C#	Course Category	D	*Discipline Elective* Course	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLR-1 :	*To cover the fundamental concepts of the C# language*																		
CLR-2 :	*To learn various C# libraries*																		
CLR-3 :	*To understand the basis of web programming*																		
CLR-4 :	*To understand the basis of Windows Programming*																		
CLR-5 :	*To understand .NET Controls and ActiceX Data Objects*																		
CLR-6 :	*To enable the learner to become an application developer using this language*																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	*Understand the basics of C# and .NET framework*	*3*	*80*	*70*	*H*	*L*	*L*	*L*	*L*	*H*	*L*	*L*	*L*	*L*	*L*	*L*	*H*	-	*H*
CLO-2 :	*Develop applications using object-oriented aspects of C#*	*3*	*85*	*75*	*H*	*L*	*H*	*L*	*H*	*H*	*L*	*L*	*L*	*L*	*L*	*L*	*H*	-	*L*
CLO-3 :	*Design Windows applications*	*3*	*85*	*75*	*H*	*H*	*L*	*H*	*H*	*H*	*L*	*L*	*L*	*H*	*L*	*H*	*L*	-	*H*
CLO-4 :	*Create Database applications using ActiveX Data Objects*	*3*	*85*	*80*	*H*	*H*	*L*	*H*	*H*	*H*	*L*	*L*	*L*	*H*	*L*	*L*	*H*	-	*H*
CLO-5 :	*Develop Web based applications*	*3*	*85*	*75*	*H*	*H*	*L*	*L*	*H*	*H*	*H*	*H*	*H*	*H*	*L*	*H*	*L*	-	*H*
CLO-6 :	*Develop Web based applications with Database Interaction*	*3*	*80*	*70*	*H*	*H*	*L*	*L*	*H*	*H*	*H*	*H*	*H*	*H*	*L*	*H*	*H*	-	*H*

Duration (hour)		15	15	15	15	15
S-1	SLO-1	*Introducing C# - Understanding .NET Framework*	*Class Fundamentals*	*Delegates – Declaration, Methods*	*Programming with Basic Windows Form Controls: Button Control, Label and Link Label Control*	*ADO.Net framework*
	SLO-2	*Origin and Benefits*	*Principles, Defining Class*	*Delegate Instantiation, Invocation*	*Textbox Control, Radiobutton and Checkbox Controls*	*Architecture of .Net Framework*
S-2	SLO-1	*Overview of C#*	*Creating Objects*	*Multicast Delegates*	*Richtextbox Contro, Listbox and CheckedListbox Controls*	*ADO.NET managed providers*
	SLO-2	*Simple C# Program*	*Accessing Objects*	*Implementing Multicast delegates*	*Simple windows*	*Types of Providers*

S-3	SLO-1	*Literals, Variables and Data Types*	*Constructors*	*Console I/O Operations – Console Input, Output*	*ListView Controls, Advanced Windows Form Features*	*Data set – Object Model*
	SLO-2	*Declaration and Initialization of variables*	*Example using Constructors*	*Formatted Output, Numeric Formatting, Standard Numeric Format, Custom Numeric Format*	*Menus and Toolbars*	*DataTable Collection*
S-4-S 5	**SLO - 1**	***Lab 1: Initialization and Declaration, Data types***	***Lab 4: Classes, Constructors***	***Lab 7: Delegates***	***Lab 10: Create Windows Applications***	***Lab 13:Develop Web Applications Using Object Model***
S-6	SLO-1	*Operators and Expressions*	*Indexers and Properties*	Event Handling	*SDI and MDI Applications*	*Data source controls*
	SLO-2	*Evaluation of Expressions*	*Implementation of an indexer and property*	*Application of event with Delegates*	*Building MDI Applications*	*SQL DataSource, AccessDataSource*
S-7	SLO-1	*Program Control Statements: Branching*	*Inheritance*	*Errors and Exception Handling*	*Validation Controls*	*Working with Grid view*
	SLO-2	*If, If else, Elseif*	*Implementation of inheritance*	*Using try, Catch*	*Types of Validation Controls*	*Bind Data Using SQlConnection and SQL Adapter*
S -8	SLO-1	*Program Control Statements: Looping*	Abstract Class, Sealed Class	*Exception Hierarchy*	*Navigation Controls*	*DataList*
	SLO-2	*While, Do While, For*	Case Study	*Implementing Exception Hierarchy*	*Types of Navigation Controls*	*Templates and Events in Datalist*
S-9-S 10	**SLO-1**	***Lab 2:Control Statements***	***Lab 5: Inheritance***	***Lab 8: Exception Handling***	***Lab 11: Develop Web Applications using Validation and Navigation Controls***	***Lab 14: Develop Web Application Using DataSource Control***
S-11	SLO-1	*Methods in C#*	Interface	Custom Exception	*Data Controls*	*Formview*
	SLO-2	*Case Study Using Methods*	*Sample Programs*	*Throwing our own Exceptions*	*Program using Data Controls*	*Displaying Data with Formview Control*
S-12	SLO-1	*Arrays : Array Class, Array List*	*Operator Overloading*	*Multithreading in C#*	*Creating Web Applications*	*Repeater Control*
	SLO-2	*One Dimensional array, Two Dimensional array, Jagged Arrays*	*Overloadable Operators, Defining*	Creating and Starting Thread	*Case Study*	*Templates and Events in Repeater*
S-13	SLO-1	*Arrays : Array Class, Array List*	*Operator Overloading – Unary Operators, Binary Operators*	*Scheduling a Thread*	*Deployment*	*Designing Web Application*
	SLO-2	*One Dimensional array, Two Dimensional array, Jagged Arrays*	*Operator Overloading –Binary Operators*	*Synchronizing Threads*	*Steps to Deployment*	*Steps to Design Web Applications*

S-14-S 15	**SLO-1**	***Lab 3:Arrays***	***Lab 6: Interface, Operator Overloading***	***Lab 9: Custom Exception,Thread***	***Lab 12: Develop Web Applications using Data Controls***	***Lab 15: Develop Web Application Using Form View and Repeater Control***

Learning Resources	1. E. Balagurusamy, "Programming in C#-A Primer" – Fourth Edition, Mc Graw Hill Education. 2. Kogent(2010), "ASP.NET 4.0 Black Book – Platinum Edition", Dreamtech Press,New Delhi	1. Paul Deitel, Harvey Deitel – C# 2010 For Programmers, Deitel Developer Series – Pearson Education – 2011 2. Andrew Troelsen – C# and the .NET Platform – A1 Press – 2003

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	*Dr.S.Gopinathan, Professor, University of Madras, Chennai*	*Mrs. D. Jebeula, SRMIST*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		*Dr.S.Albert Antony Raj , SRMIST*

Course Code	PCA20D06J	Course Name	SOFTWARE TESTING	Course Category	D	Discipline Elective Course	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3
CLR-1 :	*Familiarize the fundamentals of software testing fundamentals*			
CLR-2 :	*Understand the various techniques of White box and Black box Testing*			
CLR-3 :	*Examine basic methodologies of Levels of Testing and Various Testing*			
CLR-4 :	*Develop test cases using manual testing*			
CLR-5 :	*Acquire the latest industry knowledge, tools and comply to the latest global standards for Software testing*			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1 Disciplinary Knowledge	2 Critical Thinking	3 Problem Solving	4 Analytical Reasoning	5 Research Skills	6 Team Work	7 Scientific Reasoning	8 Reflective Thinking	9 Self-Directed Learning	10 Multicultural Competence	11 Ethical Reasoning	12 Community Engagement	13 ICT Skills	14 Leadership Skills	15 Life Long Learning
CLO-1 :	*To impart knowledge on the fundamentals of software testing and Quality assurance*	2	85	80	H	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-2 :	*To provide a complete, comprehensive coverage of various software testing methods*	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-3 :	*To develop test cases using manual testing*	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-4 :	*To enable the learner to become a Software Tester / Quality Assurance Member*	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-5 :	*To enable the learner to practice Automation testing Tool Selenium*	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	*Testing Fundamentals*	*Testing Methodologies*	*Unit testing*	*Automated Testing and Test Tools*	*Introduction to Selenium*
	SLO-2	*The Psychology of Testing*	*White box Vs Black box*	*Examples*	*Examples of various test tools.*	*Selenium Open source tool*
S-2	SLO-1	*Software Testing Principles*	*White box testing Techniques*	*Incremental testing*	*Benefits of test tools*	*Things selenium can automate*
	SLO-2	*Explanation*	*Statement coverage-Decision coverage*	*Incremental Vs Non Incremental testing*	*Software Test Automation*	*Things selenium cannot automate*
S-3	SLO-1	*Code Inspections*	*Condition coverage-Decision-condition coverage*	*Top-down testing*	*Bug Bashes*	*Browsers supported by Selenium*
	SLO-2	*An Error checklist for Inspections*	*Examples*	*Bottom-up testing*	*Beta Testing*	*OS supported by Selenium*
S-4 to S-5	**SLO-1**	***Lab 1: Test Case Design for Arithmetic Calculations***	***Lab 4:Preparation of Test Case Report on Binary Search Program***	***Lab 7: Develop a Employee salary Processing application and Prepare Test Case Report***	***Lab 10: Software Test Automation using testing tool***	***Lab 13: Basic Operation of Selenium Testing tool***
S - 6	SLO-1	*Walkthroughs*	*Multiple-condition coverage*	*System testing*	*Alpha testing Vs Beta testing*	*Programming language supported by Selenium*

	SLO-2	*Desk Checking-Peer ratings.*	*Explanation of examples*	*Categories*	*Writing and Tracking Test Cases*	*Selenium versions*
S-7	SLO-1	*Definition of bug*	*Black box testing techniques*	*Facility-Volume-Stress*	*Test Case Planning Overview*	*History of Selenium – Selenium Core*
	SLO-2	*Reasons for bug occurrence*	*Advantages , Drawbacks*	*Usability-Security*	*goals*	*Selenium Grid – Selenium RC*
S-8	SLO-1	*Cost of bugs*	*Equivalence Partitioning*	*Performance-Storage*	*Bug's Life cycle*	*Selenium Components*
	SLO-2	*Graph Explanation*	*Examples*	*Configuration-Compatibility*	*Explanation with diagram.*	*Selenium Toolset*
S-9 to S-10	**SLO-1**	***Lab 2: Test Case Report for Sorting of n number .***	***Lab 5: Develop a Login Form and Prepare Test Case Report***	***Lab 8: Develop a Flight Reservation application and Prepare Test Case Report***	***Lab 11: Writing and Tracking Test Cases***	***Lab 14:Working with Selenium Components***
S-11	SLO-1	*Role of a software tester*	*Boundary-value analysis*	*Installability,Reliability*	*Bug Tracking System*	*Locators*
	SLO-2	*Software tester traits-*	*Examples*	*Recovery-Serviceability*	*Case study*	*Locators Strategies*
S-12	SLO-1	*Software Development life cycle models*	*Cause-effect graphing*	*Web Site Testing*	*Software Quality Assurance*	*Add ons*
	SLO-2	*Explanation with diagrams*	*Examples*	*Explanation With Example*	*ISO Standards*	*Examples*
S-13	SLO-1	*Testing axioms*	*Error guessing.*	*Testing for Software Security.*	*Test case Design*	*Unit testing Frameworks*
	SLO-2	*Software testing terms and definitions*	*Explanation of examples*	*Explanation With Example*	*Case study*	*Case study:TestNG Unit Testing Frameworks*
S 14-S 15	**SLO-1**	***Lab 3: Preparation of Test Case Report on Triangle Program***	***Lab 6: Develop a Student Mark sheet application and Conducting Testing***	***Lab 9: Web site Testing***	***Lab 12: Bug Tracking System***	***Lab 15:Selenium Web driver Handling***

Learning Resources	1. *Glenford J. Myers (2008), The Art of Software Testing - John Wiley &Sons, Second Edition, New Delhi.(For Units 1,2,3)* 2. *Ron Patton (2007), Software Testing – Pearson Education, Second Edition, New Delhi (For Units 1,3,4)* 3. *Arun Motoori(2019),Selenium - A Brief Overview , ebook. (For Unit 5)*	4. *. William E Perry (2000), Effective Methods for Software Testing, John Wiley & Sons, Second Edition, New York.* 5. *2.Boris Beizer (1995), Black-Box Testing: -Techniques for Functional Testing of Software and Systems, John Wiley & Sons, New York*

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	*Dr.S.Gopinathan, Professor, University of Madras, Chennai*	*1. Mrs.J.Shobana ,SRMIST*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		*2. Dr.S.Albert Antony Raj, SRMIST*

Course Code	PCA20S02J	Course Name	DATA ANALYSIS USING R	Course Category	S	*Skill Enhancement Course*	L	T	P	C
							0	3	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Learn in-depth concepts, methods and applications of data mining																		
CLR-2 :	Learn how to start looking at data from the perspective of the data scientist																		
CLR-3 :	Experimenting with different data mining techniques for knowledge discovery																		
CLR-4 :	Use R software for data import and export, data exploration and visualization, and for data analysis tasks																		
CLR-5 :	Demonstration on how to perform classification and clustering data mining tasks on real time datasets																		
CLR-6 :	Build an effective model and perform model evaluation based on performance metrics																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	Understand Data Mining and its various tasks	2	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-2 :	Perform Linear Regression and Logistic Regression on a dataset	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-3 :	Extract interesting rules from dataset using Association Rule Mining	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-4 :	Apply various Classification Algorithms in data mining	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-5 :	Perform unsupervised learning using various Clustering Techniques	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-6 :	Effectively use R programming constructs and packages to perform mining on different datasets	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-

Duration (hour)		15	15	15	14	15
S-1	SLO-1	Introduction to Data Science	Working with R Programming	Classification in R	Clustering In R	Data Visualization in R
	SLO-2	What is Data Science	Data Types and Syntax	Classification - Introduction	Clustering - introduction	Overview of Data Visualization
S-2	SLO-1	Scenarios on Data Science,	Processing on Variables	Types of Classification	Types of Clustering	Packages
	SLO-2	Data Science and Organization			Application of Clustering,	
S-3	SLO-1	Different types of data	Data Items on Structure	Application of Classification	Overview of K-means,	Interactive Graphics
	SLO-2					

S 4	SLO-1	Lab 1: Implementation of how to install R program and import packages	Lab 4: Implementation of data types in R	Lab 7: Implementation of Decision Tree and KNN in R	Lab 10: Implementation of Kmeans	Lab 13: Implementation of data visualization in R
S 5	SLO-2					
S-6	SLO-1	Structured data	Classes and Manipulate Objects	Overview of DT, Naïve Bayes, KNN, Random forest	Hierarchical, Medoids, DBSCAN	Plotting
	SLO-2	Unstructured data	Control statements IF, ELSE, SWITCH	Introduction – DT, DT Algorithm, Example of DT with R	Packages,	Scatter plot
S-7	SLO-1	Machine generated data	Loop statements FOR	Introduction – Naïve bayes	Introduction – K-means	Box plot, Bar plot,
	SLO-2			Naïve Bayes Algorithm		Pie chart
S-8	SLO-1	Understanding on Data Science Process	WHILE, REPEAT	, Example of Naïve Bayes with R	K-means Algorithm	Histogram
	SLO-2					
S-9-S 10	**SLO-1**	Lab 2: **Implementation of R program - basic**	Lab 5: **Implementation of Control Statements in R**	Lab 8: **Implementation of Naïve Bayes**	Lab 11: **Implementation of mediods**	Lab 14: **Implementation of various charts**
	SLO-2					
S-11	SLO-1	Explain on Research Goal	Working with String and Date	Introduction - KNN	Example of K-means with R	XKD-Style Plots
	SLO-2	Data Processing on Data Science, Getting Start With R	Understanding on Vector	KNN Algorithm, Example of KNN with R	Introduction – Hierarchical	Heat Maps
S-12	SLO-1	Overview of R, Why R for Data Science, Eclipse, Live-R, Project Workspace Setup	List, Data Frames, Working with Arrays	Introduction – Random Forest	Hierarchical Algorithm	Introduction to predictive models
	SLO-2		Read and Write data from CSV,	Random Forest Algorithm,		
S-13	SLO-1	Understanding on R Packages	Tabular Data and Database	Example of Random Forest with R	Example of Hierarchical with R	What is Model?
	SLO-2	Load Libraries and Installed Packages				
S 14-S15	**SLO-1**	**Lab 3: Implementation of R program - basic**	**Lab 6: Implementation of Looping Statements**	**Lab 9: Implementation of Random forest in R**	**Lab 12: Implementation of Hierarchical with R**	**Lab 15: Implementation of predictive model in R**
	SLO-2					

Learning Resources	*1. R for Data Science by Hadley Wickham* *2. Introduction to Data Science, R. Irizarry*	*3. R Programming for Data Science, Roger D Peng* *4. Data Visualization: A practical introduction, by Kieran Healy*

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	-	40%	-	40%	-	40%	-	40%	-	40%
	Understand										
Level 2	Apply	-	40%	-	40%	-	40%	-	40%	-	40%
	Analyze										
Level 3	Evaluate	-	20%	-	20%	-	20%	-	20%	-	20%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	Dr.S.Gopinathan, Professor, University of Madras, Chennai	1.Dr S.Umarani,SRMIST
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		2. Dr.S.Albert Antony Raj, SRM IST

Course Code	PCA20AE2T	Course Name	CAREER ADVANCEMENT– II	Course Category	AE	Ability Enhancement Course	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Career Guidance and Development	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
CLR-1 :	Demonstrate various principles involved in solving mathematical concepts	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	Develop interest and awareness in students regarding profit/ loss, interest calculations and average			
CLR-3 :	Critically evaluate basic mathematical concepts related to mixtures and alligations, permutation and combination, time and work			
CLR-4 :	Provide students with skills necessary to generate and interpret data and concepts related to time, speed and distance and blood relation.			
CLR-5 :	Enable students to understand reasoning skills			
CLR-6 :	Create awareness in students regarding the various concepts in quantitative aptitude and reasoning skills and also its importance in various competitive exams			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Understand, analyze and solve questions based on Profit and Loss, Discount, Simple Interest and Compound Interest.	3	80	70
CLO-2 :	Create, solve, interpret and apply basic mathematical models which are applicable in our day to day life	3	80	75
CLO-3 :	Understand the concepts of time and work, Time, Speed Distance Pipes & Cistern and to approach questions in a simpler and innovative method	3	85	70
CLO-4 :	Understand the concept in Clock, Calendar, Data in different forms and interpretations.	3	85	80
CLO-5 :	Ability to solve the problems on logical reasoning	3	85	75
CLO-6 :	Able to face different competitive exams	3	80	70

Program Learning Outcomes (PLO)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	H	H	M	H	L	M	-	H	-	H	-	H	M	-	H
CLO-2 :	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-3 :	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-4 :	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-5 :	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-6 :	M	H	M	H	-	M	-	H	H	M	-	H	M	-	H

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Percentage-Introduction	Time, Speed and Distance-Introduction	Problems on Trains	Clocks-Concepts Discussion	Logical Reasoning : Puzzles-Concepts
	SLO-2	Percentage - Basic Problems	Time, Speed and Distance-Basic problems	Problems on Trains	Clocks-Problems	Puzzles-Problems
S-2	SLO-1	Percentage - Problems	Time, Speed and Distance-Problems	Races & Games of Skill	Calendars-Introduction of basic concept	Puzzles-Problems

	SLO-2	Percentage - Tricky Problems	Time, Speed and Distance- Tricky problems	Races – Problems	Calendars-Problems	Puzzles- Tricky Problems
S-3	SLO-1	Discount – Basics	Time, Speed and Distance- Tricky problems	Area – Basics	Clock – Tricky Problems	Alphanumeric series - Introduction
	SLO-2	Discount – Problems	Time, Speed and Distance Advanced Problems	Area – Problems	Calendars – Tricky Problems	Alphanumeric series -Different types
S-4	SLO-1	Simple Interest-Introduction & Formulas	Height and distance - Introduction	Volume and Surface Area	Data sufficiency-Introduction and Basics	Alphanumeric series - Problems
	SLO-2	Simple Interest- Problems	Height and distance - Problems	Problems on Volume	Data sufficiency-Problems	Alphanumeric series - Tricky Problems
S-5	SLO-1	Simple Interest- Problems	Height and distance - Problems	Problems on Surface Area	Data sufficiency-Tricky Problems	Cube - Basics
	SLO-2	Simple Interest- Tricky Problems	Height and distance – Tricky Problems	Tricky problems on Area, Volume and Surface Area.	Data sufficiency-Advanced Problems	Cube - Problems
S-6	SLO-1	Compound Interest- Introduction & Formulas	Stocks and shares - Introduction	Geometry-Basics	Data Interpretation – Table	Cube –Tricky Problems
	SLO-2	Compound Interest- Problems	Stocks and shares -Basic problems	Geometry- Formulas	Data Interpretation – Table - Problems	Series – Odd one out- Introduction
S-7	SLO-1	Compound Interest- Problems	Stocks and shares - Problems	Geometry-Problems	Data Interpretation – Bar chart	Series – Odd one out - Problems
	SLO-2	Compound Interest-Tricky Problems	Stocks and shares - Tricky problems	Geometry – Tricky Problems	Data Interpretation – Bar chart - Problems	Series – Odd one out – Tricky Problems
S-8	SLO-1	Partnership – Fact and Formula	Stocks and shares - Tricky problems	Mensuration-Basics	Data Interpretation – Pie chart	Seating Arrangements - Linear
	SLO-2	Partnership – Problems	Problems based on ages - Introduction	Mensuration –Formulas	Data Interpretation – Pie chart - Problems	Seating Arrangements - Linear – Problems
S-9	SLO-1	Partnership – Problems	Problems based on ages - Basics	Mensuration – Problems	Data Interpretation – Line graph	Seating Arrangements – Circular
	SLO-2	Partnership – Tricky Problems	Problems based on ages – Tricky Problems	Mensuration - Tricky Problems	Data Interpretation – Line graph - Problems	Seating Arrangements – Circular – Problems

Learning Resources	1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata McGraw Hill, 5th Edition 2. Dr. Agarwal.R.S, Quantitative Aptitude for Competitive Examinations, S. Chand and Company Limited, 2018 Edition 3. Archana Ram, PlaceMentor: Tests of Aptitude for Placement Readiness, Oxford University Press, Oxford, 2018	4. Edgar Thrope, Test Of Reasoning for Competitive Examinations, Tata McGraw Hill, 6th Edition 5. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for competitive examinations, Pearson, 3rd Edition ***6. P A Anand, Quantitative Aptitude for competitive examinations, Wiley publications, e book, 2019***

Learning Assessment					
Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA-1 (20%)	CLA-2 (20%)	CLA-3 (30%)	CLA-4 (30%) ##
		Theory	Theory	Theory	Theory
Level 1	Remember	10%	10%	30%	15%
	Understand				
Level 2	Apply	50%	50%	40%	50%
	Analyze				
Level 3	Evaluate	40%	40%	30%	35%
	Create				
	Total	100 %	100 %	100 %	100 %

CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Mock interviews, etc.

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers	
Experts from Industry	Internal Experts
1. Ajay Zener, Director, Career Launcher	*1. Dr P Madhusoodhanan, HoD, CDC, E&T, SRMIST*
	2. Dr M Snehalatha, Assistant. Professor, CDC, E&T, SRMIST

SEMESTER III

Course Code	PCA20C07J	Course Name	OBJECT ORIENTED ANALYSIS AND DESIGN	Course Category	C	Professional Core Course	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	To understand the fundamentals of object modeling	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLR-2 :	To understand and differentiate Unified Process from other approaches.																		
CLR-3 :	To design with static UML diagrams.																		
CLR-4 :	To design with the UML dynamic and implementation diagrams																		
CLR-5 :	To improve the software design with design patterns.																		
CLR-6 :	To test the software against its requirements specification																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	Express software design with UML diagrams.	*3*	*80*	*70*	*L*	*H*	*H*	*H*	*H*	*M*	-	*H*	*M*	*H*	-	*H*	-	-	-
CLO-2 :	Design software applications using OO concepts.	*3*	*85*	*75*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-3 :	Identify various scenarios based on software requirements.	*3*	*75*	*70*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-4 :	Transform UML based software design into pattern based design using design patterns	*3*	*85*	*80*	*M*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-5 :	Understand the various testing methodologies for OO software	*3*	*75*	*70*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*M*	-	-	-
CLO-6 :	Apply the concepts of architectural design for deploying the code for software.	*3*	*85*	*80*	*M*	*H*	*H*	*H*	*H*	-	-	*H*	*M*	*L*	-	*H*	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	*Introduction to OOAD with OO Basics*	*Class Diagram*	*Dynamic Diagrams*	*GRASP: Designing objects with responsibilities*	*Object Oriented Methodologies*
S-2	SLO-1	*Unified Process*	*Elaboration – Domain Model*	*UML interaction diagrams*	*Creator – Information expert*	*Software Quality Assurance*
S-3	SLO-1	*UML diagrams-Basics*	*Finding conceptual classes*	*System sequence diagram-Basics*	*Low Coupling*	*Impact of object orientation on Testing*

	SLO-2	*UML diagrams*	*Finding description classes.*	*System sequence diagram*	*High Cohesion*	*Impact of object orientation on Testing - Feedback*
S-4-S-5	**SLO-1**	***Lab 1:Case study – the Next Gen POS system***	***Lab 4: Identify use cases***	***Lab7: Using the identified scenarios, find the interaction between objects and represent them using UML***	***Lab 10: Implement the system as per the detailed design.***	***Lab 13:Improve the reusability and maintainability of the software system***
S-6	SLO-1	Use Case	Associations – Attributes	Collaboration diagram – When to use Communication Diagrams	Controller ,Design Patterns	Develop Test Cases and Test Plans
S-7	SLO-1	*Inception -Use case Modelling*	*Domain model refinement*	*State machine diagram and Modelling –When to use State Diagrams*	*creational – factory method*	*APPLICATIONS-Satellite Based Navigation*
S-8	SLO-1	*Relating Use cases*	*Finding conceptual class Hierarchies*	*Activity diagram – When to use activity diagrams*	*Adapter – behavioural*	*Traffic Management*
S-9-S10	**SLO-1**	***Lab 2 :Identify a software system that needs to be developed.***	***Lab 5: Develop the Use Case model***	***Lab 8:Sequence and Collaboration Diagrams.***	***Lab 11: package diagrams - Component and Deployment Diagrams.***	***Lab 14 By applying appropriate design patterns.***
S-11	*SLO-1*	*include, extend and generalization.*	*Aggregation and Composition*	*Implementation Diagrams - UML package diagram*	*Strategy – observer*	*Crypt Analysis*
S-12	*SLO-1*	*When to use Use-cases*	*- Relationship between sequence diagrams and use cases*	*When to use package diagrams - Component and Deployment Diagrams*	*Applying GoF design patterns*	*Weather Monitoring Station,*
S-13	*SLO-1*	*UML modeling tool*	*When to use Class Diagrams*	*When to use Component and Deployment diagrams*	*Mapping design to code*	*Vacation Tracking System.*
S-14-15	**SLO-1**	***Lab 3: Document the Software Requirements Specification (SRS) for the identified system.***	***Lab 6: Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.***	***Lab 9: Draw relevant State Chart and Activity Diagrams for the same system***	***Lab 12: Test the software system for all the scenarios identified as per the use case diagram.***	***Lab 15: Implement the modified system and test it for various scenarios.*** ***SUGGESTED DOMAINS FOR MINI-PROJECT:*** ***1.Passport automation system.*** ***2. Book bank*** ***3. Exam registration*** ***4. Stock maintenance system.*** ***5.Online course reservation system***

Learning Resources	*1. Craig Larman, —Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development‖, Third Edition, Pearson Education, 2005.* *2. Ali Bahrami - Object Oriented Systems Development - McGraw Hill International Edition – 1999.*	*1. Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, —Design patterns: Elements of Reusable Object-Oriented Software‖, Addison-Wesley, 1995.* *2. Martin Fowler, —UML Distilled: A Brief Guide to the Standard Object Modeling Language‖, Third edition, Addison Wesley, 2003.*

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	20%	20%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	10%	10%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Mock interviews, etc.

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	Dr.S.Gopinathan, Professor, University of Madras, Chennai	*Mr.D.B.Shanmugam, SRMIST*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		

Course Code	PCA20D07J	Course Name	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	Course Category	D	*Discipline Elective* Course	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3
CLR-1 :	*Gain knowledge about Artificial Intelligence(AI) and Heuristic search technique*			
CLR-2 :	*Gain knowledge about Knowledge representations and Predicate logic*			
CLR-3 :	*Understand Machine Learning and concept learning, Develop a Learning System*			
CLR-4 :	*Understand and Apply real time problem using Artificial Intelligence* *Understand and Apply Machine Learning in Gaming development*			
CLR-5 :	*Practice the Machine Learning Models*			
CLR-6 :	*Understand the Decision tree and , Neural Network and Genetic algorithm*			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1 Disciplinary Knowledge	2 Critical Thinking	3 Problem Solving	4 Analytical Reasoning	5 Research Skills	6 Team Work	7 Scientific Reasoning	8 Reflective Thinking	9 Self-Directed Learning	10 Multicultural Competence	11 Ethical Reasoning	12 Community Engagement	13 ICT Skills	14 Leadership Skills	15 Life Long Learning
CLO-1 :	*Gain knowledge about Artificial Intelligence and Heuristic search technique*	*2*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	*M*	-	*H*	*M*	*H*	-	*H*	-	-	-
CLO-2 :	*Gain knowledge about Knowledge representations and Predicate logic*	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-3 :	*Understand Machine Learning and concept learning, Develop a Learning System*	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-4 :	*Understand and Apply real time problem using Artificial Intelligence* *Understand and Apply Machine Learning in Gaming development*	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-5 :	*Understand the Decision tree and , Neural Network and Genetic algorithm*	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-6 :	*Practice the Machine Learning Models*	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-

Duration(hour)		15	15	15	15	15
S-1	SLO-1	*Definitions*	*Knowledge representations*	*Learning*	*Learning with Trees*	*Introduction about Neural Network*
S-2	SLO-1	*History of Artificial Intelligence*	*Representation and Mapping*	*Types of Machine Learning*	*Basic Decision tree algorithm*	*Neural Network representation*
S-3	SLO-1	*AI Problems and AI Techniques*	*Approaches in Knowledge representations*	*Supervised Learning*	*Hypothesis space search*	*Types of Neural Network*

	SLO-2	*Demonstration of water Jug problem*	*Explanations of different types of Knowledge*	*Perspectives and Issues in Machine Learning*	*Decision tree and Inductive Bias*	*Application of Neural Network using ppt*
S-4 to S-5	SLO-1	***Lab 1 : Simple AI Techniques implementation***	***Lab : 4 Knowledge implementation***	***Lab : 7 Concept Learning task***	***Lab : 10 Decision tree implementation***	***Lab : 13 Neural Network model implementation***
S-6	SLO-1	*Production System Characteristics*	*Predicate logic*	*Concept Learning as a search*	*Unsupervised Learning*	*Perceptronand Multi-layer perceptron*
S-7	SLO-1	*Game Planning*	*First order Predicate Logic (FOPL)*	*Reinforcement Learning*	*Clustering techniques*	*Convergence andlocal minima*
S-8	SLO-1	*Heuristic Search Techniques*	*Representing Knowledge using Rules*	*Importance of Reinforcement Learning*	*K- Means algorithm*	*Activation functionsandSigmoid functions*
S-9 to S-10	SLO-1	***Lab 2 : Implementation of Tic-Tac-Toe Game and Travelling Sales man problem***	***Lab : 5 Implementations of FOPL and Rules***	***Lab : 8 Design a Learning System***	***Lab : 11 Implementation of Decision tree and K- Mean algorithm***	***Lab : 14 Implementation of Multi-layer neural network***
S-11	SLO-1	*Revolutions of AI*	*Knowledge Acquisition*	*Candidate Elimination Algorithm*	*ID3 algorithm*	*Backpropagation algorithm*
S-12	SLO-1	*Intelligent Agents*	*Ontology*	*Hypothesis space Version space*	*Entropy calculation*	*Feed Forward Neural Network*
S-13	SLO-1	*Demonstrations of AI real-time examples*	*Syntax and semantic of FOL*	*Mushroom dataset*	*Measure Information gain*	*Genetic algorithm*
S14-S 15	SLO-1	***Lab 3 : Implementation of intelligent agents***	***Lab : 6 Implementation of Ontology and FOL***	***Lab : 9 Implementation of candidate elimination algorithm***	***Lab : 12 Implementation of ID3 algorithm***	***Lab : 15 Applying Backpropagation and genetic algorithm***

Learning Resources	1. Rich Elaine & Kevin Knight – Artificial Intelligence – Tata McGraw Hill - 1993 2. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997. (Chapters : 1, 2, 3, 4, 8 and 9)	3. Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense of Datall, First Edition, Cambridge University Press, 2012. 4. Stephen Marsland, —Machine Learning –An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	*Dr.S.Gopinathan, Professor, University of Madras, Chennai*	*1. Dr. Agusthiyar Ramu SRMIST*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		

Course Code	PCA20D08J	Course Name	CLOUD COMPUTING	Course Category	D	Discipline Elective Course	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning

		Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	An overview of Distributed Systems and its algorithm.	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLR-2 :	To understand the concepts of Cloud Computing and Learn about various public cloud services																		
CLR-3 :	To explore about Web Services and Service Oriented Architecture.																		
CLR-4 :	To learn about Cloud Management Products, Cloud Storage and Cloud Security.																		
CLR-5 :	To know about Google App Engine, AWS and Azure.																		
CLR-6 :	To Learn about Cloud Computing Ideologies, Paradigm and its implementation.																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	Implement various Distributed algorithms.	3	80	70	L	H	H	H	H	M	-	H	M	H	-	H	-	-	-
CLO-2 :	Use Google collaboration tools and several public cloud services.	3	85	75	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-3 :	Recognize and Implement the Levels of Virtualization.	3	75	70	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-4 :	Use security tools, finding the vulnerabilities and also to Generate a detailed report.	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-5 :	Install and configure Open Stack and launch VMs in AWS and Azure.	3	85	75	M	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-6 :	Gain an insight of Cloud Computing its Implementation, Management and Security.	3	80	70	M	H	H	H	H	M	-	M	M	L	-	H	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	*Introduction to Distributed Systems*	*Introduction to Cloud Computing*	*Introduction to Web Service and Service Oriented Architecture*	*Resource Provisioning and Methods*	*HDFS MapReduce*
S-2	SLO-1	*Characteristics*	*Evolution of Cloud Computing*	*SOAP – REST – Basics of Virtualization*	*Cloud Management Products*	*Google App Engine (GAE)*
S-3	SLO-1	*Issues in Distributed Systems*	*Cloud Characteristics- Elasticity in Cloud*	*Full and Para Virtualization*	*Cloud Storage – Provisioning Cloud Storage*	*Programming Environment for GAE*
S-4-S-5	**SLO-1**	***Lab 1: Practical - Implement RPC and Bankers algorithm.***	***Lab 4: Use Google collaboration tools: Create***	***Lab 7: Create a simple web service using Python***	***Lab 10: Use security tools like ACUNETIX, ETTERCAP to***	***Lab13: Install and configure OpenStack all-in-one using Devstack/Packstack.***

			Google Docs, Sheets and Slides and share it with other users.	***Flask/Java/any language [Web Service: Client-server model should be implemented using socket/http].***	***scan web applications on the cloud.***	
S-6	SLO-1	*Distributed System Model*	*On-demand Provisioning*	*Implementation Levels of Virtualization*	*Managed and Unmanaged Cloud Storage*	*Architecture of GFS*
S-7	SLO-1	*Request/Reply Protocols*	*NIST Cloud Computing Reference Architecture*	*Tools and Mechanisms*	*Cloud Security Overview*	*Case Studies: Openstack, Heroku and Docker Containers*
S-8	SLO-1	*RMI*	*Architectural Design Challenges*	*Virtualization of CPU*	*Cloud Security Challenges*	*Amazon EC2*
S-9-10	**SLO-1**	***Lab 2: Create and distribute a Torrent file to share a file in LAN Environment.***	***Lab 5: Explore public cloud services like Amazon, Google, Sales Force, Digital Ocean etc***	***Lab 8:Install Oracle Virtual Box/VMware Workstation and create a chat application [Note: Launch two virtual machines for chat application].***	***Lab 11: Cloud networks for finding vulnerabilities, verifying leakage of information to an unauthorized third party.***	***Lab 14: Launch VMs in OpenStack through dashboard.***
S-11	SLO-1	*Logical Clocks and Casual Ordering of Events*	*Deployment Models: Public, Private and Hybrid Clouds*	*Memory – I/O Devices*	*Architecture Design – Virtual Machine Security*	*AWS*
S-12	SLO-1	*RPC- Election Algorithm*	*Service Models: IaaS- PaaS – SaaS*	*Desktop Virtualization*	*Security – Application Security*	*Microsoft Azure*
S-13	SLO-1	*Distributed Mutual Exclusion - Distributed Deadlock Detection Algorithms*	*Benefits of Cloud Computing.*	*Server Virtualization.*	*Data Security*	*Google Compute Engine.*
S-14-15	**SLO-1**	***Lab 3: Demonstration and assessment of the implemented algorithms.***	***Lab 6: Quizzes on different service models and deployment models. Report submission - Comparison of various services provided by different Cloud Service Providers (configuration of VM, cost, network bandwidth etc.).***	***Lab 9: Review web services implementation - Proper Connection should be established between the client and server to make use of the service offered by the Server. Review the working of application in virtual environment.***	***Lab12: Report submission - Generate a detailed report describing vulnerabilities along with the suitable action that can be taken to remedy the loopholes.***	***Lab 15: OpenStack Dashboard should be accessed though web browser. Verify the working of instance by logging into it/pinging the instance.***

Learning Resources	*1. Andrew S. Tanenbaum, Maarten Van Steen, "Distributed Systems - Principles and Paradigms", Second Edition, Pearson, 2006.* *2. Buyya R., Broberg J., Goscinski A., "Cloud Computing: Principles and Paradigm", John Wiley& Sons, 2011.*	*1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.* *2. Mukesh Singhal, "Advanced Concepts In Operating Systems", McGraw Hill Series in Computer Science, 1994.* *3.John W.Rittinghouse, James F.Ransome, "Cloud Computing: Implementation "Management, and Security", CRC Press, 2010.*

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	Dr.S.Gopinathan, Professor, University of Madras, Chennai	***Dr.J.Dhilipan, SRMIST***
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		

Course Code	*PCA20D09J*	Course Name	INTERNET OF THINGS (IoT)	Course Category	D	*Discipline Elective Course*	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3
CLR-1 :	Demonstrate the design, communication model and enabling technologies for IoT.			
CLR-2 :	Explore the system management and domain for various applications of IoT			
CLR-3 :	Categorize the various protocols that are used for developing IoT applications.			
CLR-4 :	Deploy an IoT application and connect to the cloud.			
CLR-5 :	Develop IoT application for real time scenario			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1 Disciplinary Knowledge	2 Critical Thinking	3 Problem Solving	4 Analytical Reasoning	5 Research Skills	6 Team Work	7 Scientific Reasoning	8 Reflective Thinking	9 Self-Directed Learning	10 Multicultural Competence	11 Ethical Reasoning	12 Community Engagement	13 ICT Skills	14 Leadership Skills	15 Life Long Learning
CLO-1 :	Apply the knowledge/understanding of mathematics, science, to the solution of complex problems applicable to the discipline	*3*	*80*	*70*	*L*	*H*	-	*H*	*L*	-	-	-	*L*	*L*	-	*H*	-	-	-
CLO-2 :	Design, implement, and evaluate a computer-based system, process, component, or program to meet desired solutions that meet the specified needs with suitable concern for the public health and safety, and the cultural, societal, and environmental considerations.	*3*	*85*	*75*	*M*	*H*	*L*	*M*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-3 :	Create, select, and apply applicable techniques, resources, and modern engineering and IT tools to complex engineering activities with an understanding of the limitations.	*3*	*75*	*70*	*M*	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-4 :	Function successfully as an individual, and as a member or leader in assorted teams, and in multidisciplinary settings.	*3*	*85*	*80*	*M*	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-5 :	Prove knowledge and understanding of the engineering and management principles and apply the same to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	*3*	*85*	*75*	*H*	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	*Introduction*	*Introduction*	*Introduction about Iot protocols*	*IoT Platforms Design Methodology*	*Introduction about RESTful API*

	SLO-2	*Definition& Characteristics of IoT*	*Application of IoT*	*Infrastructure , 6LowPAN, Architecture of 6LowPAN*	*Purpose & Requirements, process model specification, domain model specification*	*Designing a RESTful Web API*
S-2	SLO-1	*Physical design of IoT*	*Home Automation*	*Ipv6, Architecture of Ipv6*	*Information model specifications, service specifications, Iot level specifications*	*Amazon Web Services*
	SLO-2	*Things in IoT,*	*Cities,Industry, Health & Lifestyle*	*Comms / Transport*	*Functional view specifications, operational view specifications.*	*Amazon Web Services for IoT*
S-3	SLO-1	*IoT protocols*	*Discuss Health*	*Wifi,*	*Device & component Integration, Application development*	*Creating a ID in Amazon*
	SLO-2	*logical Design of IoT*	*Lifestyle problem*	*Bluetooth,*	*IoT System for Weather Monitoring, Purpose & Requirements, process model specification, domain model specification, Information model specifications, service specifications, Iot level specifications*	*EC2, Implementation of EC2, Autoscaling*
S 4 – S 5	**SLO-1**	**Lab 1: Define and Explain Eclipse IoT Project.**	**Lab 4: Sketch the architecture of IoT**	**Lab 6: Describe gateway as a service deployment in Iot toolkit .**	**Lab 10: Give overview of Zetta.**	**Lab 13: Smart Irrigation System**
S-6	SLO-1	*IoT Functional Blocks* ,IoT Communication Model	*M2M*	*mDNS , Discovery, Physical Web*	Functional view specifications, operational view specifications.	Implementation of Autoscaling
	SLO-2	and IoT Communication APIs	*Architecture of M2M*	*DNS-SD*	Device & component Integration, Application development	S3
S-7	SLO-1	IoT Enabling Technologies	SDN, Architecture of SDN	*Data Protocols*	IoT System for Agriculture	Implementation of S3
	SLO-2	Wireless Sensor Networks, Cloud Computing, Big Data Analytics	NFV for IOT, Architecture of NFV	MQTT, Examples of MQTT, Difference between MQTT and HTTP	Purpose & Requirements, process model specification, domain model specification	RDS
S-8	SLO-1	Communication Protocols, Embedded Systems	IoT System Management	CoAP	Information model specifications, service specifications, Iot level specifications	Implementation of RDS
	SLO-2	IoT Levels and Deployment Templates, Levels 0	Advantages of IoT system management, Need for IoT Systems Management	AMQP	Functional view specifications, operational view specifications. Device & component Integration, Application development	DynamoDB, Implementation of DynamoDB, Kinesis
S-9-S 10	**SLO-1**	**Lab 2: List and summarize few Eclipse IoT Projects.**	**Lab 4:Demonstrate a smart object API gateway service**	**Lab 7:Explain application framework and embedded software agents for IoT toolkit**	**Lab 11: Home Automation – Level 0**	**Lab 14: Weather Reporting Systems**

			reference implementation in IoT toolkit			**Lab 15: Air Pollution Monitoring System**
S-11	SLO-1	Levels 1, Levels 2	Disadvantages of IoT system management	Types of CoAP	Introduction to Cloud Storage Models, Arduino	Implementation of Kinesis
	SLO-2	Levels 3	Simple Network Management Protocol	Request and Response methods	Rasberry pi, Explanation of raspberry pi pin diagram	Case studies – Environment IoT systems for weather Reporting Bot Air Pollution Monitoring System Forest Fire Detection Case studies - IoT system for Energy Smart grid Renewable Energy Systems
S-12	SLO-1	Level 4	Limitations of SNMP	Pros and Cons of CoAP	Introduction to Cloud StorageCommunication APIs	
S-13	SLO-1	Level 5, IOT Applications	Network Operator, Requirements	Semantic, JSON- LD	Python Web Application Framework, Django Architecture Design of Weather Monitoring using Django, Starting Development with Django Toolkit	
S-14-S 15	**SLO-1**	**Lab 3:Smart Lighting**	**Lab 5: Write and explain working of an HTTP- to-CoAP semantic mapping proxy in IoT toolkit.**	**Lab 8: Explain working of Raspberry Pi.** **Lab 9: Connect Rasberry Pi with your existing system components**	**Lab 12: Home Automation – Level 4**	

Learning Resources	1. ArshdeepBahga and Vijay Madisetti, “Internet of Things - A Hands-on Approach”, Universities Press, 2015.(Unit I – Unit V) 2. Dieter Uckelmann et.al, “Architecting the Internet of Things”, Springer, 2011. 3. CunoPfister, “Getting Started with the Internet of Things”, O’Reilly, 2011.	4. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, Wiley, 2014. 5. HonboZhou , “The Internet of Things in the Cloud: A Middleware Perspective “, CRC Press , 2012. 6. Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things – Key applications and Protocols”, Wiley, 2012.

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	Dr.S.Gopinathan, Professor, University of Madras, Chennai	*Dr.S.Umarani, SRMIST*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		

Course Code	PCA20P01L	Course Name	INTERNSHIP	Course Category	P	Project Work, Internship In Industry / Higher Technical Institutions	L	T	P	C
							-	-	-	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3
CLR-1 :	Demonstrate skills learnt in the real time environment.			
CLR-2 :	Explore the different industries that are using IT			
CLR-3 :	Enhance the skills in the system aspects			
CLR-4 :	Understanding the professional connections with the knowledge learnt			
CLR-5 :	Applying the skills in problem solving			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1 Disciplinary Knowledge	2 Critical Thinking	3 Problem Solving	4 Analytical Reasoning	5 Research Skills	6 Team Work	7 Scientific Reasoning	8 Reflective Thinking	9 Self-Directed Learning	10 Multicultural Competence	11 Ethical Reasoning	12 Community Engagement	13 ICT Skills	14 Leadership Skills	15 Life Long Learning
CLO-1 :	To get an insight of an industry and organization/company	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	H	H
CLO-2 :	To gain valuable skills and knowledge	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	H	H
CLO-3 :	To make professional connections and enhance networking	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	H	H
CLO-4 :	To get experience in a field to allow the student to make a career transition	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	H	H
CLO-5 :	To get an inside view of an industry and organization/company	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	H	H

Students can choose a company of their own interest for internship for a period of minimum four weeks to learn about the application of IT in real time environment. In the first week of July, all the students have to give a presentation about their observations made by them in internship. At the end of the internship period, every student shall submit a structured internship report within 15 days from the date of the completion of the internship period.

Learning Assessment				
Project Work / Internship	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)	
	Review – 1	Review – 2	Internship Report	Viva-Voce
	20%	30 %	30 %	20 %

Course Code	PCA20P02L	Course Name	MINI PROJECT WORK	Course Category	P	Project Work, Internship In Industry / Higher Technical Institutions	L	T	P	C
							0	0	12	6

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3
CLR-1 :	Demonstrate skills learnt in the real time environment.	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	Explore the different industries that are using IT			
CLR-3 :	Enhance the skills in the system aspects			
CLR-4 :	Understanding the professional connections with the knowledge learnt			
CLR-5 :	Applying the skills in problem solving			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1 Disciplinary Knowledge	2 Critical Thinking	3 Problem Solving	4 Analytical Reasoning	5 Research Skills	6 Team Work	7 Scientific Reasoning	8 Reflective Thinking	9 Self-Directed Learning	10 Multicultural Competence	11 Ethical Reasoning	12 Community Engagement	13 ICT Skills	14 Leadership Skills	15 Life Long Learning
CLO-1 :	To get an inside view of an industry and organization/company	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	To gain valuable skills and knowledge	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	To make professional connections and enhance networking	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	To get experience in a field to allow the student to make a career transition	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	To get an inside view of an industry and organization/company	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-

Students can choose a company of their own interest for internship for a period of minimum four weeks to learn about the application of IT in real time environment. In the first week of July, all the students have to give a presentation about their observations made by them in internship. At the end of the internship period, every student shall submit a structured internship report within 15 days from the date of the completion of the internship period.

Learning Assessment				
	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)	
Project Work	Review – 1	Review – 2	Project Report	Viva-Voce
	20%	30 %	30 %	20 %

Course Code	PCA20G01T	Course Name	SOFTWARE PROJECT MANAGEMENT	Course Category	G	Generic Elective Course	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	To develop an awareness of the need for project planning and management.			
CLR-2 :	To know about software effort estimation and activity planning.			
CLR-3 :	To explore risk and people management.			
CLR-4 :	To learn about project monitoring and control mechanisms.			
CLR-5 :	To know about software quality management.			
CLR-6 :	To Learn About Process Models.			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLO-1 :	Differentiate between various software process models.	2	85	80	L	H	H	H	H	M	-	H	M	H	-	H	-	-	-
CLO-2 :	Prepare project planning documents.	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-3 :	Estimate the software cost for projects.	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-4 :	Perform effective activity planning.	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-5 :	Prepare effective project scheduling work product.	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-6 :	Perform software quality management activities.	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Basics of SPM : Definition	Software Effort Estimation:	Categories of Risk	Creating the Framework	Managing Contracts: The ISO 12207 Approach,
	SLO-2	Software Projects Versus Other Types of Project	Problems with Over and Under Estimates	Framework for Dealing with Risk	Creating the Framework	Supply Process, Types, Stages
S-2	SLO-1	Contract Management	Basis of Software Estimating	Risk Identification	Collecting the Data:	Contract Management
	SLO-2	Technical Project Management	Software Estimating – Techniques	Risk Assessment	Partial Completion Reporting	Managing People
S-3	SLO-1	Activities – Plans, Methods	Expert Judgment	Risk Planning	Risk Reporting –	Organizing Teams:
	SLO-2	Methodologies	Cosmic Full Function Points	Risk Management	Visualizing Progress: Gantt chart	Understanding Behaviour

S-4	SLO-1	Requirement Specification – Management Control	A Procedural Code Oriented Approach-COCOMO: A Parametric Model	Evaluating Risks to the Schedule	Slip chart – Ball Charts	Organizational Behaviour, Motivation
S-5	SLO-1 SLO-2	Overview of Project Planning	Activity Planning: Objectives – Project Schedules	Applying the PERT Technique	The Timeline – Cost Monitoring	The Oldham-Hackman Job Characteristics Model
S-6	SLO-1	. Introduction to Step Wise Project Planning.	Projects and Activities – Sequencing and Scheduling Activities	Monte Carlo Simulation – Critical Chain Concepts	Earned Value Analysis	Decision Making, Leadership
S-7	SLO-1	Introduction to Step Wise Project Planning – Programme Management and Project Evaluation:	– Network Planning Models – Formulating A Network Model	Resource Allocation: Nature of Resources	Prioritizing Monitoring	Dispersed and Virtual Teams, Software Quality – Importance
S-8	SLO-1	Programme Management, Benefits, Evaluation, Technical Assessment, Cost -Benefit Analysis, Risk Evaluation	Identifying Critical Path – Shortening the Project Duration	Identifying Resource Requirements – Scheduling Resources	Getting the Project Back to Target	Defining Software Quality, ISO 9126, Software Quality Measures
S-9	SLO-1 SLO-2	Selection of an Appropriate Project Approach: Choosing Technologies, Process Models, Software Prototyping, Dynamic Systems Development Method, Managing Iterative Processes.	Identifying Critical Activities – Activity-on-arrow Networks	Creating Critical Paths – Counting the Cost – Cost Schedules – Scheduling Sequence.	Change Control.	Product Versus Process Quality Management, External Standards, Quality Plans

Learning Resources	1. Bob Hughes, Mike Cotterell, “Software Project Management”, Fourth Edition, Tata McGraw-Hill, 2011.	1. Walker Royce, “Software Project Management: A Unified Framework”, Pearson Education, 2004. 2. Rishabh Anand, “Software Project Management”, S. K. Kataria, 2013. 3. S. A. Kelkar, “Software Project Management: A Concise Study Paperback”, Prentice Hall of India, 2013.

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	20%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	*Dr.S.Gopinathan, Professor, University of Madras, Chennai*	*Mr.D.B.Shanmugam, SRMIST*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		

Course Code	PCA20G02T	Course Name	DATA WAREHOUSE AND DATA MINING	Course Category	G	Generic Elective Course	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3
CLR-1 :	Gain knowledge about Data mining and Knowledge Discovery Process			
CLR-2 :	Practice the Data mining Tools to apply Data mining algorithms			
CLR-3 :	Understand and Apply Association rule mining techniques Understand and Apply various Classification algorithms			
CLR-4 :	Gain knowledge on the concepts of Cluster and Outlier Analysis			
CLR-5 :	Gain knowledge about Data Warehouse manager, Query manager and DW Schema			
CLR-6 :	Understand the partitioning and backup technologies			

Course Learning Outcomes (CLO):	To facilitate access to funding for long-term investment needs	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1 Disciplinary Knowledge	2 Critical Thinking	3 Problem Solving	4 Analytical Reasoning	5 Research Skills	6 Team Work	7 Scientific Reasoning	8 Reflective Thinking	9 Self-Directed Learning	10 Multicultural Competence	11 Ethical Reasoning	12 Community Engagement	13 ICT Skills	14 Leadership Skills	15 Life Long Learning
CLO-1 :	Understand the Data mining concepts and KDD process	3	80	70	L	H	H	H	-	H	H	L	H	L	H	M	H	H	H
CLO-2 :	Understand and Apply Association rule mining and classification techniques in real world scenario	3	85	75	M	H	H	L	L	H	M	L	L	L	-	L	H	L	H
CLO-3 :	Gain knowledge about Cluster & Outlier Analysis	3	75	70	M	L	H	L	M	H	H	M	M	L	L	H	L	L	H
CLO-4 :	Understand the importance of applying Data mining concepts in different domains	3	85	80	M	M	H	M	M	H	H	M	M	L	L	M	-	M	H
CLO-5 :	Gain knowledge on Data warehouse and different types of Schema concepts	3	75	70	H	M	H	M	M	H	H	L	L	L	M	M	-	H	L
CLO-6 :	Understand the partitioning and backup technologies	3	85	80	L	H	H	H	-	M	H	H	H	L	H	L	M	H	H

Duration (hour)		9	9	9	9	9
S1	SLO1	Why Data mining? What is Data mining?	Visualization techniques	Introduction to data warehouse architecture	Data warehouse partitioning and needs	Introduction of data marts
S2	SLO1	Kinds of data, information and knowledge	Measures Likelihood & distance	Process architecture: Load manager	Horizontal partitioning	Estimation of design cost
S3	SLO1	Data mining tools and applications	Neural Networks, Decision tree technique	Data warehouse manager, Query manager	Vertical partitioning Comparison of partitioning	Meta data
	SLO2			Quiz exam	Explain partitioning using ppt	

		Explain data, information and Knowledge through real time examples using ppt	*Constructing Decision tree for real time applications*			*Explanation of Data mart and meta data by role play*
S4	**SLO1**	*Knowledge Discovery in Database*	*ID3 algorithm*	*Data warehouse Objects*	*Hardware partitioning*	*Backup*
S5	**SLO1**	*Data mining architecture and Data mining operations*	*Genetic algorithm*	*Fact table, Dimension table*	*Software partitioning*	*Types of Backup*
S6	**SLO1**	*Issues in Data mining*	*Crossover, mutation techniques*	*Data warehouse users*	*Types of Software partitioning*	*Hot and Cold backup, Sure west online backup*
S7	**SLO1**	*Demonstration on data mining algorithms*	*Demonstration of Neural Networks Decision tree and genetic algorithms*	*Compare and explain OLTP and OLAP*	*Demonstration of partitioning and its types*	*Backup the data warehouse*
S8	**SLO1**	*Anatomy of data mining*	*Clustering, K-Means algorithm*	*Data warehouse schema, star schema*	*Design fact tables*	*Disaster recovery procedure and Various recovery models*
S9	**SLO1**	*Learning and types*	*Association Rule Mining and Apriori algorithm*	*Snowflake schema and Fact constellation schema*	*Design summary table*	*Testing and types*

Learning Resources	1. Prabhu S, Venkatesan N (2006), Data Mining & Warehousing – New Age International – First Edition, New Delhi 2. Sam Anahory, Dennis Murray (2004), Data warehousing in real world – Pearson Education, New Delhi	1. Pieter Adriaans, Dolf Zantinge (2005), Data Mining – Pearson education, New Delhi. 2. Alex Berson, Stephen J Smith (2004), Data Warehousing, Data mining & OLAP – Tata McGraw Hill Publications, New Delhi.

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	40%	-	30%	-	30%	-	30%	-	30%	-
Level 2	Apply Analyze	40%	-	40%	-	40%	-	40%	-	40%	-
Level 3	Evaluate Create	20%	-	30%	-	30%	-	30%	-	30%	-
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	Dr.S.Gopinathan, Professor, University of Madras, Chennai	Dr. Agusthiyar Ramu SRMIST
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		

Course Code	PCA20G03T	Course Name	ORGANIZATIONAL BEHAVIOR AND PROFESSIONAL ETHICS	Course Category	G	Generic Elective Course	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	To identify their personality type and behavioral pattern	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLR-2 :	To identify the basic skills of leadership																		
CLR-3 :	To apply the principles of conflict resolution and learn about group behavior																		
CLR-4 :	To understand the concepts of computer ethics in work environment																		
CLR-5 :	To understand the threats in computing environment																		
CLR-6 :	To understand the intricacies of accessibility issues																		
Course Learning Outcomes (CLO):	*To facilitate access to funding for long-term investment needs*																		
CLO-1 :	Demonstrate the applicability of the concept of organizational behavior to understand the behavior of people in the organization	*3*	*80*	*70*	*L*	*H*	*H*	*H*	*H*	*M*	-	*H*	*M*	*H*	-	*H*	*H*	-	*M*
CLO-2 :	Demonstrate the applicability of analyzing the complexities associated with management of individual behavior in the organization	*3*	*85*	*75*	*M*	*M*	*H*	*H*	*H*	-	-	*M*	*M*	*M*	-	*H*	*M*	-	*L*
CLO-3 :	Analyze the complexities associated with management of the group behavior in the organization.	*3*	*75*	*70*	*M*	*M*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	*M*	-	*H*
CLO-4 :	Ethical, social and environmental awareness	*3*	*85*	*80*	*L*	*L*	*H*	*H*	*H*	*M*	-	*M*	*L*	*H*	*M*	*H*	*M*	-	-
CLO-5 :	Professional's rights and responsibilities act in morally desirable ways, towards moral commitment and responsible conduct	*3*	*75*	*70*	*H*	*H*	*H*	*H*	*H*	*L*	-	*M*	*H*	*L*	*L*	*H*	-	*L*	-
CLO-6 :	Integrating academic learning with experimental learning in a profession	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	*H*	-	*M*	*M*	*L*	*H*	*H*	-	*L*	-

Duration (Hours)		9	9	9	9	9
S-1	SLO-1	*What Is Organizational Behavior?*	*Diversity- Biographical Characteristics-*	*A general Introduction – Computer ethics: an overview*	*Aspects of computer crime - Introduction - What is computer crime*	*Introduction – Principle of equal access – Obstacles to access for individuals –*
	SLO-2					

S-2	SLO-1 SLO-2	*The importance of interpersonal skills*	*Ability- Implementing Diversity Management Strategies-*	*Identifying an ethical issue – Ethics and law – Ethical theories*	*computer security measures – Professional duties and obligations -*	*professional responsibility - Empowering computers in the workplace –*
S-3	SLO-1 SLO-2	*What managers Do*	*ETHICAL DILEMMA- Board Quotas-*	*Professional Code of conduct – An ethical dilemma*	*Intellectual Property Rights*	*Introduction – computers and employment – computers and the quality of work –*
S-4	SLO-1 SLO-2	*Organizational behavior-*	*Case incidents-Defining Motivation- Early Theories of Motivation-*	*A framework for ethical decision making*	*The nature of Intellectual property*	*computerized monitoring in the work place – telecommuting –*
S-5	SLO-1 SLO-2	*Complementing intuitions with systematic study*	*Contemporary Theories of Motivation-*	*Computer hacking – Introduction –definition of hacking*	*Intellectual Property Patents, Trademarks, Trade Secrets,*	*social, legal and professional issues - Social Networking – Company owned social network web site –*
S-6	SLO-1 SLO-2	*Disciplines that contribute to the OB field*	*Integrating Contemporary Theories of Motivation*	*Destructive programs – hacker ethics*	*Software Issues, Copyright*	*the use of social networks in the hiring process – Social Networking ethical issues –d*
S-7	SLO-1 SLO-2	*Challenges and opportunities for OB*	*Theories of Motivation- Motivating by Job Design:*	*Professional constraints*	*The extent and nature of software piracy*	*Cyber bullying – cyber stalking – Online virtual world –*
S-8	SLO-1 SLO-2	*Developing an OB model*	*The Job Characteristics Model- Employee Involvement-.*	*BCS code of conduct – To hack or not to hack?*	*Ethical and professional issues*	*Crime in virtual world - digital rights management -*
S-9	SLO-1 SLO-2	*ETHICAL DILEMMA Jekyll and Hyde*	*Using Rewards to Motivate Employee*	*Ethical positions on hacking*	*Free software and open source code*	*Online defamation – Piracy – Fraud*

Learning Resources	1.Stephen P. Robbins,Timothy A. Judge, “Organizational Behavior”, 14th Edition, Pearson Education,2012. 2. Penny Duquenoy, Simon Jones and Barry G Blundell, “Ethical , legal and professional issues in computing”, Middlesex University Press, 2008	1.Robert Kreitner, Angelo Kinicki, “Organizational Behavior”, 8th Edition, McGrawHill,2007. 2.Fred Luthans, "Organizational Behavior", McGraw Hill, 1997. 3.George Reynolds, “Ethics in Information Technology”, Cengage Learning, 2011 4.Caroline Whitback,” Ethics in Engineering Practice and Research “, Cambridge University Press, 2011

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	20%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	Dr.S.Gopinathan, Professor, University of Madras, Chennai	*Mr.N.KRISHNAMOORTHY, SRMIST*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		

Course Code	PCA20G04T	Course Name	SOCIAL NETWORK ANALYSIS	Course Category	G	Generic Elective Course	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Familiarize the Concept of semantic web and its related applications			
CLR-2 :	Understand Modeling and aggregating of social network data			
CLR-3 :	Examine the extraction and mining of social network communities			
CLR-4 :	Understanding and predicting human behavior for social communities and Acquire Visualizing social networks with matrix-based representations			

Course Learning Outcomes (CLO):	To facilitate access to funding for long-term investment needs	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	To understand the concept of semantic web and related applications	3	80	70	L	H	H	H	H	M	-	H	M	H	-	H	H	-	M
CLO-2 :	To learn knowledge representation using ontology	3	85	75	M	M	H	H	H	-	-	M	M	M	-	H	M	-	L
CLO-3 :	To understand human behavior in social web and related communities	3	75	70	M	M	H	H	H	-	-	M	M	L	-	H	M	-	H
CLO-4 :	To learn visualization of social networks	3	85	80	L	L	H	H	H	M	-	M	L	H	M	H	M	-	-

Duration (Hour)		9	9	9	9	9
S-1	SLO-1	*Introduction to Semantic Web*	*Ontology and their role in the Semantic Web*	*Introduction to Social Network Communities*	*Understanding and predicting human behavior for social communities*	*Visualization of Social Network*
	SLO-2	*Limitations of current Web*	*Roles of Ontology*	*Extracting evolution of Web Community from a Series of Web Archive*	*Explanation with example*	*Example*
S-2	SLO-1	*Development of Semantic Web*	*Ontology-based knowledge Representation*	*Definition of Community*	*User data management*	*Graph theory*
	SLO-2	*Emergence of the Social Web*	*Explanation of Diagram*	*Examples for Community*	*Inference and Distribution*	*Centrality*
S-3	SLO-1	*Social Network analysis*	*Ontology languages for the Semantic Web*	*Detecting communities in social networks*	*Enabling new human experiences*	*Clustering*
	SLO-2	*Components*	*Resource Description Framework*	*Examples for Detection of Communities*	*Reality mining*	*Node-Edge Diagrams*

S-4	SLO-1	*Development of Social Network Analysis*	*Web Ontology Language*	*Methods for community detection and mining*	*Context*	*Matrix representation*
	SLO-2	*Key concepts and measures in network analysis*	*Examples*	*Methods explanation with example*	*Awareness*	*Example for Matrix Representation*
S-5	SLO-1	*Electronic sources for network analysis*	*Modeling and aggregating social network data*	*Applications of community mining algorithms*	*Privacy in online social networks*	*Visualizing online social networks,*
	SLO-2	*Examples*		*Algorithms*	*Trust in online environment*	*Matrix-based representations*
S-6	SLO-1	*Electronic discussion networks*	*State-of-the-art in network data representation*	*Tools for detecting communities social network infrastructures and communities*	*Trust models based on subjective logic*	*Matrix and Node*
	SLO-2	*Explanation of Diagram*	*Ontological representation of social individuals*	*Examples for various tools*	*Trust model example*	*Link Diagrams*
S-7	SLO-1	*Blogs and online communities*	*Ontological representation of social relationships*	*Decentralized online social networks*	*Trust network analysis*	*Hybrid representations*
	SLO-2	*Examples*	*Examples*	*Example*	*Trust transitivity analysis*	*Applications*
S-8	SLO-1	*Web-based networks*	*Aggregating*	*Dynamic social network communities*	*Combining trust and reputation*	*Cover networks*
	SLO-2	*Examples with diagrams*	*Reasoning with social network data*	*Dynamic social network communities*	*Explanation of Formula*	*Community welfare*
S-9	SLO-1	*Applications of Social Network Analysis*	*Advanced representations*	*Relational characterization of dynamic social network communities.*	*Trust derivation based on trust comparisons*	*Collaboration networks*
	SLO-2	*Examples*	*Examples for Representations*	*Examples*	*Attack spectrum and countermeasures.*	*Co-Citation networks*

Learning Resources	1. Peter Mika, “Social Networks and the Semantic Web”, First Edition, Springer 2007. 2. Borko Furht, “Handbook of Social Network Technologies and Applications”, 1st Edition, Springer, 2010. 3. Guandong Xu,Yanchun Zhang and Lin Li, “Web Mining and Social Networking – Techniques and applications”, First Edition Springer, 2011	4. Dion Goh and Schubert Foo, “Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively”, IGI Global Snippet, 2008. 5. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, “Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling”, IGI Global Snippet, 2009. 6. John G Breslin, Alexander Passant and Stefan Decker, “The Social Semantic Web”, Springer, 2009.

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	20%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	Dr.S.Gopinathan, Professor, University of Madras, Chennai	*Mrs.J.Shobana, SRMIST*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		

Course Code	PCA20AE3T	Course Name	CAREER ADVANCEMENT– III	Course Category	AE	Ability Enhancement Course	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Career Guidance and Development	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	To put in use the basic mechanics of Grammar.			
CLR-2 :	To learn to use grammar communicatively so that they become effective and efficient communicators			
CLR-3 :	To test the vocabulary power and skill to follow the logic of sentences			
CLR-4 :	To interpret and analyse texts			
CLR-5 :	To instill confidence in students and develop skills necessary to face the challenges of competitive exams and placements			
CLR-6 :	To help learners develop vocabulary of a general kind by developing their reading skills			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	To understand the different parts of speech and use them in sentences appropriately	3	80	70
CLO-2 :	To understand correct usage of grammar	3	80	75
CLO-3 :	To acquire satisfactory competency in use of Verbal Reasoning	3	85	70
CLO-4 :	To demonstrate his/her ability to write error free while making the best use of correct Vocabulary & Grammar.	3	85	80
CLO-5 :	To develop comprehension and interpretation skills	3	85	75
CLO-6 :	To help the students succeed in competitive exams and placements	3	80	70

Program Learning Outcomes (PLO)															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning	
H	H	M	H	L	M	-	H	-	H	-	H	M	-	H	
M	H	M	H	-	M	-	H	-	H	-	H	M	-	H	
M	H	M	H	-	M	-	H	-	H	-	H	M	-	H	
M	H	M	H	-	M	-	H	-	H	-	H	M	-	H	
M	H	M	H	-	M	-	H	-	H	-	H	M	-	H	
M	H	M	H	-	M	-	H	H	M	-	H	M	-	H	

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Parts of Speech	Synonyms	Sentence improvement	Sentence completion (Vocabulary based)	Para Jumble/ Anagram
	SLO-2	Parts of speech -Practice	Synonyms Practice			Sentence Anagram
S-2	SLO-1	Modal verbs	Antonyms	Sentence improvement Practice	Sentence completion (Vocabulary based) - Practice	Anagrams - Practice
	SLO-2	Uses of Modal Verbs	Antonyms Practice			Cloze Passage

S-3	SLO-1	Types of Modal Verbs	Idioms	Sentence Correction	Sentence completion (Vocabulary based - Practice	Cloze Passage – Techniques to solve
	SLO-2	Modal Verbs- Assessment	Idioms – Practice			cloze passage-Practice
S-4	SLO-1	Spotting Errors	Idioms - Assessment	Sentence Correction-Practice	Odd word	Word analogy
	SLO-2	Error spotting based on Parts of Speech	Phrasal Verbs			Analogies – Types of Relationship
S-5	SLO-1	Errors how to avoid in Nouns & Pronouns	Phrasal verbs - Assessment	Sentence completion (Grammar based)	Odd word-Practice	Analogies – Types of Relationship
	SLO-2	Common Errors: Subject - verb Agreement		Sentence completion-Practice		Word analogy - Practice
S-6	SLO-1	Subject- verb Agreement - Practice	one word substitution	Sentence completion-Practice	Words often confused	Techniques of Effective Reading
	SLO-2	Usage of Articles (a, an, the)	One Word Substitution - Practice	Critical Reasoning and Verbal deduction		Kinds of Reading
S-7	SLO-1	Common mistakes with Prepositions	Homophones	Types of Critical Reasoning	Words often confused-Practice	Reading Comprehension – Unseen Passages
	SLO-2	Prepositional Errors - Practice	Homophones-Practice			
S-8	SLO-1	Change of Speech	Homonym	Critical Reasoning – Level 1	Words often misused	Reading comprehension - Practice
	SLO-2	Change of Speech - Practice	Homonym-Practice	Critical Reasoning – Intermediate Level		
S-9	SLO-1	Change of Voice	Homographs	Critical Reasoning – Advanced Level	Words often misused-Practice	Reading comprehension-Practice
	SLO-2	Change of voice - assessment	Homographs - Practice	Practice Session		

Learning Resources	1. Hari Mohan Prasad and Meenakshi Upadhyay, Objective English for Competitive Examinations, McGraw Hill Education. 2. Norman Lewis, Word Power Made Easy New Revised and Expanded Edition, Goyal publication, 2011 3. Raymond Murphy, Intermediate English Grammar, Cambridge University Press, 2007	4. Bhatnagar R P, English for Competitive Examinations, Trinity Press, 2016. 5. .S Aggarwal, Objective General English, S.Chand Limited, 2018

Learning Assessment					
Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA-1 (20%)	CLA-2 (20%)	CLA-3 (30%)	CLA-4 (30%) ##
		Theory	Theory	Theory	Theory
Level 1	Remember	10%	10%	30%	15%
	Understand				
Level 2	Apply	50%	50%	40%	50%
	Analyze				
Level 3	Evaluate	40%	40%	30%	35%
	Create				
	Total	100 %	100 %	100 %	100 %

CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Mock interviews, etc.

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers	
Experts from Industry	Internal Experts
1. Ajay Zener, Director, Career Launcher	*1. Dr P Madhusoodhanan, HoD, CDC, E&T, SRMIST*
	2. Mrs.Deepalakshmi, Assistant. Professor, CDC, S&H , SRMIST

SEMESTER IV

Course Code	PCA20P03L	Course Name	PROJECT WORK	Course Category	P	Project Work, Internship In Industry / Higher Technical Institutions	L	T	P	C
							0	0	24	12

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	To understand the basics of software development			
CLR-2 :	To know about life cycle of the software development			
CLR-3 :	To explore risk and people management for software development			
CLR-4 :	To learn about different software tools for software development.			
CLR-5 :	To know about different techniques related to software development.			
CLR-6 :	To Learn About documentation process for software development			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Program Learning Outcomes (PLO)														
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
					Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	To conceptualize a novel idea / technique into a product	3	80	70	H	H	M	H	L	M	-	H	-	H	-	H	M	-	H
CLO-2 :	To think in terms of multi-disciplinary environment	3	80	75	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-3 :	To understand the management techniques of implementing a project	3	85	70	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-4 :	To experience on the challenges of teamwork	3	85	80	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-5 :	To prepare a presentation in a professional manner	3	85	75	M	H	M	H	-	M	-	H	-	H	-	H	M	-	H
CLO-6 :	To prepare document all aspects of design work.	3	80	70	M	H	M	H	-	M	-	H	H	M	-	H	M	-	H

Students can choose problems of their own interest to develop software package using the programming languages/tools available. There will be two reviews conducted during the project period for all the students .At the end of the project, every student shall submit a structured project report and will take a Viva Voce examination.

Learning Assessment				
Project Work	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)	
	Review – 1	Review – 2	Project Report	Viva-Voce
	20%	30 %	30 %	20 %

******