Department of Computer Science

(PG)

SYLLABUS AND REGULATIONS

Under

OUTCOME-BASED EDUCATION

2020

(Effective for the Batch of Students Admitted from 2020-2021)

AUXILIUM COLLEGE (Autonomous)

(Accredited by NAAC with A+ Grade with a CGPA of 3.55 out of 4 in the 3rd Cycle)

Gandhi Nagar, Vellore-632 006

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Department of **Computer Science** (PG)

OUTCOME BASED EDUCATION - 2020

(Effective for the Batch of Students Admitted from 2020-2021)

A) INSTITUTION LEVEL

Vision

The vision of the college is the education of young women especially the poorest to become empowered and efficient leaders of integrity for the society.

Mission

To impart higher education to the economically weak, socially backward and needy students of Vellore and neighboring districts.

Framework of Curriculum

Number of Credits: 90 Credits

Credit Distribution: 15 Weeks/Semester

Assessment and Evaluation Methods:

There are two components in the Assessment and Evaluation of a student – Internal and External. These are implemented through

1. Continuous Assessment (CA) during the Semester for 40 marks. It consists of two written tests and an innovative component.
2. Semester Examination (SE) at the end of the Semester for 100 marks which will be converted to 60 marks.

The maximum marks for each paper shall be 100.

Each Postgraduate Programme consists of Four Semester.

Continuous Assessment (CA)

1. The Continuous Assessment of each student will be done by the respective Department.

2. Each written test is of two hours duration for 50 marks. The tests will be conducted centrally. The average of two such CA is calculated for 35 marks/
3. The innovative component is for 5 marks, conducted during the class hours by the staff member in charge of the course, in the form of assignments/ quiz/ seminars/ presentations/ online/ open book/ viva-voce/ group work/ mini project/ exhibition, etc. The topic and time for submission/ presentation will be announced by the staff member in charge of the course in advance. Each student should explain and defend her presentation.
4. Syllabus of not less than two units shall be included for each CA.
5. A retest for CA will be conducted for a student only if a student is absent due to NSS/NCC/Sports campus on prior written permission obtained through the concerned staff members.
6. There is no passing minimum for CA.
7. There is no provision for improvement in CA.

Semester Examination (SE)

1. A student should register herself to appear for the Semester Examinations by payment of the prescribed fee.
2. The Semester Examination will be in the form of a comprehensive examination covering the entire syllabus in each course. It will be of 3 hours duration, irrespective of the number of credits allotted to it.

Valuation of Answer Scripts

1. There shall be a single valuation for Postgraduate Courses. The panel of Examiners will consist of internal and external examiners.
2. The valuation will be centralized.
3. A student has a minimum period of five years from the date of Admission to clear all the courses prescribed for the Programme at the time of her admission. After the fifth year, to complete the Programme, the student has to appear for an examination in the same/equivalent paper offered under the revised syllabus structure.
4. The fraction of final marks in CA and SE shall be rounded off to the nearest integer.

Revaluation

1. A student can apply for the photocopy of answer scripts, if needed, on payment of the prescribed fee.
2. A student can apply for revaluation of any paper, on payment of the prescribed fee within the specified date. Receipt of the photocopy of the answer script is a pre-requisite for revaluation.

CA and SE for Laboratory and Practical Work

CA		SE	
Components	**Marks**	**Components**	**Marks**
Performance during regular Practical's	10	Record	10
Regularity and submission of observation Notebook and Record	5	Practical Examination	45
Practical Examination	25	Viva Voce	5
Total	**40**	**Total**	**60**

B) NAME OF THE PROGRAMME: M.Sc. Computer Science

Vision of the Programme

- Build a strong research and teaching environment aimed towards the betterment of society and industrial needs.
- To be a leading, contemporary, innovative Computer Science department in inculcating professional competencies in the field of Computing and related interdisciplinary technologies to achieve academic excellence and to facilitate research activities as a timely response to dynamic needs and challenges of industry and society.

D) List of courses

Sem	Part	Code	Title	Hours/ Week	Exam Hours		Credits	Marks
					Th	Pr		
I		PCCSA20	Java Programming	5	3	-	5	40+60
		PCCSB20	.Net Framework	5	3	-	5	40+60
		PCCSC20	Research Methodology	5	3	-	5	40+60
		PECSA20	Elective I A: Design and Analysis of Algorithm	5	3	-	5	40+60
		PECSB20	Elective I B: Cyber Security					
		PCCSD20	Practical I: Java Programming Lab	5	-	3	3	40+60
		PCCSE20	Practical II: .Net Programming Lab	5	-	3	3	40+60
Total							**26**	**600**
II		PCCSF20	Machine Learning	5	3	-	5	40+60
		PCCSG20	Open Source Programming	4	3	-	4	40+60
		PCCSH20	Wireless Communications and Networks	5	3	-	5	40+60
		PCCSI20	Theory of Computation	4	3	-	4	40+60
		PECSC20	Elective II A: Cryptography and Network Security	4	3	-	4	40+60
		PECSD20	Elective II B: Soft Computing					
		PCCSJ20	Practical III: Machine Learning	3	-	3	2	40+60
		PCCSK20	Practical IV: Open Source Programming Lab	3	-	3	2	40+60
		PNHRA12	Human Rights	2	3	-	2	40+60
Total							**28**	**800**
III		PCCSL20	Web Services	5	3	-	4	40+60
		PCCSM20	Distributed and Cloud Computing	5	3	-	5	40+60
		PCCSN20	Principles of Compiler Design	5	3	-	4	40+60
		PECSE20	Elective III A: Internet of Things	5	3	-	4	40+60

		PECSF20	Elective III B: Multimedia Communication					
		PECSG20	Elective IV A: Big Data Analytics	4	3	-	4	40+60
		PECSH20	Elective IV B: Software Project Management					
		PCCSO20	Practical V: Web Services Lab	3	-	3	2	40+60
		PCCSP20	Practical VI: Mini Project	3	-	3	3	40+60
Total							**26**	**700**
IV		PCCSQ20	Project Work				**10**	40+60
Grand Total							**90**	**2200**

INDEPENDENT ELECTIVES:

SEM	CODE	TITLE
I	PICSA20	Software Quality Assurance
I	PICSB20	Green Computing
I	PICSC20	Distributed Operating System
II	PICSD20	Wireless Sensor Networks
II	PICSE20	Digital Image Processing
II	PICSF20	Steganography and Digital Watermarking
III	PICSG20	Cloud Solution with Azure
III	PICSH20	Introduction to Block chain Technology
III	PICSI20	Embedded System

E) Program Objectives (POs)

PO1: Attain an in-depth knowledge in the respective domains augmented through self-learning.

PO2: Assimilate and apply principles and concepts towards skill development &employability.

PO3: Apply critical and scientific approaches to address problems and find solutions.

PO4: Develop research skills through multi/inter/trans-disciplinary perspectives.

PO5: Integrate issues of social relevance in the field of study.

PO6: Persist in life-long learning for personal and societal progress.

F) Programme Specific Outcomes (PSOs)

PSO1: To apply fundamental knowledge of computing and science relevant to the discipline.

PSO2: Ability to learn & apply advance concepts to generate novel solutions for solving complex computational problems.

PSO3: To design, implement, and evaluate a computer-based system, process, component, or program for various applications.

PSO4: Contribute significantly to the research and the discovery of new knowledge and methods in the field of computer science.

PSO5: To use current techniques, skills, and modern tools necessary for research-based knowledge and research methods for the cultural, societal, environmental considerations and demonstrate the knowledge of and need for sustainable development.

PS06: To Formulate models, design and conduct experiments for interpreting data and critical thinking.

SEMESTER I

PCCSA20 – JAVA PROGRAMMING

Year: I **Sem:** I	**Course Code:** PCCSA20	**Title of the Course:** Java Programming	**Course Type:** Theory	**Course Category:** Core	**H/W** 5	**Credits** 5	**Marks** 100

Course Objectives

1. This paper helps to enhance the knowledge in advanced features of Java and programming skill as per the industry need.
2. Using Graphics, Animations and Multithreading for designing applet based applications.
3. Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and event handling.
4. Designing GUI based applications using swing.
5. Design and develop Web applications using Java Server Pages.

Course Outcomes (COs)

1. Understand the basics of Java and AWT
2. Develop Swing-based GUI
3. Update and retrieve the data from the databases using JDBC
4. Develop client/server applications and distributed applications using RMI
5. Develop server-side programs in the form of Servlets

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	H	M	M	L	H
CO4	M	M	M	H	L	M
CO5	L	M	H	M	M	L

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I **(18 Hours)**

1.1 Introduction to Java – Features of Java– Constructors (K1, K2)
1.2 Exception handling: try, catch - Throw and throws – Multithreading (K1, K2)
1.3 Java AWT – working with Graphics – Font – Color (K1, K3)
1.4 Networking – Networking Basics – Networking Classes and Interface – InetAddress – Factory Methods – Instance Methods (K2, K3)
1.5 Inet4Address and Inet5Address – TCP/IP Client Sockets – Cookies. (K3, K4)
1.6 URL – URL Connection – HTTP URL Connection – URI Class (K4, K5)

Unit II **(16 Hours)**

2.1 Swing: JFC – Features of Swing – Swing Components (K1, K3)
2.2 Working with Swing – Event Handling Using Swing(K2, K3)
2.3 Exploring Swing: Jlabel and JtextField - The Swing Buttons - JcomboBox - Trees- Jtable (K2, K3)
2.4 JDBC: Introduction- Architecture-– JDBC Environment – JDBC Driver Types (K4, K5)
2.5 Java, Sql Package – Data Manipulation – Data Navigation – JDBC Classes and Interfaces (K2, K3)
2.6 JDBC Statement Interface – Connection Interface – Statement Interface –ResultSet Interface (K3, K5)

Unit III **(14 Hours)**

3.1 RMI – Introduction - RMI Architecture – RMI for Distributed Computing(K2, K3)
3.2 Working of an RMI application - Marshalling and Unmarshalling - RMI Registry - Goals of RMI(K1, K2, K3)
3.3 Working RMI Application – Defining Remote Interface – Simple Programs(K3, K4)
3.4 Working Servlets**:** Background – Life Cycle of Servlets – Servlet Architecture Cognitive (K2, K3)
3.5 Servlet API – Javax Servlet Packages – Creating Servlets – Reading Servlet Parameters, The javax.servlet.http Package(K4, K6)
3.6 Handling HTTP Request and Responses – Using Cookies - Simple Programs(K5, K6)

Unit IV **(15 Hours)**

4.1 JSP: Introduction and Marketplace – JSP and HTTP – JSP Engines – JSP Works(K1, K2)
4.2 Anatomy of JSP page – Life Cycle of JSP – JSP API – JSP in IDE(K2, K3)
4.3 JSP Expressions – Declarations – - Scripting elements – Scriplet – Expression(K1, K4)
4.4 Directive Elements – Page – Include – Taglib Directive – Action Element(K4, K5)
4.5 Inserting Applet into JSP (K5, K6)
4.6 Accessing a Database from JSP (K5, K6)

Unit V **(12 Hours)**

5.1 EJB: Introduction to EJB – EJB fundamentals - EJB Architecture - EJB Roles (K1, K5)
5.2 J2EE architecture, Enterprise application concepts(K1, K2)
5.3 J2EE platform, HTTP protocol, web application (K3, K5)
5.4 Web containers and Application servers (K2, K3, K4)
5.5 Java Web Frameworks: Spring MVC Overview of Spring, Spring Architecture(K3, K4, K5)
5.6 Hibernate 4.0 Overview of Hibernate, Hibernate Architecture(K5, K6)

Text Books:

1. Herbert Schildt (2017). The Complete Reference: Java. Tata McGraw Hill Publishing, Eighth Edition.
2. Ivan Bayross (2013). Web Enabled Commercial Applications Development using Java, 2- BPB Publications, Second Edition.
3. Phil Hanna (2013). The Complete Reference: JSP 2.0. Tata McGraw Hill Publishing.
4. UttamK.Roy (2017). Advanced Java Programming. Oxford University Press, Third Edition.

Reference Books:

1. Jim Keogh (2014). The Complete reference to J2EE. Tata McGraw-Hill.
2. Hall Brown (2015). Core Servlet and JavaServer page. Pearson Education, Second edition
3. Mike Mcgrath (2062).Java Server Pages in Easy Steps. Dreamtech Publications. Second Edition

Open Educational Resources (OER):

1. https://www.youtube.com/watch?v=vJ-Zn4fo0MQ
2. https://www.tutorialspoint.com/java/index.htmhttps://www.tutorialspoint.com/php/php_tutorial.pdf
3. https://www.youtube.com/watch?v=eiu2eXxeCCU

SEMESTER I

PCCSB20 - .NET FRAMEWORK

Year: I **Sem:** I	**Course Code:** PCCSB20	**Title of the Course:** .Net Framework	**Course Type:** Theory	**Course Category:** Core	**H/W** 5	**Credits** 5	**Marks** 100

Course Objectives

1. This course presents the practical aspects of application development using .Net framework.
2. It also covers the Common Language Runtime (CLR), .Net framework classes, C#, and ADO.NET
3. To update and enhance skills in writing Windows applications, ADO.NET and ASP.NET.
4. The student will gain programming skills in C# both in basic and advanced levels.
5. By building sample applications, the student will get experience and be ready for large - scale projects.

Course Outcomes (COs)

1. Understand code solutions and compile C# projects within the .NET Framework.
2. Develop C# console applications using Classes and Objects and Interfaces.
3. Design and Implement database connectivity using ADO.NET in Windows Based Applications.
4. To understand and be able to using XML in C#.NET specifically ADO.NET and SQL server.
5. Develop the Web Applications using C#.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	M	H	M	L	L
CO2	L	L	H	M	L	M
CO3	L	M	L	M	L	L
CO4	L	M	L	H	M	M
CO5	H	L	H	M	M	L

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I **(18 Hours)**

1.1 Introducing C# - .NET Framework - The C# Language (K1)
1.2 Variables and Data - Operators (K1, K2)
1.3 Control Structures (K3)
1.4 C# Array - ArrayList Class (K5)
1.5 String - StringBuilder Class (K3, K4)
1.6 Functions and Methods – Structures (K3, K6)

Unit II **(16 Hours)**

2.1 Classes and Objects - Constructor and Destructors (K1, K2)
2.2 Types of Classes - Various Class Members (K2)
2.3 Interfaces - Delegates - Events (K4, K6)
2.4 Inheritance - Access Modifiers - Class Modifiers (K3, K4)
2.5 Polymorphism - Operator Overloading - Errors and Exceptions (K5)
2.6 C# Files and IO - C# Collections. (K5, K6)

Unit III **(14 Hours)**

3.1 ADO.NET: C# Graphical User Interface and Application Development (K2, K3)
3.2 .Net Environment - User Interface Elements and Hierarchy in C# (K4)
3.3 Programming with the Windows Controls (K5)
3.4 C# MDI Form - Dialog Box (K4, K5)
3.5 C# ADO.Net: Data Providers - ADO.NET Objects (K3)
3.6 Data Set - Working with Data. (K6)

Unit IV **(15 Hours)**

4.1 XML.Net: XML- A Brief Introduction - XML Syntax (K1)
4.2 Reading and Writing XML Files - Searching XML File using XPATH (K1, K2)
4.3 XML and ADO.NET for Handling Data (K6)
4.4 Fundamentals of Web Programming - ASP.NET Life Cycle (K2, K5)
4.5 ASP.NET Applications and Configuration - Web Forms (K4)
4.6 SOAP and Web Services - Creating and Consuming Web Service. (K5, K6)

Unit V **(12 Hours)**

5.1 .Net Assemblies: Integrating Application Files (K2)
5.2 Security in .NET - Attributes (K2, K4)
5.3 Reflections - Type Discovery (K3)
5.4 Remote Programming: C# Remoting Architecture (K2, K6)
5.5 Domains - Contexts - Proxies (K2, K5)
5.6 Marshalling and Unmarshalling (K3)

Text Books:

1. Anamitra Deshmukh–Nimbalkar (2018). C# and .Net Programming. Technical Publications. First Edition.

Reference Books:

1. Christian Nageletal (2012). Professional C# 2012 with .NET 4.5. Wiley India.
2. Herbert Schildt (2012). The Complete Reference: C# 4.0. Tata McGraw Hill.
3. Andrew Troelsen (2010). Pro C# 2010 and the .NET 4 Platform. Fifth Edition.
4. Ian Griffiths- Matthew Adams- Jesse Liberty (2010). Programming C# 4.0. Sixth Edition. O'Reilly.

Open Educational Resources (OER):

1. https://www.w3schools.com/cs/
2. https://www.youtube.com/watch?v=GcFJjpMFJvI&t=759s

SEMESTER I

PCCSC20 – RESEARCH METHODOLOGY

Year: I **Sem:** I	**Course Code:** PCCSC20	**Title of the Course:** Research Methodology	**Course Type:** Theory	**Course Category:** Core	**H/W** 5	**Credits** 5	**Marks** 100

Course Objectives

1. To gain familiarity with a phenomenon or to achieve new insights into it.
2. To portray accurately the characteristics of a particular individual situation or a group.
3. To determine the frequency with which something occurs or with which it is associated with something else.
4. To test a hypothesis of a causal relationship between variables.
5. To find solutions for scientific, non-scientific and social problems.

Course Outcomes (COs)

1. Understand the concepts of research design, research process and various types of research.
2. Understand the different steps in writing report.
3. Implement the methods and techniques for experimental study.
4. Analyze the ethical issues in research.
5. Assess the Various research areas in Computer science.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	L	L	M	H	M
CO2	L	L	M	M	M	L
CO3	L	H	L	H	L	H
CO4	M	M	M	M	M	M
CO5	H	M	M	L	L	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I **(18 Hours)**

1.1 Research - Definition- importance and meaning of research-characteristics of research (K2)
1.2 Type of research - steps in research (K2).
1.3 Research process – an overview (K2)
1.4 Identification of research area (K2)
1.5 Selection and formulation of research problem (K2).
1.6 Formulation of objectives (K6)

Unit II **(16 Hours)**

2.1 Review of Literature – Course work - Literature Survey (K2)
2.2 Collecting research papers from journals (K2)
2.3 Web Browsing - Efficient Searching (K2)
2.4 Online Resources - Reading a research paper - Scopus tool (K2)
2.5 Develop a theoretical framework (K6)
2.6 Improve your methodology (K5, K6)

Unit III **(14 Hours)**

3.1 Preparing the research design (K2)
3.2 Data collection and preparation (K2)
3.3 Experimental study – Result analysis and Discussions (K3)
3.4 Writing a research paper (K4)
3.5 Publishing the results (K6)
3.6 IEEE format – Latex tool (K1)

Unit IV **(15 Hours)**

4.1 Significance of Report writing – Different steps in writing report (K2, K4)
4.2 Layout of the research report - Types of Reports – Oral Presentation (K2)
4.3 Mechanics of writing a research report – Precautions for writing Research Reports (K5)
4.4 Ethical issues in research (K4)
4.5 Patent registration procedure – Funding agencies (K6)
4.6 Writing research proposals – Effective presenting methods (K6)

Unit V **(12 Hours)**

5.1 Various research areas in Computer science (K2)
5.2 Image processing (K4)
5.3 Networks and security (K4)
5.4 Data mining and machine learning (K4)
5.5 wireless and sensor systems (K4)
5.6 Audio, speech, language and signal processing (K2)

Text Books:

1. Kothari, C.R (2013), Research Methodology – Methods and Techniques, Second Edition. Wiley Eastern Limited.
2. 1. R. Panneerselvam (2014). Research Methodology, Fourth Edition, Prentice Hall India Learning Private Limited.

Reference Books:

1. Ranjit Kumar (2011). Research Methodology – A step- by-step guide for beginners, Third Edition, Pearson Education.
2. Deepak Chawla and Neena Sondh (2011). Research Methodology, Concepts and Cases, Vikas Publishing House Pvt. Ltd.

Open Educational Resources (OER):

1. https://www.youtube.com/watch?v=PDjS20kic54
2. https://www.youtube.com/watch?v=w_Ujkt83i18

SEMESTER I

PECSA20 – ELECTIVE I A: DESIGN AND ANALYSIS OF ALGORITHM

Year: I **Sem:** I	**Course Code:** PECSA20	**Title of the Course:** Elective I A: Design and Analysis of Algorithm	**Course Type:** Theory	**Course Category:** Elective	**H/W** 5	**Credits** 5	**Marks** 100

Course Objectives

1. To develop skills in design and implementation of data structures and their applications.
2. To understand the usage of graph structures and spanning trees.
3. To acquire the knowledge of using advanced tree structures.
4. To learn the usage of heap structures.
5. To explain classification of problems based on the computational complexity

Course Outcomes (COs)

1. Understand data structures and the concepts of algorithm for Merge Sort, Quick Sort and Binary Search.
2. Understand the fundamental graph algorithms in solving optimization problems.
3. Update knowledge to learn advanced tree concepts in data structure and algorithm.
4. Able to perform all the operations on Hashing and Heaps.
5. Analyze the computational complexity of various algorithms.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	M	H	M	L	M
CO2	M	H	L	L	M	L
CO3	H	M	L	M	L	M
CO4	M	H	M	L	M	L
CO5	L	M	M	L	M	L

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I **(15 Hours)**

1.1 Introduction: Fundamentals of algorithmic problem solving (K1)
1.2 Asymptotic notations (K2)
1.3 Mathematical Analysis for Recursive and Non-Recursive Algorithms (K1, K3)
1.4 External Sorting: k-way Merge Sort (K5, K6)
1.5 Quick Sort – Binary Search (K4, K5)
1.6 Strassen's Matrix Multiplication (K3, K6)

Unit II **(15 Hours)**

2.1 Graphs: Graph Terminology – Directed Graphs – Representation of Graphs (K1)
2.2 Graph Traversal Algorithms – Topological Sorting (K1, K2, K6)
2.3 Minimum Spanning Trees: Kruskal's Algorithm (K4, K5, K6)
2.4 Prim's Algorithm (K4, K5)
2.5 Shortest Path Algorithms: Dijkstra's Algorithm (K3, K4, K6)
2.6 Warshall's Algorithm – Floyd's Algorithm (K4, K5, K6)

Unit III **(15 Hours)**

3.1 Trees: Basic Terminology – Types of Trees (K1, K2)
3.2 Creating a Binary Tree from a General Tree – Traversing a Binary Tree(K2, K3)
3.3 Efficient Binary Search Trees: Binary Search Trees (K3, K6)
3.4 Optimal Binary Search Tree (OBST) – AVL Trees (K1, K5)
3.5 Multi-way Search Trees: M-way Search Trees (K1, K4)
3.6 B-Trees - B+ Trees (K3, K6)

Unit IV **(15 Hours)**

4.1 Hashing: Introduction to Static Hashing – Hash Tables (K1, K2)
4.2 Different Hash Functions – Secure Hash Functions Dynamic Hashing (K2)
4.3 Priority Queues (Heaps): Binary Heaps – Basic Heap Operations (K2, K6)
4.4 Applications of Priority Queues (K2, K4)
4.5 Binomial Heaps Structure and Implementation – Binomial Queue Operations (K5)
4.6 Comparison between Binary and Binary Heaps**(**K1, K3)

Unit V **(15 Hours)**

5.1 Backtracking: N- Queens problem – Hamiltonian Circuit Problem (K2)
5.2 Subset- Sum Problem – Branch and Bound(K3, K4)
5.3 Assignment Problem (K4, K6)
5.4 Knapsack Problem (K4, K5, K6)
5.5 Travelling Salesman Problem (K2, K5)
5.6 P & NP Problems – NP- Complete Problems (K3, K4)

Text Books:

1. ReemaThareja, S. Rama Sree (2018), "Advanced Data Structure", Oxford University Press.

Reference Books:

1. J. LalithaVani, T. Priya Radhika Devi (2015). Design and Analysis of Algorithms. First Edition.
2. Anany Levitin (2011). Introduction to the Design and Analysis of Algorithms. Edition III, Addison-Wesley.
3. Thomas H. Carmen, Charles Eric Leiserson, Ronald L. Rivest, Clifford Stein (2009). Introduction to Algorithms. Edition III - MIT Press.

Open Educational Resources (OER):

1. https://www.youtube.com/watch?v=gY0MwGLq9W8&list=PLGdMwVKbjVQ8Ew7KUp65sRL9_k2_3xlKE
2. https://nptel.ac.in/courses/106/106/106106131/

SEMESTER I

PECSB20 - ELECTIVE I B: CYBER SECURITY

Year: I Sem: I	Course Code: PECSB20	Title of the Course: Elective I B: Cyber Security	Course Type: Theory	Course Category: Elective	H/W 5	Credits 5	Marks 100

Course Objectives

1. Gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks.
2. Understand key terms and concepts in cyber law, intellectual property and cyber crimes, trademarks and domain theft.
3. Examine secure software development practices.
4. Understand principles of web security.
5. Gain familiarity with prevalent network and distributed system attacks, defenses against them, and forensics to investigate the aftermath.

Course Outcomes (COs)

1. Evaluate the computer network and information security needs of an organization.
2. Assess cyber security risk management policies in order to adequately protect an organization's critical information and assets.
3. Analyze the performance of applications in a variety of system contexts.
4. Implement continuous network monitoring and provide real-time security solutions.
5. Identify physical points of vulnerability in simple networks.

CO	PSO					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	PO					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	L	M	L	M	H
CO2	L	M	M	H	M	L
CO3	H	M	M	L	M	L
CO4	M	M	M	L	M	M
CO5	L	M	L	M	H	L

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I **(16 Hours)**

1.1 Digital securities introduction, types of attacks, digital privacy, online tracking, privacy laws (K1, K2)
1.2 Types of computer security risks - malware, hacking, pharming, phishing, ransomware, adware and spyware, trojan, virus, worms, wifi eavesdropping(K1, K2)
1.3 Scareware, distributed denial-of-service attack, rootkits, juice jacking (K1, K2)
1.4 Antivirus and other security solution – password (K1, K2)
1.5 Secure online browsing email security - iot security (K1, K2)
1.6 Physical security threads (K1, K2)

Unit II **(16 Hours)**

2.1 Online anonymity anonymous networks - tor network (K1, K4)
2.2 I2P network – freenet - darknet, anonymous os (K1, K4)
2.3 Tails – secure file sharing – vpn – proxy server (K1, K4)
2.4 Connection leak testing – secure search engine (K1, K4)
2.5 Web browser privacy configuration (K1, K4)
2.6 Anonymous payment (K1, K4)

Unit III **(15 Hours)**

3.1 Disk Encryption using windows BitLocker (K4)
3.2 Disk Encryption Using open source tools – multitask encryption tools(K4)
3.3 Attacking cryptographic systems – countermeasures against cryptography attacks (K4)
3.4 Securing data in transit – cloud storage encryption (K4)
3.5 Encrypt DNS Traffic and Email communication (K4)
3.6 Secure IM and video calls (K4)

Unit IV **(14 Hours)**

4.1 Cyber Crime issues and investigation unauthorized access, computer intrusions (K4, K5)
4.2 White collar crimes – viruses and malicious code – internet hacking and cracking(K4, K5)
4.3 Virus attacks – pornography – software piracy –intellectual property –mail bombs (K4, K5)
4.4 Digital evidence collection – evidence preservation – e-mail investigation (K4, K5)
4.5 E-mail tracking – IP tracking – e-mail recovery (K4, K5)
4.6 Recovering deleted evidences – password cracking (K4, K5)

Unit V **(14 Hours)**

5.1 Digital Forensics introduction to digital forensics – forensic software and hardware (K1, K3)
5.2 Analysis and advanced tools – forensic technology and practices, forensic ballistics and photography (K1, K3)
5.3 Face, iris and fingerprint recognition – audio video analysis (K1, K3)
5.4 Windows system forensics – linux system forensics (K1, K3)
5.5 WIFI Security (War-driving) – Network Forensics (K1, K3)
5.6 Mobile Forensics – Cloud Forensics (K1, K3)

Text Books:

1. Digital Privacy and Security Using Windows: A Practical Guide by Nihad Hassan, Rami Hijazi, Apress, 2017.

Reference Books:

a. Cybersecurity: The Ultimate Beginners Guide to Learn and Understand Cybersecurity Measures Effectively Kindle Edition by Zach Webber 2018.
b. Cybersecurity for Beginners by Raef Meeuwisse Lulu Publishing Services, 2017.

Open Educational Resources (OER):

1. https://www.goodreads.com/book/show/28320795-cybersecurity-for-beginners
2. 2.https://www.academia.edu/40648445/Digital_Privacy_and_Security_Using_Windows_A_Practical_Guide
3. https://www.slideshare.net/lawitwan112/digital-privacy-and-security-using-windows-a-practical-guide

SEMESTER I

PCCSD20 - PRACTICAL I: JAVA PROGRAMMING LAB

Year: I **Sem:** I	**Course Code:** PCCSD20	**Title of the Course:** Practical I: Java Programming Lab	**Course Type:** Practical	**Course Category:** Core	**H/W** 5	**Credits** 3	**Marks** 100

Course Objectives

1. Create a full set of UI widgets and other components, including windows, menus, buttons, Checkboxes, text fields, scrollbars and scrolling lists, using Abstract Windowing Toolkit (AWT) & Swings.
2. Apply event handling on AWT and Swing components.
3. Learn to access database through Java programs, using Java Data Base Connectivity (JDBC).
4. Learn to develop server side programming using servlets.
5. Create dynamic web pages, using JSP.

Course Outcomes (COs)

1. Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.
2. Update and retrieve the data from the databases using SQL.
3. Develop Applet based programming using IDE.
4. Develop server-side programs in the form of servlets.
5. Design and develop JSP based Web applications.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	M	L	H	M	L
CO2	H	M	L	M	H	M
CO3	M	M	L	M	H	M
CO4	L	M	L	M	M	L
CO5	L	M	H	M	L	M

(Low - L, Medium – M, High - H)

Course Syllabus

Exercises

1. Program using Basic User Interface Components and Layouts (K1, K2)
2. Create Payroll Processing form using swing (K1, K3)
3. Student Mark Sheet Processing using JDBC (K2, K4)
4. Bank Account Processing using JDBC (K4, K5)
5. Survey form using applets and JDBC (K2, K5)
6. Creating authentication form using servlets (K1, K3)
7. Creating survey form using servlets (K6)
8. Programs using JSP
    - JSP program that creates a table of power of 2 (K1, K3)
    - Factorial of a number (K1, K2)
9. Registration and Login form using JSP (K1, K3)
10. JSP program to process credit card information. (K5)

SEMESTER I

PCCSE20 - PRACTICAL II: .NET PROGRAMMING LAB

Year: I **Sem:** I	**Course Code:** PCCSE20	**Title of the Course:** Practical II: .Net Programming Lab	**Course Type:** Practical	**Course Category:** Core	**H/W** 5	**Credits** 3	**Marks** 100

Course Objectives

1. This course presents the practical aspects of application development using .Net framework.
2. To learn the technologies of the .NET framework.
3. To cover all segments of programming in C# starting from the language basis, followed by the object oriented programming concepts.
4. To update and enhance skills in writing Windows applications, ADO.NET and ASP.NET.
5. Using XML in C#.NET specifically ADO.NET and SQL server.

Course Outcomes (COs)

1. Create user interactive web pages using ASP.NET.
2. Create simple data binding applications using ADO.NET connectivity.
3. Performing Database operations for Windows Form and Web Applications.
4. Create Mobile Application using .NET compact Framework
5. Work with the basic and advanced features of C# language.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	M	M	M	H	L
CO2	H	L	H	M	L	L
CO3	H	L	L	L	M	M
CO4	M	M	L	H	M	L
CO5	L	L	M	L	M	M

(Low - L, Medium – M, High - H)

Course Syllabus

Exercises

1. Write a Program to accept a String and Convert the Case of the Characters. (K1, K5)
2. Write a Program to implement a Calculator with Memory and Recall operations. (K1, K4)
3. Develop a menu based .Net application to implement a text editor with Cut- Copy- Paste- Save and Close operations using Master pages. (K2, K6)
4. "How is the book ASP.NET with C# by DreamTech?" Give the user three choices: i) Good ii) Satisfactory iii) Bad. Provide a VOTE button. After user votes- present the result in percentage using labels next to the choices. (K3, K6)
5. Develop an application to perform timer based quiz of 10 questions. (K1, K6)
6. Develop a database application to store the details of students using ADO.NET (K1, K6)
   a. Develop a database application using ADO.NET to insert- modify- update and delete operations.
   b. Develop a .Net application using Datagrid to display records.
   c. Develop a .Net application using Datagrid to add- edit and modify records. (K1, K4)
7. Develop Windows form to
   a. Display Product details (Product Id, Name, Category and other details) in DataGridView using Dataset and Data Adapter.
   b. Fill Combobox for listing all the categories from the database using SqlDataReader and DataTable.
   c. When user select particular category only that category's products must be displayed in the Grid.
   d. Generate xml file from above generated dataset.(K4, K6)
8. Create an application for Accessing a SQL Database by Using ADO.NET by connecting to the SQL Server database and call a stored procedure. You then display the data in a Repeater control. (K2, K5)
9. Develop a web application to read the details of a selected country stored in XML database and display back to the user using Web controls. (K1, K4)
10. Write a Program to implement View State and Session State. (K4, K5)

SEMESTER II

PCCSF20 – MACHINE LEARNING

Year: I **Sem:** II	**Course Code:** PCCSF20	**Title of the Course:** Machine Learning	**Course Type:** Theory	**Course Category:** Core	**H/W** 5	**Credits** 5	**Marks** 100

Course Objectives

1. To introduce basic concepts and techniques of Machine Learning.
2. To understands complexity of Machine Learning algorithms and their limitations.
3. To understand modern notions in data analysis oriented computing.
4. To discover patterns in user's data.
5. To make predictions based on user data.

Course Outcomes (COs)

1. Understand the basics of Machine Learning.
2. Explore knowledge about concept learning hypothesis.
3. Illustrate the working of basic classifier models.
4. Develop client/server applications and distributed applications using RMI.
5. Know about parametric methods bias and variance.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	M	L	M	L	L
CO2	M	L	M	H	L	M
CO3	L	H	M	H	M	L
CO4	M	L	H	M	L	H
CO5	H	L	M	M	M	L

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I **(18 Hours)**

1.1 Introduction to Machine Learning – Well Posed Learning Problems – Designing a Learning system (K1, K2)
1.2 Perspectives and Issues in Machine Learning (K1, K2)
1.3 choosing training experience – target function (K1, K3)
1.4 Essential Libraries and Tools – Jupyter Notebook – Numpy – Scipy – Matplotlib – Pandas (K2, K3)
1.5 Limitations of inference machines, Approximation and estimation errors (K3, K4)
1.6 Simple Application.(K4, K5)

Unit II **(16 Hours)**

2.1 Inductive bias and bias-variance tradeoff (K1,K3)
2.2 Concept Learning and General to Specific Ordering – Introduction – Concept Learning Task (K2, K3)
2.3 Inductive Learning Hypotheisis – Concept Learning as Search. (K2, K3)
2.4 FIND –S: Finding a Maximally Specific Hypothesis (K4, K5)
2.5 Representation – Inductive Bias. (K2, K3)
2.6 Learning theory, Hypothesis and target class. (K3, K5)

Unit III **(14 Hours)**

3.1 Supervised Learning – Learning a Class from Examples (K2, K3)
3.2 Chervonenkis Dimension – Probably Approximately Correct Learning(K1, K2, K3)
3.3 Noise – Learning Multiple Classes (K3, K4)
3.4 Linear separability and decision regions, Linear discriminants (K2, K3)
3.5 Linear regression, Standard and stochastic gradient descent(K4, K6)
3.6 Regression – Model Selection and Generalization. (K5, K6)

Unit IV **(15 Hours)**

4.1 Decision Tree Learning – Introduction – Decision Tree Representation (K1, K2)
4.2 Appropriate Problems for Decision Tree Learning (K2, K3)
4.3 Basic Decision Tree Learning Algorithm – Hypothesis Space Search in Decision Tree Learning (K1, K4)
4.4 Restriction Biases and Preferences – Issues in Decision Tree Learning. (K4, K5)
4.5 Overfitting, pruning of decision trees, Bagging and Boosting (K5.K6)
4.6 Dimensionality reduction and Feature selection (K5, K6)

Unit V **(12 Hours)**

5.1 Parametric Methods – Introduction – Evaluating and Estimator (K1, K5)
5.2 Bias and Variance – Baye's Estimator (K1, K2)
5.3 Parametric Classification (K3, K5)
5.4 Regression – Model Selection Procedure. (K2, K3, K4)
5.5 Evaluation: Performance evaluation metrics (K3, K4.K5)
5.6 ROC Curves, Validation methods. (K5.K6)

Text Books:

1. Andreas C. Muller and Sarah Guide (2019). Introduction to Machine Learning with Python. FifthEdition. Shroff Publishers.
2. E. Alpaydin, Introduction to Machine Learning, 3rd Edition, Prentice Hall of India, 2014.

Reference Books:

1. Tom M. Mitchell (2019). Machine Learning. Third Edition Mc Graw Hill
2. Ethem Alpaydin (2016). Introduction to Machine Learning Third Edition PHI Learning.

Open Educational Resources (OER):

1. https://www.tutorialspoint.com/machine_learning_with_python/index.htm
2. https://www.youtube.com/watch?v=GwIo3gDZCVQ
3. https://www.youtube.com/watch?v=eiu2eXxeCCU

SEMESTER II

PCCSG20 - OPEN SOURCE PROGRAMMING

Year: I **Sem:** II	**Course Code:** PCCSG20	**Title of the Course:** Open Source Programming	**Course Type:** Theory	**Course Category:** Core	**H/W** 4	**Credits** 4	**Marks** 100

Course Objectives

1. Understand how server-side programming works on the web.
2. PHP Basic syntax for variable types and calculations.
3. Using PHP built-in functions and creating custom functions.
4. Use PHP to access a MySQL database.
5. To gain knowledge in Linux administration- features and multimedia using Red Hat Linux

Course Outcomes (COs)

1. Learned the need of open source technology, open source development model, application of open sources, aspects of open source movement
2. Knowledge about the problems with traditional commercial software.
3. Work with regular expressions, handle exceptions, and validate data.
4. Familiar with basis syntax of PHP, common PHP scripts elements and creating of the server-side scripting using PHP, implement PHP database connectivity, perform operation on database and open source database management system.
5. Familiar with basics of LINUX & SHELL Scripting

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	L	L	M	L	L
CO2	M	M	L	H	M	L
CO3	L	M	L	M	M	H
CO4	M	M	M	L	H	M
CO5	L	M	L	M	M	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I **(13 Hours)**

1.1 Installing and Configuring PHP: The Basics of PHP Scripts (K1)
1.2 The Building Blocks of PHP: Variables – Data Types – Operators and Expression – Constants (K1, K2)
1.3 Flow Control Functions in PHP: Switching Flow – Loops – Code Blocks and Browser Output (K1, K3)
1.4 Working with Functions: Variable Scope – Saving State between Function Calls with the Static Statement (K1, K4)
1.5 More About Arguments – Testing for the Existence of a Function (K1, K5)
1.6 Working with Arrays: Array – Creating Arrays – Some Array-Related Constructs and Functions (K1, K3)

Unit II **(14 Hours)**

2.1 Working with objects: creating an object – object inheritance (K1, K3)
2.2 Working with strings- dates and time – formatting strings with PHP – investigating strings with PHP – manipulating strings with PHP (K2, K3)
2.3 Using date and time functions in PHP – other strings- date and Time functions (K2, K3)
2.4 Working with Forms: creating a sample input form – accessing form input with User-defines arrays – combing HTML and PHP code on a single page – working with file uploads (K4, K5, K6)
2.5 Working with Cookies and user sessions – introducing cookies – setting and deleting a cookie with PHP (K2, K3)
2.6 Session function overview – starting a session – working with session variables – destroying sessions and unsetting variables – using sessions in an Environment with registered users (K3, K6)

Unit III **(11 Hours)**

3.1 Working with files and Directories: including files – using include once – validating files (K2, K3)
3.2 Creating and deleting files – opening a file for writing- reading or appending – reading from files – writing or appending to a file (K1, K2, K3)
3.3 Working with directories (K3, K4)
3.4 Working with images – understanding the image-creation process – necessary modification to PHP (K2, K5)
3.5 Drawing a new image – modifying existing images (K4, K5, K6)
3.6 Image creation from user input – using images created by scripts (K6)

Unit IV **(12 Hours)**

4.1 Learning Basics SQL commands: Learning the MySQL data Types (K1, K2)
4.2 Learning the Table-creation syntax – using DDL and DML (K2, K3)
4.3 Frequently used string function in MySQL (K1, K4)
4.4 Using Date and Time Function in MySQL (K1, K2)
4.5 Interacting with MySQL using PHP: MySQL or MySQL functions (K5)
4.6 Connecting to MySQL with PHP – Working with MySQL data (K2, K5, K6)

Unit V **(10 Hours)**

5.1 Case Study: creating a shopping cart mechanism (K5, K6)
5.2 An overview of Red Hat Linux – What is Linux? – Common Linux features – Primary advantages of Linux (K1, K2)
5.3 Using Linux commands: The shell Interface (K3, K6)
5.4 Understanding the Red Hat Linux shell (K2, K3)
5.5 Working with the Red Hat Linux file system (K3, K4)
5.6 Using the vi text Editor (K5, K6)

Text Books:

1. Julie C. Meloni- (2013). PHP- MySQL and Apache. Pearson Education.
2. Christopher Negus (2003). Red Hat Linux 9 Bible. Wiley publishing.
3. Ivan Bayross (2010). Web Enabled Commercial Application Development Using HTML, DHTML Java Script and PHP. BPB Publications. 4th Edition.

Reference Books:

1. AnBayross (2002). Using Linux- Apache MySQL PHP PERL on Linux-IV BPB publications.
2. Ed Lecky-ThompsonSsteven d. Nowicki- Thomas Myer (2012). Professional PHP6. Wiley India Edition.

Open Educational Resources (OER):

1. https://education.fsu.edu/wp-content/uploads/2015/04/Learning-PHP-MySQL-JavaScript-and-CSS-2nd-Edition-1.pdf
2. http://webalgarve.com/books/MySQL%20&%20PHP/Teach%20Yourself%20PHP,%20MySQL%20and%20Apache%20All%20in%20One,%205th%20Edition.pdf
3. https://udaygade.files.wordpress.com/2015/04/linux-bible-by-christopher-negus.pdf
4. https://nish.info/books/PHP.pdf
5. https://www.tutorialspoint.com/php/php_tutorial.pdf
6. https://www.tecmint.com/linux-commands-cheat-sheet/
7. http://linuxcommand.org/index.php
8. https://linuxconfig.org/linux-commands#h1-introduction
9. https://www-uxsup.csx.cam.ac.uk/pub/doc/suse/suse9.0/userguide-9.0/ch24s04.html

SEMESTER II

PCCSH20 – WIRELESS COMMUNICATION AND NETWORKS

Year: I **Sem:** II	**Course Code:** PCCSH20	**Title of the Course:** Wireless Communication and Networks	**Course Type:** Theory	**Course Category:** Core	**H/W** 5	**Credits** 5	**Marks** 100

Course Objectives

1. To provide an overview of Wireless Communication Networks area and its applications
2. To enable students to compare and contrast multiple division techniques, mobile communication systems, and existing wireless networks.
3. To explain the various terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks.
4. List and describe different network standards and protocols.
5. This course introduces the fundamentals of networking and principles of network operations.It also provides knowledge on various generations of cellular systems.

Course Outcomes (COs)

1. To design the various wireless networks.
2. Understand the principles behind the networking operation.
3. Examine the services provided in various layers of networks.
4. Classify different technologies followed in various generation of cellular networks.
5. Analyze different types of networks in wireless technology.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	L	H	M	L	M
CO2	M	L	M	H	M	L
CO3	H	L	L	M	M	L
CO4	L	M	M	M	L	H
CO5	M	L	M	L	M	H

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I **(18 Hours)**

1.1 Introduction to Wireless Communications and Networks – Cellular Mobile - Wireless Networks: Description of Cellular Systems (K1, K2)

1.2 Propagation Models for Wireless Networks – Mobile Communication Antennas (K3)

1.3 Evolution of Modern Mobile Wireless Communication Systems: Personal Area Networks (PAN) – Low-Tier Wireless System (K3, K4)

1.4 Public Wide-area Wireless Networks – Wireless Local Area Networks (WLANs) (K2, K5)

1.5 Wireless Technology Divisions – Cellular-WLAN Integration (K1, K2)

1.6 All-IP Networks: Vision for 4G(K1, K6)

Unit II **(16 Hours)**

2.1 Multiple Access Techniques in Wireless Communications: FDMA (K1)

2.2 TDMA (K2, K3)

2.3 SDMA (K2)

2.4 CDMA (K2)

2.5 GSM: Architecture and Protocols: GSM Network Architecture(K1, K5)

2.6 GSM Authentication and Security (K4, K6)

Unit III **(14 Hours)**

3.1 2.5G GPRS: Revisited– GPRS Networks Architecture (K1, K2)

3.2 Overview of CDMA - CDMA Evolution (K2)

3.3 CDMA IS-95 Systems – Handoff Process in a CDMA System (K3, K5)

3.4 3G- UMTS: UMTS Network Architecture – UMTS Interfaces (K4)

3.5 UMTS FDD and TDD – UMTS Channels (K5, K6)

3.6 UMTS Network Protocol (K4, K5)

Unit IV **(15 Hours)**

4.1 Overview of Internet Protocol and Mobile Internet Protocol: – TCP – UDP – DNS(K2)

4.2 Network Address Resolution Protocol (K2, K3)

4.3 IP Routing Protocols – Basic Mobile IP (K4)

4.4 Problems and Limitations of MIP (K3, K6)

4.5 Cellular and WLAN integration (K4, K5)

4.6 Internetworking Network Integration(K6)

Unit V **(12 Hours)**

5.1 Fundamentals of Wireless Local Area Networks: IEEE 802.11 – WLAN Transmission Technology – Spread Spectrum Technology (K1, K2)

5.2 WLAN System Architecture – IEEE 802.11 Logical Architecture (K3)

5.3 Collision Sense Multiple Access with Collision Detection: CSMA/CD (K4)

5.4 Collision Sense Multiple Access with Collision Avoidance: CSMA/CA – MAC Frame Format and Fragmentation (K4, K5)

5.5 IEEE 802.11 PCF – IEEE 802.11 PHY Layer – 802.11 Systems Performance – Security Issues: Some Basic 802.11 Services (K3, K6)

5.6 Roaming Handover and Mobility Management for WLAN – WLAN Applications – Overview of WiMAX Technologies: – IEEE 802.16 Standard Architecture(K2, K6)

Text Books:

1. ITI SahaMisra (2013). Wireless Communications and Networks. McGraw Hill Education.

Reference Books:

1. Jochen Schiller (2011). Mobile Communications. PHI/Pearson Education. 2nd Edition.
2. Dharma Prakash Agrawal- Qing-An Zeng (2006). Introduction to Wireless and Mobile Systems Cencage Learning.
3. William Stallings (2002). Wireless Communications and Networks. PHI/ Pearson Education.Second Edition.
4. KavehPahlavan-PrasanthKrishnamoorthy (2003). Principles of Wireless Networks. PHI/ Pearson Education

Open Educational Resources (OER):

1. https://www.tutorialspoint.com/wireless_communication/wireless_communication_overview.htm
2. https://www.youtube.com/watch?v=f2wlHL1Sok8&list=PLuv3GM6-gsE3ypUYh43pPuZsXxJVG1e7F

SEMESTER II

PCCSI20 – THEORY OF COMPUTATION

Year: I **Sem:** II	**Course Code:** PCCSI20	**Title of the Course:** Theory of Computation	**Course Type:** Theory	**Course Category:** Core	**H/W** 5	**Credits** 4	**Marks** 100

Course Objectives

1. To understand the concepts and operations of matrix algebra needed for computing graphics modeling.
2. To understand and apply the class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
3. To impart discrete knowledge in computer engineering through finite automata and Context free grammars.
4. To develop methods by which computer scientists can describe and analyze the dynamic behavior of discrete systems, in which signals are sampled periodically.
5. To enhance student's ability to understand and conduct mathematical proofs for computation and algorithms.

Course Outcomes (COs)

1. Understand and conduct mathematical proofs for computation and algorithms.
2. Show a competent understanding of the basic concepts of graph theory.
3. Explain the models of computation, including formal languages, grammars and automata.
4. Recognize and comprehend formal reasoning about languages.
5. Expand knowledge of pushdown automata and Turing machines.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	M	M	H	L	H
CO2	L	H	M	M	M	H
CO3	H	L	M	H	M	M
CO4	L	M	H	M	L	H
CO5	L	M	L	H	M	L

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I **(13 Hours)**

1.1 Logic and Propositional Calculus: Introduction- Propositions and Compound Propositions (K1)
1.2 Basic Logical Operations – Tautologies and Contradictions – Logical Equivalence (K1, K2)
1.3 Algebra of Propositions – Conditional and Bi conditional Statements (K2, K3)
1.4 Argument- Logical Implications- Propositional Functions (K3, K4)
1.5 Quantifiers- Negation of Quantified Statements (K4)
1.6 Normal Forms- Predicate Logic (K4)

Unit II **(14 Hours)**

2.1 Graph Theory: Introduction, Data Structures (K1)
2.2 Graphs and Multi graphs- Sub graphs, Isomorphic and Homeomorphic Graphs- Paths, Connectivity (K2)
2.3 The Bridges of Konigsberg, Traversable Multigraphs (K3)
2.4 Labeled and Weighted Graphs (K4)
2.5 Complete, Regular and Bipartite Graphs (K4, K5)
2.6 Tree Graphs- Planar Graphs-Graph Coloring (K4, K5)

Unit III **(11 Hours)**

3.1 Deterministic finite automata (DFA) (K3, K4)
3.2 Nondeterministic finite automata (NFA) (K3, K4)
3.3 Equivalence of DFA and NFA, and regular expressions (K3)
3.4 Regular expression and regular languages (K3, K4)
3.5 Non-regular languages and pumping Lemma (K4)
3.6 Closure properties (K4)

Unit IV **(12 Hours)**

4.1 Grammar Introduction– Types of Grammar (K1)
4.2 Context Free Grammars and Languages– Derivations and Languages (K1, K2)
4.3 Ambiguity- Relationship between derivation and derivation trees (K1, K3)
4.4 Simplification of CFG (K2)
4.5 Elimination of Useless symbols (K5)
4.6 Unit productions – Null productions (K5)

Unit V **(10 Hours)**

5.1 Pushdown automata and grammar simplification (K3)
5.2 Chomsky normal form (K4)
5.3 Pumping lemma for context-free languages (K4)
5.4 Turing Machines: Formal definition and behavior (K3)
5.5 Languages of a TM, TM as accepters (K4)
5.6 Types of TMs (K4)

Text Books:

1. Seymour Lipschutz, Marc Las Lipson, Varsha H Patil (2010). Discrete Mathematics, Fourth Edition, Tata McGraw Hill.
2. Hopcroft and Ullman (2002). Introduction to Automata Theory, Languages and Computation, Narosa Publishing House, Delhi.

Reference Books:

1. Kenneth H.Rosen (2002). Discrete Mathematics and Its Applications, Fourth Edition, Tata McGraw Hill.
2. A.Tamilarasi & A.M.Natarajan (2005). Discrete Mathematics and its Application, Second Edition, Khanna Publishers.
3. K. L. P Mishra, N. Chandrashekaran (2003). Theory of Computer Science - Automata Languages and Computation, Second Edition, Prentice Hall of India, India.

Open Educational Resources (OER):

1. https://www.youtube.com/watch?v=LFKZLXVO-Dg
2. https://www.youtube.com/watch?v=58N2N7zJGrQ&list=PLBlnK6fEyqRgp46K4ZY69yXm_pwKOIev

SEMESTER II

PECSC20 - ELECTIVE II A: CRYPTOGRAPHY AND NETWORK SECURITY

Year: I **Sem:** II	**Course Code:** PECSC20	**Title of the Course:** Elective II A: Cryptography and Network Security	**Course Type:** Theory	**Course Category:** Elective	**H/W** 5	**Credits** 5	**Marks** 100

Course Objectives

1. To know about various encryption techniques.
2. To understand the concept of Public key cryptography.
3. To explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms.
4. To understand various protocols for network security to protect against the threats in the networks.
5. To develop the ability to use existing cryptographic utilities to build programs for secure communication.

Course Outcomes (COs)

1. Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
2. Understand network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP.
3. Analyze and apply system security concept to recognize malicious code.
4. Able to do research in the emerging areas of cryptography and network security.
5. Protect any network from the threats in the world.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	H	M	L	H	M
CO2	M	L	M	H	M	L
CO3	M	M	M	L	M	L
CO4	M	L	M	H	M	L
CO5	M	L	L	M	H	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I **(16 Hours)**

1.1 Introduction – Classical Encryption techniques: Symmetric Cipher Model (K2)
1.2 Substitution Techniques – Transposition Techniques – Steganography(K2)
1.3 Block Ciphers and the Data Encryption Standards: Principles(K2)
1.4 DES – Strength of DES(K2)
1.5 Differential and Linear Cryptanalysis(K2)
1.6 Block Cipher Design principles (K2)

Unit II **(16 Hours)**

2.1 Advanced Encryption Standard: Evaluation Criteria for AES (K4)
2.2 AES cipher – Multiple Encryption and Triple DES (K4)
2.3 Block Cipher Modes of Operation. Confidentiality Using Symmetric Encryption.(K4)
2.4 Placement of Encryption Function – Traffic Confidentiality(K4)
2.5 Key Distribution(K4)
2.6 Random Number Generation(K4)

Unit III **(15 Hours)**

3.1 Introduction to Number Theory – Prime numbers(K2)
3.2 Fermat's and Euler's Theorem – Testing for Primality (K2)
3.3 The Chinese Remainder Theorem Public Key Cryptography and RSA (K2)
3.4 Principles of Public Key Cryptosystems –RSA Algorithm(K2)
3.5 Elliptical Curve Algorithm - Key Management(K2)
3.6 Diffie -Hellman Key Exchange – Kerberos(K2)

Unit IV **(14 Hours)**

4.1 Message Authentication and Hash functions(K2, K4)
4.2 Authentication Requirements – Authentication Functions(K2, K4)
4.3 MAC – Hash Functions(K2, K4)
4.4 Security of Hash functions and MACs (K2, K4)
4.5 Digital Signatures and Authentication Protocols: Digital Signatures (K2, K4)
4.6 Authentication Protocols – Digital Signature Standard (K2, K4)

Unit V **(14 Hours)**

5.1 Intruders – Intrusion Detection (K2, K3)
5.2 Password Management- Malicious Software (K2, K3)
5.3 Viruses and Related Threats – Virus Countermeasure (K2, K3)
5.4 Distributed Denial Of Service Attacks (K2, K3)
5.5 Firewall – Design Principles (K2, K3)
5.6 Trusted System (K2, K3)

Text Books:

1. William Stallings (2011). Cryptography and Network Security: Principles and Practices. Prentice Hall India, Fifth Edition.

Reference Books:

1. Charlie Kaufman, Radia Perlman and Mike Speciner (2002). Network Security: Private Communication in a Public World, Prentice Hall India, Second Edition.
2. William Stallings (2010). Network Security Essentials: Applications and Standards. PearsonEducationAsia, Third Edition.

Open Educational Resources (OER):

1. http://vssut.ac.in/lecture_notes/lecture1428550736.pdf
2. http://uru.ac.in/uruonlinelibrary/Cyber_Security/Cryptography_and_Network_Security.pdf
3. https://www.slideshare.net/patisa/cryptography-and-network-security-27006194
4. https://www.cise.ufl.edu/~nemo/crypto/slides/ch01_overview_nemo.ppt
5. https://www.youtube.com/watch?v=UbwhW4Xof9E

SEMESTER II

PECSD20 - ELECTIVE II B: SOFT COMPUTING

Year: I **Sem:** II	**Course Code:** PECSD20	**Title of the Course:** Elective II B: Soft Computing	**Course Type:** Theory	**Course Category:** Elective	**H/W** 5	**Credits** 4	**Marks** 100

Course Objectives

1. To Learn and Understand basics of Neural Networks.
2. Introduce and use the idea of neural networks and fuzzy logic.
3. To Learn Basics of Classification and Regression Algorithms.
4. Introduce and use the concepts of Genetic algorithm and its applications to soft computing.
5. Familiarize with soft computing concepts.

Course Outcomes (COs)

1. Describe Soft Computing Techniques and their roles in building Intelligent Machines
2. Analyze various fuzzy models in developing fuzzy inference system to be appropriate with specific real time problems.
3. Apply Specific Unsupervised and Supervised Neural Network to find the approximate solutions to real world Problems.
4. Use genetic algorithm to combinatorial Optimization Problems.
5. Present the feasibility of applying a Soft Computing methodology for specific problem.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	L	M	M	L	M
CO2	H	M	M	L	H	M
CO3	M	M	L	M	L	M
CO4	L	M	M	L	H	H
CO5	M	M	L	M	L	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I (13 Hours)

1.1 Artificial Neural Networks: Introduction-History of Artificial Neural Network(K1)
1.2 Knowledge Based Information processing: Neural Information Processing-Hybrid Intelligence (K1)
1.3 Basic Neural Computational Model: Basic Concepts of Neural Networks – Network Properties - Node Properties System Dynamics (K1)
1.4 Single Layer Perceptron: Multilayer Perceptron - Adalines- Competitive Learning Hebbian learning (K1)
1.5 Supervised and Unsupervised: Explanation Based Learning- BACON learning -meta dendral (K1)
1.6 Neural Network Learning: Backpropagation- Applications (K2, K5)

Unit II (14 Hours)

2.1 Fuzzy System: Set Theoretic Operations MF formulation and Parametrization Compositional Rule of Interface (K1)
2.2 Fuzzy sets and Fuzzy reasoning: Single rule with Single Antecedent – Single rule with Multiple Antecedent – Multiple rules with Multiple Antecedent(K1)
2.3 Decision making under Fuzzy States and FuzzyActions (K2, K3)
2.4 Fuzzy function – Fuzzy Decomposition(K2, K3)
2.5 Fuzzy control methods: Mamdani fuzzy models - Sugeno fuzzy models - Tsukamoto fuzzy model (K4)
2.6 Fuzzy decision making: Input space Partitioning - Grid Partitioning - Application (K4, K5)

Unit III (11 Hours)

3.1 Neuro Fuzzy modeling:Adaptative Neuro fuzzy Inference systems - Introduction -ANFIS Architecture – Hybrid Learning Algorithm (K3)
3.2 ANIFS As a Universal Approximation: Classification and Regression trees - Introduction Decision trees (K3)
3.3 CART Algorithm for Tree Introduction: Tree Growing - Classification Trees(K3)
3.4 Regression Trees: Tree Growing - Tree Pruning (K3)
3.5 Rule Based Structure Identification: Introduction Input Selection (K3)
3.6 Rule Based Organization: Neuro fuzzy control I - Neuro fuzzy control I(K3)

Unit IV (12 Hours)

4.1 Introduction: Genetic Algorithm - Encoding Binary Encoding - Real Number Bumbing - Integer or literal Permutation encoding (K3)
4.2 Crossover: Single point crossover - Multi point Crossover - Uniform Crossover(K2)
4.3 Mutation – Single point Mutation - Multipoint Mutation (K3)
4.4 Selection – Roulette Wheel Selection - Rank Selection - Tournament Selection - Steady State selection (K4)
4.5 Generic Algorithm Parameters - Population size - Crossover rate - Mutation rate (K5)
4.6 Applications of Generic Algorithm - Advantages and Disadvantages of Genetic Algorithm (K5)

Unit V (10 Hours)

5.1 Introduction to Neuro fuzzy and Soft computing - Soft computing Constituents and conventional AI (K1, K3)
5.2 Conventional AI to computational Intelligence Neuro Fuzzy and Soft computing Characteristics (K2)
5.3 Search Strategies for AI Production systems Backtracking Strategies - Graph Search

Strategies (K2)

5.4 Heuristic Graph Search Procedures -Algorithm A - The Admissibility of A* - Comparison of AR Algorithms (K3, K4)

5.5 Predicate calculator in AI - Frames - Frames as sets and Instances - Semantic Nets (K4, K5)

5.6 Hybrid Model Applications - Fuzzy implement using Matlab (K4, K5)

Text Books:

1. S.N.Deepa and S.N.Sivanandham-Principles of Soft computing, Third Edition - Wiley India Pvt.Ltd., 2018.
2. N.P Padhy and S.P Simon-Soft computing with mat lab programming, oxford university press, 2015.
3. Jang J.S.R, Sun C.T and Mizutami E-Neuro Fuzzy and Soft Computing- Prentice Hail India, New Delhi, 2015.
4. Laurene Fauseett - Fundamentals of Neural Networks - Prentice Hall India, New Delhi, 2008.

Reference Books:

1. S Rajasekeran, G.A Vijayalakshmipai, Neural Networks, Fuzzy logic and Genetic Algorithm, Synthesis and Application, PHI learning Pvt.Ltd., 2017.
2. Timothy J.Ross - Fuzzy Logic Engineering Application - Tata McGraw Hill, 1997.

Open Educational Resources (OER):

1. Introduction to Artificial Intelligence - Video Tutorial - https://youtu.be/J7LqgglEfQw
2. Fuzzy logics and fuzzy system - Video Tutorial- https://youtu.be/UIqrfHjXBjM

SEMESTER II

PCCSJ20 - PRACTICAL III: MACHINE LEARNING

Year: I **Sem:** II	**Course Code:** PCCSJ20	**Title of the Course:** Practical III: Machine Learning	**Course Type:** Practical	**Course Category:** Core	**H/W** 5	**Credits** 3	**Marks** 100

Course Objectives

1. To work on important concepts of Machine Learning.
2. Practical implementation of algorithms with sample data.
3. To develop skills of using machine learning algorithms for solving problems.
4. Developing skills in predictive analytics using ML algorithms.
5. To gain experience of doing independent research.

Course Outcomes (COs)

1. Be capable of confidently applying common Machine Learning algorithms in practice and Implementing their own.
2. Be capable of performing distributed computations.
3. To be capable of performing experiments in Machine Learning using sample data.
4. Understand a wide variety of learning algorithms.
5. Understand how to evaluate models generated from data

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	H	L	M	M	L
CO2	H	M	L	L	M	M
CO3	M	H	M	L	L	M
CO4	H	M	M	M	H	L
CO5	L	M	H	L	L	M

(Low - L, Medium – M, High - H)

Course Syllabus

Exercises

1. Linear Regression (K1, K2)
2. Logistic Regression without CSV file (K1, K3)
3. Logistic Regression with CSV file (K2, K4)
4. Classification using SVM (K4, K5)
5. k-means algorithm (K2, K5)
6. Decision Tree Algorithm (K1, K3)
7. Random Forest Algorithm (K6)
8. Naive Bayes Algorithm to find Accuracy. (K1, K3)
9. JSP program to process credit card information(K5)

SEMESTER II

PCCSK20 - PRACTICAL IV- OPEN SOURCE PROGRAMMING LAB

Year: I **Sem:** II	**Course Code:** PCCSK20	**Title of the Course:** Practical IV: Open Source Programming Lab	**Course Type:** Practical	**Course Category:** Core	**H/W** 3	**Credits** 2	**Marks** 100

Course Objectives

1. Demonstrate different open source technology like Linux, PHP & MySQL with different packages.
2. To understand the importance of the web as an effective medium of communication
3. Explore programs of PHP with MySQL connection.
4. Use PHP to access a MySQL database.
5. Illustrate Linux commands for programming.

Course Outcomes (COs)

1. Explore different open source technology like Linux, PHP & MySQL with different packages.
2. Implement static, dynamic and interactive web pages and web applications.
3. Develop basic skills in analyzing the usability of a web site.
4. Execute programs of PHP with MySQL connection.
5. Execute Linux commands for programming.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	H	L	M	L	L
CO2	L	M	M	L	L	M
CO3	M	L	M	L	H	M
CO4	L	M	L	M	M	L
CO5	L	M	H	M	L	M

(Low - L, Medium – M, High - H)

Course Syllabus

Exercises

1. Write a server side PHP program that displays marks- total- grade of a student in tabular format by accepting user inputs for name- number and marks from a HTML form. (K1, K6)
2. Write a PHP program implement Simple Calculator Operations. (K6)
3. Write a PHP program interface to create a database and to insert a table into it.
   a. Use classes to create a table. (K2)
   b. Create a directory - and to read contents from the directory. (K3)
4. a. Write a PHP program to display a digital clock which displays the current time of the server.(K6)
   b. Write a Program and check message passing mechanism between pages. (K2, K4)
5. Create a MYSQL table and execute queries to read – add - remove and modify a record from that table. (K6)
6. a. Write a shell script to stimulate the file commands. (K1, K2)
   b. Write a shell script program to find out the maximum and minimum number of the given series. (K6)
7. a. Write a shell script to show the system configuration. (K1, K2)
   b. Write a shell script program to check whether the given string is palindrome or not. (K6)
8. a.Write a shell script to implement the following: pipes-Redirection and tee commands.(K1,K2)
   b. Write a Shell Script program to develop a calculator application. (K6)
9. a. Write a shell script to implement the filter commands. (K1, K2)
   b. Write a shell script to print the multiplication table of the given argument using for loop. (K6)
10. a. Write a shell script to swap two numbers. (K6)
    b. Write a shell script to find greatest of given three numbers. (K6)

SEMESTER III

PCCSL20 - WEB SERVICES

Year: II **Sem:** III	**Course Code:** PCCSL20	**Title of the Course:** Web Services	**Course Type:** Theory	**Course Category:** Core	**H/W** 5	**Credits** 5	**Marks** 100

Course Objectives

1. To understand Web Services and its implementation model.
2. Understand the principles of SOA, its Principles and Benefits.
3. Understand XML concepts.
4. Understand paradigms needed for testing Web Services.
5. To learn how to implement and deploy Web Services.

Course Outcomes (COs)

1. Efficiently use market leading environment tools to create and consume web services.
2. Identify and select the appropriate framework components in creation of web service solution.
3. Able to apply SOAP, HTTP and UDDI services in the web applications.
4. Apply SOAP principles to creation of web service solutions.
5. Able to know the structure of XML and to design and store data in XML.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	L	M	M	L	H
CO2	M	H	L	M	L	M
CO3	L	M	L	H	L	M
CO4	M	M	L	M	H	M
CO5	L	M	M	M	L	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I **(18 Hours)**

1.1 Evolution of Distributed Computing: Basics of Distributed Computing - Evolution of Middleware (K1, K2)

1.2 Importance of Distributed Computing (K1)

1.3 Web Service Architecture (K1, K3)

1.4 Client Server Applications – CORBA – Java RMI - Microsoft DCOM - Message Oriented Middleware (K1, K4)

1.5 Common Challenges in Distributed Computing - The Emergence of Web Services (K1)

1.6 SOA – Architecture (K1, K3)

Unit II **(16 Hours)**

2.1 Introduction to Web Services: What are Web Services? Motivation and Characteristics – Use of Web Services (K1, K2)

2.2 Basic Operational Model of Web Services (K1)

2.3 Core Web Services Standards (K1, K2)

2.4 Other industry Standards Supporting Web Services (K3)

2.5 Challenges in Web Services (K3)

2.6 Web Services Software and Tools-Benefits of Web Services. (K1, K4)

Unit III **(14 Hours)**

3.1 Web Services Architecture and Technologies: Building the Web Service Architecture – Web Service Architecture and its Core Building Blocks (K1, K2)

3.2 Tools of the Trade - SOAP-WSDL-UDDI (K2, K3)

3.3 Web Services Communication Models - RPC Based Communication Models - Messaging Based Communication Model (K3, K4)

3.4 Implementing Web Services (K4)

3.5 To develop java-based Web Services - Developing Web Services using J2EE (K4, K6)

3.6 Description and Discovery of Web Services: Web Services Description Language (WSDL)-Universal Description, Discovery, and Integration (UDDI)(K4)

Unit IV **(15 Hours)**

4.1 Developing Web Services using SOAP: XML based Protocols and SOAP (K6)

4.2 Anatomy of a SOAP Message (K2)

4.3 SOAP Encoding (K1, K4)

4.4 SOAP Message Exchange Protocol (K4)

4.5 SOAP Communication - SOAP Messaging - SOAP Bindings for Transport Protocols (K4, K5)

4.6 SOAP Security - Building SOAP Web Services. (K3, K6)

Unit V **(12 Hours)**

5.1 Creating .NET Interoperability: Means of Ensuring Interoperability (K6)

5.2 Microsoft .NET Framework: An Overview (K1, K2)

5.3 Challenges in Creating Web Services Interoperability. (K1, K6)

5.4 XML Processing and Data Binding with Java API's: XML Basics (K1, K2)

5.5 Java Architecture for XML Binding – Data Binding Generation - Marshalling XML - Unmarshalling Java (K1, K4)

5.6 Sample Code for XML Data Binding. (K6)

Text Books:

1. R. Nagappan, R. Skoczylas, R.P. Sriganesh (2014). Developing Java Web Services. Wiley India.
2. Michael P. Papazoglou (2011). Web Services & SOA Principles and Technology. Second Edition.

Reference Books:

1. F.P.Coyle (2010). XML- Web Services and the Data Revolution. Pearson Education.
2. S. Graham (2005). Building web Services with Java. Pearson Education. Second Edition.
3. D.A. Chappell & T. Jewell- O'Reilly (2012). Java Web Services. SPD.
4. McGovern- et al. (2005). Java web Services Architecture. Morgan Kaufmann Publishers.
5. Richard Monson-Haefel (2009). J2EE Web Services. Pearson Education.

Open Educational Resources (OER):

1. https://www.tutorialspoint.com/webservices/what_are_web_services.htm#:~:text=Web%20services%20are%20built%20on,objects%2C%20messages%2C%20or%20documents.
2. https://www.javatpoint.com/web-services-tutorial
3. https://docs.oracle.com/cd/E17802_01/webservices/webservices/docs/1.6/tutorial/doc/JavaWSTutorial.pdf
4. https://www.eclipse.org/webtools/community/education/web/t320/Implementing_a_Simple_Web_Service.pdf
5. http://helpme.engr.scu.edu/JavaWSTutorial.pdf
6. https://swrdfish.github.io/assets/ssl/JavaWebServices.pdf
7. https://hle2ng0za0mn8ya.files.wordpress.com/2014/09/introduction-to-web-services-with-java.pdf

SEMESTER III

PCCSM20 – DISTRIBUTRED AND CLOUD COMPUTING

Year: II **Sem:** III	**Course Code:** PCCSM20	**Title of the Course:** Distributed and Cloud Computing	**Course Type:** Theory	**Course Category:** Core	**H/W** 5	**Credits** 5	**Marks** 100

Course Objectives

1. To explain distributed system and cloud models.
2. To learn the cloud environment, building software systems and components that scale to millions of users in modern internet and cloud concepts .
3. To understand cloud service models including Iaas, Paas, Saas and developing cloud based software applications on top of cloud platform.
4. To distribute a single task among multiple computers and to solve it quickly by maintaining coordination between them.
5. To apply distribute computational model and understand the need for cloud computing.

Course Outcomes (COs)

1. Understand the concepts of cloud Architecture and its services.
2. Classify different services providers and its services, tools.
3. Demonstrate the paradigms and to map applications.
4. Analyze the best resource for cloud computing.
5. Assess virtualization in cloud.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	H	L	M	M	L
CO2	M	H	M	M	L	H
CO3	L	M	H	H	M	L
CO4	H	L	L	M	L	M
CO5	L	H	M	H	M	L

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I **(16 Hours)**

1.1 Cloud Computing Fundamentals: Motivation for Cloud Computing - Defining Cloud Computing (K1)
1.2 Principles of Cloud computing (K1)
1.3 Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning (K2)
1.4 Cloud Computing Architecture and Management: Cloud Architecture (K2, K3)
1.5 Cloud Deployment Models: Private Cloud - Public Cloud - Hybrid Cloud (K2, K3)
1.6 NIST Applications on the Cloud (K2)

Unit II **(16 Hours)**

2.1 Cloud Service Models: Infrastructure as a Service (K1, K3)
2.2 Platform as a Service (K1, K3)
2.3 Software as a Service (K1, K3)
2.4 Cloud Storage (K1, K5)
2.5 Advantages of Cloud Storage (K1, K2)
2.6 Cloud Service Providers: Google - Amazon Web Services – Microsoft – Manjrasoft – S3 (K5)

Unit III **(15 Hours)**

3.1 Parallel and Distributed Programming Paradigms (K1, K3)
3.2 MapReduce, Twister and Iterative MapReduce (K1, K3)
3.3 Hadoop Library from Apache (K1, K3)
3.4 Mapping Applications (K1, K2)
3.5 Google App Engine, Amazon AWS (K1, K2)
3.6 Cloud Software Environments – CloudSim (K1, K2)

Unit IV **(14 Hours)**

4.1 Clustering for Massive Parallelism (K1, K2)
4.2 Computer Clusters (K1, K3)
4.3 MPP Architectures (K1, K3)
4.4 Design Principles of Computer Clusters (K1, K4)
4.5 Cluster Job and Resource Management (K2)
4.6 Case Studies of Top Supercomputer Systems (K1)

Unit V **(14 Hours)**

5.1 Implementation Levels of Virtualization (K4)
5.2 Virtualization Structures/Tools and Mechanisms (K4)
5.3 Virtualization of CPU, Memory, and I/O Devices (K4)
5.4 Virtual Clusters (K1)
5.5 Resource Management (K2)
5.6 Virtualization for Data-Center Automation (K3)

Text Books:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra (2012). Distributed and Cloud Computing, From Parallel Processing to the Internet of Things. Morgan Kaufmann Publishers.
2. K. Chandrasekaran (2015). Essentials of cloud computing, CRC Press.

Reference Books:

1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi (2013). Mastering Cloud Computing. Tata McGraw Hill.
2. Toby Velte, Anthony Velte, Robert Elsenpeter (2009). Cloud Computing – A Practical Approach. Tata McGraw Hill.

Open Educational Resources (OER):

1. https://www.youtube.com/watch?v=Yh3gCFG-IRI
2. https://www.youtube.com/watch?v=2PAVAvyj1q0

SEMESTER III

PCCSN20 – PRINCIPALS OF COMPILER DESIGN

Year: II **Sem:** III	**Course Code:** PCCSN20	**Title of the Course:** Principals of Compiler Design	**Course Type:** Theory	**Course Category:** Core	**H/W** 5	**Credits** 4	**Marks** 100

Course Objectives

1. Understand the basic concepts of compiler.
2. Discuss the functionality of Lexical analysis.
3. Illustrate the concepts of syntax analysis through parser and its types.
4. Define and List the intermediate codes.
5. Summarize the working features of Code Generation.

Course Outcomes (COs)

1. Explain the concepts of compiler and discuss the Code Generation
2. Describe the functionality of Lexical analysis.
3. Describe the functionality of Syntax analysis.
4. Define the storage organization and List the intermediate codes.
5. Summarize the working features of Code Generation.
6. Apply their basic knowledge of Data Structure to design Symbol Table, Lexical Analyzer, Intermediate Code Generation, and Parser.

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	L	M	H	M	L
CO2	M	L	M	H	M	M
CO3	M	M	L	M	L	M
CO4	H	L	M	M	L	H
CO5	L	M	M	L	H	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I **(13 Hours)**

1.1 Introduction: The Structure of a Compiler (K2, K4)
1.2 Lexical Analysis – BootStrap (K4)
1.3 Syntax Analysis- Semantic Analysis-Intermediate Code Generation (K4)
1.4 Code Optimization - Code Generation (K4, K5)
1.5 Symbol Table Management - The Grouping of Phases into Passes (K4, K5)
1.6 Compiler Construction Tools - The Evolution of Programming Languages (K3, K5)

Unit II **(14 Hours)**

2.1 Lexical Analysis: The Role of the Lexical Analyzer (K2, K4)
2.2 Input Buffering - Specification of Tokens (K4)
2.3 Recognition of Tokens (K2)
2.4 Finite Automata- Nondeterministic Finite Automata (K2)
2.5 Conversion of an NFA to a DFA (K5)

Unit III **(11 Hours)**

3.1 Construction of an NFA from a Regular Expression (K6)
3.2 Syntax Analysis: Introduction (K2)
3.3 Context-Free Grammars (K3)
3.4 Top-Down Parsing (K6)
3.5 Bottom-Up Parsing (K6)

Unit IV **(12 Hours)**

4.1 Introduction to LR Parsing (K2)
4.2 Intermediate Code Generation: Variants of Syntax Trees (K2, K4)
4.3 Three-Address Code (K2, K4)
4.4 Types and Declarations (K3)
4.5 Translation of Expressions. (K4, K5)

Unit V **(10 Hours)**

5.1 Code Generation: Design of a Code Generator (K2, K4)
5.2 Basic Blocks and Flow Graphs- Optimization of Basic Blocks (K2, K5)
5.3 Peephole Optimization- the Principal Sources of Optimization (K4, K2)
5.4 Introduction to data flow Analysis (K2)
5.5 Apply their basic knowledge of Data Structure to design Symbol Table, Lexical Analyzer, Intermediate Code Generation, Parser (Top Down and Bottom Up Design) (K3)

Text Books:

1. Alfred V Aho - Monica S. Lam- Ravi Sethi - Jeffrey D Ullman (2007). Compilers - Principles - Techniques and Tools. Addison - Wesley. Second Edition.

Reference Books:

1. Charles N. Fischer, Richard. J. LeBlanc (2008). Crafting a Compiler with C.
2. Randy Allen, Ken Kennedy (2002). Optimizing Compilers for Modern Architectures: A
3. Dependence - based Approach. Morgan Kaufmann Publishers.
4. Steven S. Muchnick (2003). Advanced Compiler Design and Implementation. Morgan
5. Kaufmann Publishers Elsevier Science. Indian Reprint.
6. Keith D Cooper and Linda Torczon (2004). Engineering a Compiler. Morgan Kaufmann
7. Publishers Elsevier Science.

Open Educational Resources (OER):

1. https://www.tutorialspoint.com/compiler_design/index.htm
2. https://en.wikipedia.org/wiki/Principles_of_Compiler_Design
3. https://www.youtube.com/watch?v=WccZQSERfCM&list=PLEbnTDJUr_IcPtUXFy2b1sGRPsLFMghhS&index=2

SEMESTER III

PECSE20 - ELECTIVE III A: INTERNET OF THINGS

Year: II **Sem:** III	**Course Code:** PECSE20	**Title of the Course:** Elective III A: Internet of Things	**Course Type:** Theory	**Course Category:** Elective	**H/W** 5	**Credits** 4	**Marks** 100

Course Objectives

1. To understand smart objects and IoT Architectures.
2. To learn various protocols at the different layers for IoT.
3. To develop prototype systems using Arduino.
4. To learn the design and development process involved in creating a cloud based application.
5. To apply the concept of Internet of Things in the real world scenario.

Course Outcomes (COs)

1. Understand the fundamentals of IoT.
2. Analyze different connectivity technologies for IoT.
3. Design a portable IoT using Arduino / equivalent boards and relevant protocols.
4. Deploy an IoT application and connect to the Fog.
5. Develop IoT applications with different platform and frameworks.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	L	M	H	L	M
CO2	L	M	H	M	H	L
CO3	M	L	L	L	L	M
CO4	M	L	L	M	L	M
CO5	L	H	M	M	L	M

(Low - L, Medium – M, High – H)

Course Syllabus

Unit I **(17 Hours)**

1.1 Introduction to Internet of Things: Introduction - Characteristics of IoT (K1)
1.2 Applications of IoT - IoT Categories - Sensors (K1, K2)
1.3 Actuators - IoT Components and Implementation (K1, K3)
1.4 Challenges of IoT - IoT Networking: Connectivity Terminologies (K2)
1.5 Gateway Prefix Allotment (K3, K4)
1.6 IoT Identification and Data Protocols (K4, K6)

Unit II **(14 Hours)**

2.1 Connectivity Technologies: IEEE802.15.4 - ZigBee (K2, K3)
2.2 RFID - HART and Wireless HART - NFC - Bluetooth (K4, K6)
2.3 Z-Wave - Wireless Sensor Networks: Components of Sensor Nodes (K3)
2.4 Challenges in WSN - Applications of WSN - Wireless Multimedia Sensor Network (K2)
2.5 Wireless Nano sensor Networks - Under Water Acoustic Sensor Networks (K2, K4)
2.6 UAV Networks and M2M Communication: UAV Components - UAV Networks - M2M Communication (K2, K6)

Unit III **(15 Hours)**

3.1 Programming with Arduino: Features of Arduino - Program Elements (K2)
3.2 Cloud Computing: Characteristics - Deployment Models - Service Models (K1, K2)
3.3 Service Management - Cloud Security (K2, K3)
3.4 Sensor Cloud: Comparison with WSN - Sensor Cloud Architecture (K4, K6)
3.5 Advantages of Sensor Cloud - Sensor Cloud Services Life Cycle Model (K3)
3.6 Sensor Cloud Applications - Issues and Challenges in Sensor Cloud (K1, K3)

Unit IV **(16 Hours)**

4.1 Fog Computing: Requirements of IoT - Architecture of Fog (K1, K2)
4.2 Working - Advantages - Applications - Challenges in Fog (K2, K3)
4.3 Smart Homes: Smart Home Implementations - House Area Networks (K3, K6)
4.4 Smart Home benefits and Issues (K4)
4.5 Smart Grids: Characteristics of Smart Grid (K2, K3)
4.6 Components of Smart Grid - Smart Grid and Cloud(K1, K5)

Unit V **(12 Hours)**

5.1 Smart Cities: Characteristics of Smart Cities (K1, K2)
5.2 Smart City Framework (K2, K6)
5.3 Challenges in Smart City - Data Fusion - Smart Parking (K3, K6)
5.4 Industrial IoT: IIoT Requirements (K3, K4)
5.5 Applications of IIoT (K1, K4)
5.6 Benefits and Challenges of IIoT (K2, K3)

Text Books:

1. Dr.Jeeva Jose (2018), "Internet of Things", Khanna Book Publishing Co. (P) Ltd.

Reference Books:

1. Jan Holler, VlasiosTsiatsis (2014)," From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence" Academic Press, First Edition.
2. Vijay Madisett, ArshdeepBahga (2014), “Internet of Things - Hands-on Approach”, First Edition, VPT.

Open Educational Resources (OER):

1. https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/
2. https://www.youtube.com/watch?v=UrwbeOIlc68

SEMESTER III

PECSF20 - ELECTIVE III B: MULTIMEDIA COMMUNICATION

Year: II **Sem:** III	**Course Code:** PECSF20	**Title of the Course:** Elective III B : Multimedia Communication	**Course Type:** Theory	**Course Category:** Elective	**H/W** 5	**Credits** 4	**Marks** 100

Course Objectives

1. Understanding the Multimedia Communications Systems, Application and Basic Principles.
2. To acquire the basic knowledge of multimedia communication technologies including audio, image, video, text compression techniques and distributed multimedia system.
3. Explanation about signal processing aspects involved in multimedia including signal properties.
4. Application of coding techniques in recent applications for data storage and communication of multimedia.
5. Analysis/comparison of various coding techniques, case study and problem solving as per given data.

Course Outcomes (COs)

1. Understand the current state-of-the-art developments in Internet technologies for multimedia communications
2. Understand and apply the principles used in designing multimedia protocols, and standard protocols that are designed the way that they are.
3. Understand the system design principles of multimedia communications systems.
4. Solve problems and design simple networked multimedia systems
5. Think critically and learn independently.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	M	L	M	L	H
CO2	M	M	L	H	L	M
CO3	L	M	M	M	L	M
CO4	L	L	M	L	H	M
CO5	M	L	L	M	L	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I **(13 Hours)**

1.1 Multimedia communication: Introduction Networks-Multimedia Applications(K2)
1.2 Multimedia Information representation: Introduction –Principles - text-Image - Audio - video (K2)
1.3 Broadcast Television – Digital video.Text and Image Compression: Compression principles(K2)
1.4 Text compression – Image compression (K2)
1.5 Audio and video compression: Audio compression (K2)
1.6 Video compression – Principles, H.261, H.263, MPEG, MPEG-1 (K2)

Unit II **(14 Hours)**

2.1 Standards for Multimedia Communications: Reference Models (K1, K2)
2.2 Interpersonal Communications. Digital Communication Basis: Transmission Media (K1, K2)
2.3 Sources of Signal Impairment – Asynchronous Transmission – Synchronous Transmission (K1, K2)
2.4 Error Detection Methods. Circuit Switched Networks: Transmission Systems (K1, K2)
2.5 Analog, PSTN Modems, Digital (K1, K2)
2.6 Switching Systems –Signal Systems (K1, K2)

Unit III **(11 Hours)**

3.1 Enterprise Networks: Introduction- Lans (K4, K6)
3.2 Ethernet – Token Ring – Bridges – FDDI (K4, K6)
3.3 High Speed Lans - LAN Protocols. The Internet: IP Datagram (K4, K6)
3.4 IP Address – ARP And RARP (K4, K6)
3.5 Routing Algorithms - Static Routing, Flooding, Vector Routing (K4, K6)
3.6 Shortest Path – ICMP - Ipv6 (K4, K6)

Unit IV **(12 Hours)**

4.1 Transport Protocols: TCP/IP Protocol Suite - TCP (K1, K2)
4.2 User Service, Protocol Operations – UDP - User Service (K1, K2)
4.3 Protocol Operations. Application Support Functions: ASN.1-Security (K1, K2)
4.4 Data Encryption - Terminology (K1, K2)
4.5 Basics Techniques - Authentication (K1, K2)
4.6 Pubic Key Certification Authorities (K1, K2)

Unit V **(10 Hours)**

5.1 Internet Applications: DNS - Email (K1)
5.2 FTP – TFTP - Internet Telephony – SNTP (K1)
5.3 World Wide Web: Urls And HTTP –HTML (K1)
5.4 Text, List, Color, Images, Tables, Forms (K1)
5.5 Java And Java Script- Security (K1)
5.6 Web Operations (K1)

Text Books:

1. Fred Halsall (2013). Multimedia Communications: Applications, Protocols, and Standards. Pearson Education Asia.

Reference Books:

1. SugataMitra and Gaurav Bhatnagar (2014). Introduction to Multimedia Systems (Communications,
2. Networking and Multimedia).Pearson Publications.
3. Steinmetz (2010). Multimedia: Computing Communications & Applications", Pearson Publications.

Open Educational Resources (OER):

1. http://www.eie.polyu.edu.hk/~enyhchan/mt_intro.pdf
2. https://www.semanticscholar.org/paper/Multimedia-communication-Wolf-Griwodz/495cdd5c738edd847bc965e06b9c01bfa5f336c8
3. https://www.slideshare.net/ayyakathir/multimedia-communication-networks-29753118

SEMESTER III

PECSG20 - ELECTIVE IV A: BIG DATA ANALYTICS

Year: II **Sem:** III	**Course Code:** PECSG20	**Title of the Course:** Elective IV A: Big Data Analytics	**Course Type:** Theory	**Course Category:** Elective	**H/W** 5	**Credits** 4	**Marks** 100

Course Objectives

1. To learn more about the trends in Big Data and how they impact the business world like Risk Marketing – Healthcare - Financial Services - etc.
2. To study the basic technologies that forms the foundations of Big data.
3. Explains this new technology and how companies can use them effectively to gather the data that they need and glean critical insights.
4. To understand the Big data platform and Usecases.
5. To study different types case studies on the current research and applications of the Hadoop and big data in industry.

Course Outcomes (COs)

1. Define the big data, types of data and understand the need of big data analytics.
2. Describe the Hadoop architecture and File system.
3. Apply the MapReduce Programming model for real-world problems.
4. Learn the concepts of Main data streams.
5. Demonstrate the working of clusters.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	M	M	L	L	H
CO2	L	M	M	L	M	H
CO3	H	L	H	L	M	M
CO4	H	M	H	M	H	L
CO5	L	H	M	H	L	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I **(13 Hours)**

1.1 Understanding Big Data: Types of Digital Data - Classification of digital data (K2)
1.2 Introduction to Big data - Characteristics of data (K2)
1.3 Evolution of Big data - Definition of Big data (K2, K5)
1.4 Challenges with Big data - Sudden Hype around Big Data Analytics (K4)
1.5 Classification of Analytics - Data Science - Terminologies used in Big Data Environments - Few Top Analytics tools (K2, K4)
1.6 NoSQL - Types of NoSQL Databases - Advantages of NoSQL (K2)

Unit II **(14 Hours)**

2.1 Basics of Hadoop: Introduction to Hadoop - Basics – RDBMS vs Hadoop (K2, K4)
2.2 Distributed computing challenges - History of Hadoop (K4)
2.3 Hadoop overview – use case of Hadoop – Hadoop distributors (K5)
2.4 Hadoop Distributed File system – Processing data with Hadoop (K3)
2.5 MongoDB: Introduction to MongoDB – Basics of MongoDB - Terms used in RDBMS and MongoDB (K2)
2.6 Data Types in MongoDB - MongoDB Query Language (K2, K3)

Unit III **(11 Hours)**

3.1 Cassandra: Introduction to Cassandra - Apache Cassandra - An Introduction (K2)
3.2 Features of Cassandra (K2)
3.3 Introduction to MAPREDUCE Programming (K2)
3.4 Hive: Introduction to Hive - Hive Architecture (K2, K3)
3.5 Hive Data Types - Hive File Format - Hive Query Language (K4)
3.6 RCFile Implementation – User Defined Function (UDF) (K3)

Unit IV **(12 Hours)**

4.1 Mining Data Streams: Data Model (K3)
4.2 Sampling Data in the Stream – Filtering Streams (K4, K5)
4.3 Counting Distance Elements in a Stream (K4, K5)
4.4 Estimating Moments (K4, K5)
4.5 Counting Ones in Window (K4)
4.6 Decaying Windows (K4)

Unit V **(10 Hours)**

5.1 Clustering: Introduction to Clustering Techniques (K2, K5)
5.2 Hierarchical Clustering (K2 K5)
5.3 Algorithms – K - Means – CURE (K5)
5.4 Clustering in Non_ Euclidean Spaces (K5)
5.5 Streams and Parallelism (K5)
5.6 Case Study: Advertising on the Web (K6)

Text Books:

1. Jure Leskovec, Anand Rajaraman & Jeffrey David Ullman (2014). Mining of Massive Datasets. Cambridge University Press. Second Edition.
2. Seema Acharya and Subhashini Chellappan (2015). Big Data and Analytics. Wiley Publication.

Reference Books:

1. Michael Minelli, Michelle Chambers and Ambiga Dhiraj (2013). Big Data and Big Analytics. Wiley Publication.
2. Jiawei Han, Micheline Kamber & Jian Pei (2011). Data Mining Concepts and Techniques. Morgan Kaufman Publications. Third Edition.

Open Educational Resources (OER):

1. https://www.youtube.com/watch?v=HwmEcudlv44&list=PL4OCRJojkV1jN-Ed6RkQpWfBvqe0utRd6
2. https://www.youtube.com/watch?v=SRTSVxUnsNI

SEMESTER III

PECSH20 – ELECTIVE IV B: SOFTWARE PROJECT MANAGEMENT

Year: II **Sem:** III	**Course Code:** PECSH20	**Title of the Course:** Elective IV B : Software Project Management	**Course Type:** Theory	**Course Category:** Elective	**H/W** 5	**Credits** 4	**Marks** 100

Course Objectives

1. Define and highlight importance of software project management.
2. Describe the software project management activities.
3. To highlight different techniques for software cost estimation and activity planning.
4. To discuss the notion of risks and the risk management process.
5. Train software project manager and other individuals involved in software project planning.

Course Outcomes (COs)

1. Estimate project cost and perform cost - benefit evaluation.
2. Projects perform project scheduling, activity network analysis and risk management
3. Apply schedule and cost control techniques for project monitoring including contract management.
4. Apply quality models in software projects for maintaining software quality and reliability.
5. Use suitable project organization structure, leadership, decision and motivation styles, proper safety and ethical practices and be responsible to the society.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	M	L	M	L	L
CO2	M	M	M	L	L	H
CO3	M	H	L	M	M	L
CO4	L	M	L	M	L	H
CO5	L	M	H	L	H	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I **(13 Hours)**

1.1 Project Definition - Software Project Basics (K1)
1.2 Introduction - Types of Software Project (K2, K4)
1.3 Classification of Software projects - Activities covered by software project management (K2, K3)
1.4 Methods and Methodologies (K4)
1.5 Stake holders - Business Case (K3, K5)
1.6 Management Control - Software process and process models (K2, K4)

Unit II **(14 Hours)**

2.1 Project Planning Infrastructure (K2, K4)
2.2 Process Database (K2)
2.3 Contents of PDB-A sample entry-the capability baseline- Process asserts and body of knowledge system (K4, K5)
2.4 process planning - Infosys development process (K2, K4)
2.5 Requirement change management (K4)
2.6 Process planning for the ACIC project (K3, K4)

Unit III **(11 Hours)**

3.1 Effort estimation and scheduling (K2, K3, K4)
3.2 Effort estimation models - Estimation schedule (K3, K5)
3.3 Effort Estimation - Scheduling (K3, K4)
3.4 Quality Planning - Quality Concepts-Quantitative quality management planning (K2, K4, K6)
3.5 Defect prevention planning (K2, K5)
3.6 The quality plan of the ACIC project (K2)

Unit IV **(12 Hours)**

4.1 Risk management - Concept of risk and risk management (K2, K4)
4.2 Risk assessment (K2, K3)
4.3 Risk Control – Examples - Measurement and Tracking planning (K3, K5)
4.4 Concepts in measurement - measurements (K2)
4.5 Project tracking (K4)
4.6 The ACIC measurement and tracking plan (K2, K4)

Unit V **(10 Hours)**

5.1 The project management plan (K2, K4)
5.2 Team management - customer communication and issue resolution (K5)
5.3 The structure of the project management plan (K2, K4)
5.4 The ACIC project plan (K2, K3)
5.5 Reviews - The Review process (K2, K3)
5.6 Data Collection - Monitoring and Control (K2)

Text Books:

1. PankajJalote (2002). Software Project Management in Practice. Published by Pearson Education. Second Edition.
2. Bob Hughes, Mike Cotterell, Rajib Mall (2011). Software Project Management. McGraw Hill. Fifth Edition.

Reference Books:

1. Greg Horine (2012). Project Management Absolute Beginner's Guide. Que Publishing. Third Edition.
2. Timothy Adolfo Villafiorita (2014). Introduction to Software Project Management AuerbachPublications.
3. MuraliChemuturi, ThomasM.cagley (2012). Mastering software project management. J.ross publishing.

Open Educational Resources (OER):

1. https://books.google.co.in/book?id=BDFpDwAAQBAJ&printsec=frontcover#v=onepage&q&f=false
2. https://www.amazon.in/Software-Project-Management-Practice-Pankaj/dp/0201737213
3. https://www.youtube.com/watch?v=p_vs7yGBKGg
4. https://www.youtube.com/watch?v=uTECToTO9Ec
5. https://www.youtube.com/watch?v=HyGb_eaT-U8

SEMESTER III

PCCSO20 – PRACTICAL V: WEB SERVICES LAB

Year: II **Sem:** III	**Course Code:** PCCSO20	**Title of the Course:** Practical V: Web Services Lab	**Course Type:** Practical	**Course Category:** Core	**H/W** 3	**Credits** 2	**Marks** 100

Course Objectives

1. Understand the basic concepts of web services.
2. Understand how the client-server model of programming works.
3. Develop interactive, client-side, executable web applications.
4. Use WSDL Service to implement a variety of presentation effects to the web application.
5. Migrate the web applications to the other platforms like .Net

Course Outcomes (COs)

1. Understand, analyze and evaluate a system using web services.
2. Identify and formulate and solve web related problems.
3. Use techniques and skills to design web based applications.
4. Understand and describe Java - enabled XML technology.
5. Be able to create, deploy, and call Web services using Java, .NET

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	M	L	M	H	L
CO2	M	M	H	M	L	M
CO3	M	L	M	L	H	M
CO4	H	M	M	L	M	L
CO5	L	M	L	M	L	H

(Low - L, Medium – M, High - H)

Course Syllabus

Exercises

1. Write a program to implement WSDL Service. (K2)
2. To create a simple Web application using Web services in Java.(K5)
3. To write a factorial application program using Web services in java. (K2)
4. To implement calculator (+ -* /) web application. (K2)
5. Web Service creation using .NET. (K4)
6. Develop a J2EE client to access a .NET Web Service. (K5)
7. Write a program the service provider can be implement a single getprice(), staticbind() and getproduct() operation. (K2)
8. Write a program to implement the operation can receive request and will return a Response in two ways.

    a) One-Way operation

    b) Request – Response (K2, K3)

INDEPENDENT ELECTIVES

SEMESTER I

PICSA20 – SOFTWARE QUALITY ASSURANCE

Year: I **Sem:** I	**Course Code:** PICSA20	**Title of the Course:** Software Quality Assurance	**Course Type:** Theory	**Course Category:** Independent Elective	**H/W** -	**Credits** 2	**Marks** 100

Course Objectives

1. To know the behavior of the testing techniques and to design test cases to detect the errors in the software.
2. To get insight into the levels of testing in the user environment.
3. To understand standard principles to check the occurrence of defects and its removal.
4. To learn the functionality of automated testing tools to apply in the specialized environment. To understand the models and metrics of software quality and reliability.
5. To generate and apply the test cases using the automated testing tool.

Course Outcomes (COs)

1. Test the software by applying various testing techniques.
2. Able to debug the project and to test the entire computer-based systems at all levels.
3. Test the applications in the specialized environment using various automation tools.
4. To evaluate the applications using software testing tools.
5. Apply quality and reliability metrics to ensure the performance of the software.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	L	M	L	M	L
CO2	H	L	M	L	M	L
CO3	L	L	H	M	L	M
CO4	M	L	M	L	H	M
CO5	L	L	L	M	L	H

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I

1.1 Software quality Challenge(K1, K2)
1.2 Software quality (K3)
1.3 Software quality assurance (K2)
1.4 Software quality factors (K2, K4)
1.5 Components of SQA(K3)
1.6 Management SQA Components (K4)

Unit II

2.1 Pre-Project Software Quality Assurance System (K1, K6)
2.2 Contract review (K1, K2)
2.3 Developing plan (K2)
2.4 Quality plan (K3, K4)
2.5 Integrating quality activities in the project life cycle(K1, K4)
2.6 Reviews**(**K2)

Unit III

3.1 Software Testing Strategies (K1)
3.2 Software Testing Implementations (K2, K6)
3.3 Automated Testing
3.4 Assuring the Quality of Software Maintenance Components (K2, K3)
3.5 Maintenance software quality assurance tools (K3)
3.6 Case Tools (K4)

Unit IV

4.1 Software Quality Infrastructure Components (K2)
4.2 Procedures and work instructions (K1, K2)
4.3 Supporting quality devices (K2, K3)
4.4 Staff training and certification (K4, K6)
4.5 Corrective action (K5)
4.6 Preventive action (K4)

Unit V

5.1 Configuration Management (K1, K6)
5.2 Documentation control (K2, K3)
5.3 Project progress control (K2, K3)
5.4 Cost of software quality (K4, K5)
5.5 Auditing and Control (K3, K4)
5.6 Vendor control (K5)

Text Books:

1. Daniel Galin - Software Quality Assurance, 2nd Edition – Pearson Education, 2011.
2. Milind Limaye – Software Quality Assurance – Tata McGraw Hill Publication, 2011.

Reference Books:

1. Ian Sommerville – Software Engineering, 5th Edition – Addison Wesley Publication, 2002.
2. Roger S. Pressman – Software Engineering: A Practitioner's Approach, 5th Edition – McGraw Hill International Edition, New York, 2000.
3. Pankaj Jalote – An Integrated Approach to Software Engineering, 2nd Edition – Narosa Publication
4. Richard Fairly - Software Engineering Concepts – Tata McGraw Hill, 1997.

Open Educational Resources (OER):

1. https://www.tutorialspoint.com/software_quality_management/software_quality_management_sqa_components.htm
2. https://www.youtube.com/watch?v=B6pQVUmBGps&list=PLy9U5GDpYZVPYwx2SBmxsFODDnBnsfG9w

SEMESTER I

PICSB20 – GREEN COMPUTING

Year: I **Sem:** I	**Course Code:** PICSB20	**Title of the Course:** Green Computing	**Course Type:** Theory	**Course Category:** Independent Elective	**H/W** -	**Credits** 2	**Marks** 100

Course Objectives

1. Understand the dimensions and goals of Green IT.
2. Discuss the green enterprise architecture with environmental intelligence.
3. Analyze the Grid framework with the collaboration of cloud computing.
4. Understand the concept of Green compliance.
5. Apply Green IT strategies and applications of home appliances.

Course Outcomes (COs)

1. Understand the Concept of Green IT.
2. Discuss Green IT in relation to technology.
3. Evaluate IT use in relation to environmental perspectives.
4. Discuss the methods and tools to measure energy consumption.
5. Conclude with a Green IT to sustainable development and develop energy saving.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	L	M	M	L	H
CO2	M	L	M	L	H	M
CO3	L	M	L	M	L	M
CO4	M	M	L	H	M	L
CO5	M	H	M	L	M	L

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I

1.1 Green IT: An Overview: Introduction - Environmental Concerns and Sustainable Development - Environmental Impacts of IT (K1)

1.2 Green IT: OCED Green IT Framework – Green IT 1.0 and 2.(K1)

1.3 Holistic Approach to Greening IT: Greening Computer's Entire life Cycle – The Three Rs of Green IT (K1)

1.4 Greening IT: Green PCs, Notebooks and Servers – Green Data Centres – Green Cloud Computing – Green Data Storage – Green Software – Green Networking and Communication (K1, K2)

1.5 Applying IT for Enhancing Environmental Sustainability-Green IT Standards and Eco Labelling of IT - Enterprise Green IT Strategy(K1, K2)

1.6 Green Devices and Hardware: Introduction-Life Cycle of a Device or Hardware- Reuse, Recycle and Dispose (K1)

Unit II

2.1 Sustainable Software Development: Introduction - Current Practices - Sustainable Software- Software Sustainability Attributes (K1)

2.2 Software Sustainability Metrics: Modifiability and Reusability – Portability – Supportability – Performance – Dependability – Usability – Accessibility – Predictability – Efficiency – Project's Carbon Footprint (K1, K2)

2.3 Sustainable Software Methodology: Collecting Metrics – Code metrics Tools – Simplified Usability Study – Platform Analysis – Existing Project Statistics - Defining Actions (K2, K3)

2.4 Green Data Centres: Data Centres and Associated Energy Challenges(K1)

2.5 Data Centre IT Infrastructure: Servers – Networking – Storage – IT Platform Innovation - Data Centre Facility Infrastructure-Implications for Energy Efficiency: Power System – Cooling – Facilities Infrastructure Management (K1, K3)

2.6 IT Infrastructure Management: Server Power – Consolidation – Virtualization (K2)

Unit III

3.1 Green Cloud Computing and Environmental Sustainability: Introduction -What is Cloud Computing? - Cloud Computing and Energy Usage Model (K1)

3.2 Features of Clouds Enabling Green Computing (K2)

3.3 Towards Energy Efficiency of Cloud Computing (K3)

3.4 Green Cloud Architecture (K2, K3)

3.5 Enterprise Green IT Strategy: Introduction-Approaching Green IT Strategies- Business Drivers of Green IT Strategy (K1, K3)

3.6 Business Dimensions for Green IT Transformation - Organizational Considerations in a Green IT Strategy (K3, K4,K6)

Unit IV

4.1 Sustainable Information Systems and Green Metrics: Introduction- Multilevel Sustainable Information (K2)

4.2 Sustainability Hierarchy Models: Sustainability Frameworks – Sustainability Principles – Tools for Sustainability (K4, K5, K6)

4.3 Product Level Information: Life-Cycle Assessment – The four stages of LCA – CRT Monitors versus LCD Monitors: Life Cycle Assessment (K3, K4)

4.4 Individual Level Information (K3)

4.5 Functional Level Information: Data Centre Energy Efficiency – Data centre Power Metrics – Emerging Data Centre Metrics (K4, K6)

4.6 Organizational Level Information: Reporting Greenhouse Gas Emissions (K4, K5)

Unit V

5.1 Green Enterprises and the Role of IT: Introduction-Organizational and Enterprise Greening: The Green Enterprise: A value chain Perspective(K2, K3)

5.2 Information Systems in Greening Enterprises: Environmental Management Information systems – Software and Databases – ERP EMISs – ERP Challenges and Deficiencies with Respect to EMIS – Integrating Environmental and LCA Information with ERP – Electronic Environmental and Sustainability Reporting (K3, K4, K5, K6)

5.3 Greening the Enterprise-IT Usage and Hardware: Environmental Information Technology Standards – Green Management of Data Centre (K2, K3)

5.4 Inter-organizational Enterprise Activities and Green Issues: Electronic Commerce and Greening the Extended Enterprise – Demanufacturing and Reverse Logistics- Eco-Industrial Parks and Information Systems - Enablers and Making the Case for IT and the Green Enterprise (K4, K5,K6)

5.5 Managing Green IT: Introduction-Strategizing Green Initiatives: Strategic Thinking – Strategic Planning – Strategic Implementation – Enterprise Architecture Planning(K2, K4)

5.6 Implementation of Green IT: Return on Investment – Metrics – The Goal-Question-Metric (GQM) - Information Assurance: Risk Management -Communication and Social Media(K5, K6)

Text Books:

1. San Murugesan, G.R. Gangadharan-Harnessing Green It Principles and Practices, A John Wiley & Sons, Ltd., Publication 2012.

Reference Books:

1. John Lamb, “The Greening of IT”, Pearson Education, 2009.
2. Jason Harris, “Green Computing and Green IT– Best Practices on Regulations &Industry”, Lulu.com, 2008.
3. Woody Leonhard, Katherrine Murray, “Green Home Computing for Dummies”, August 2009.
4. Swarup K. Das, “Cloud Computing”, Dominant Publishers, 2015.
6. PrasantaPattnaik, ManasKabat,” Fundamentals of Cloud Computing”, S.Chand (G/L) & Company Ltd; First edition (2014).

Open Educational Resources (OER):

1. https://www.google.com/url?sa=t&source=web&rct=j&url=http://www.vandemataramcollege.com/app/webroot/files/NOTES_sem246/Green_IT-FYCS-Sem2.pdf&ved=2ahUKEwjYgJaM_IXrAhUBX30KHeNtAFcQFjAAegQIARAB&usg=AOvVaw0gQehqD562q0zVa7ulBEH3&cshid=1596721284883
2. https://youtu.be/QYThOy_QiTU
3. https://www.youtube.com/watch?v=CRdm3xEJ97E
4. https://youtu.be/Nc8sNUcE-yk
5. https://youtu.be/6dSZyDRgl1M
6. https://youtu.be/X43KVeWVk

SEMESTER I

PICSC20 – DISTRIBUTED OPERATING SYSTEM

Year: I **Sem:** I	**Course Code:** PICSC20	**Title of the Course:** Distributed Operating System	**Course Type:** Theory	**Course Category:** Independent Elective	**H/W** -	**Credits** 2	**Marks** 100

Course Objectives

1. To expose students to both the abstraction and details of file systems.
2. To introduce concepts related to distributed computing systems.
3. To focus on performance and flexibility issues related to systems design decision.
4. To expose students to current literature in distributed systems.
5. To prepare students for an industrial programming environment.

Course Outcomes (COs)

1. Understand the architecture of distributed operating system.
2. Differentiate between centralized and distributed system.
3. Determine the difficulties of distributed memory management.
4. Analyze effective synchronization techniques to be performed to run a task in a distributed system.
5. Evaluate the best methods to follow to execute a task in remote machines.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	L	M	L	M	L
CO2	L	L	M	L	H	M
CO3	M	M	L	M	H	L
CO4	M	H	L	M	L	H
CO5	H	M	M	L	L	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I

1.1 Introduction to Distributed System (K1)
1.2 Communication in Distributed System: Remote Procedure Call(K2)
1.3 Synchronization in distributed system (K4)
1.4 Clock Synchronization (K2)
1.5 Mutual Exclusion (K2)
1.6 Deadlocks in Distributed System (K4)

Unit II

2.1 Process and Processors in Distributed System: Threads (K3, K4)
2.2 System Models (K2)
2.3 Processor allocation (K2)
2.4 Scheduling in Distributed Systems (K4)
2.5 Fault Tolerance (K5)
2.6 Real Time Distributed System (K4)

Unit III

3.1 Distributed Object Based Systems: Architecture (K2, K4)
3.2 Processes-Object Servers: Communication (K2, K4)
3.3 Distributed Objects: Binding a client to an object – Static Versus Dynamic – Remote Method Invocations (K2)
3.4 Parameter Passing – Naming: CORBA Object References – Globe Object Reference - Synchronization – Consistency and Replication (K2)
3.5 Distributed File Systems: Distributed File System Design – Distributed File System Implementation – File Usage (K2, K4)
3.6 System Structure – Caching – Replication –Trends in Distributed File System (K2, K4)

Unit IV

4.1 Distributed Shared Memory: Introduction – Shared Memory (K1, K2)
4.2 Consistency Models – Page based (K2, K3)
4.3 Distributed Shared Memory (K1, K2)
4.4 Shared Memory (K2)
4.5 Shared Variable Distributed Shared Memory (K2)
4.6 Object Based Distributed Shared Memory (K2)

Unit V

5.1 Distributed Web Based Systems: Architecture – Processes (K2)
5.2 Communication – Naming –Synchronization (K1, K2)
5.3 Consistency and Replication (K2)
5.4 54 Case Study: AMOEBA – Introduction –Objects and Capabilities (K2)
5.5 Process Management (K1, K2)
5.6 Memory Management – Communication (K1, K2)

Text Books:

1. Andrew S.Tanenbaum (2011). Distributed Operating System, 10/e, Pearson Education.

Reference Books:

1. ShubhraGarg (2013).Fundamentals of Distributed Operating Systems, S.K. Kataria& Sons.
2. YakupPaker et al (2012). Distributed Operating Systems: Theory and Practice, Springer.
3. S S Kudate, A P Kale et al (2012). Distributed Operating Systems, NiraliPrakashan.

Open Educational Resources (OER):

1. http://indexof.es/Varios2/Modern%20Operating%20Systems%204th%20Edition.pdf
2. http://stst.elia.pub.ro/news/SO/Modern%20Operating%20System%20-%20Tanenbaum.pdf
3. https://www.amazon.com/Operating-Systems-Design-Implementation-3rd/dp
4. https://www.youtube.com/watch?v=Azyizl9w2xo&list=PLrjkTql3jnm9FEOXHA_qjR-TMODlaIk-W&index=1
5. https://www.youtube.com/watch?v=wmMEbrGq_nU
6. https://www.youtube.com/watch?v=ipm5hDz9zG0
7. https://www.youtube.com/watch?v=oKlEjKDUkAs

SEMESTER II

PICSD20 – WIRELESS SENSOR NETWORKS

Year: I **Sem:** II	**Course Code:** PICSD20	**Title of the Course:** Wireless Sensor Networks	**Course Type:** Theory	**Course Category:** Independent Elective	**H/W** -	**Credits** 2	**Marks** 100

Course Objectives

1. Understand the challenges and applications of WSN.
2. Analyze single node and network architecture of sensor networks.
3. Classify MAC and link layer protocols in wireless sensor networks.
4. Understand the concept of Topology control in WSN.
5. Explain routing protocols in WSN.

Course Outcomes (COs)

1. Understand the concepts of Wireless Technology and supporting Protocols.
2. Understand the Basic Sensor Systems and provide a survey of Sensor Technology.
3. Understand the Medium Access Control protocols and analyze various Routing Protocols at Network Layer.
4. Learn Transport Control Protocols for Sensor Networks Middleware and design requirements.
5. Understand the Sensor Management, Sensor Networks, and Operating System.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	L	M	L	H	M
CO2	L	M	H	L	M	L
CO3	M	H	L	M	H	H
CO4	H	L	M	L	L	M
CO5	L	H	M	L	M	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I

1.1 Introduction and Overview of Wireless Sensor Networks (K1)
1.2 Introduction (K1)
1.3 Basic Overview of the Technology (K2, K3)
1.4 Applications of Wireless Sensor Networks (K3)
1.5 Examples of Category 1 (K4, K5)
1.6 Category 2 WSN Applications (K4, K5)

Unit II

2.1 Basic Wireless Sensor Technology: Sensor Node Technology (K1)
2.2 Sensor Taxonomy (K1, K2)
2.3 WN Operating Environment (K2, K3)
2.4 WN Trends (K2)
2.5 Wireless Transmission Technology and System: Radio Technology Primer (K3, K6)
2.6 Available Wireless Technologies(K3, K4)

Unit III

3.1 MAC for Wireless Sensor Networks: Fundamentals of MAC Protocols(K1, K2)
3.2 MAC Protocols for WSNs - Sensor MAC. (K2)
3.3 IEEE 802.15.4 LR WPANs. (K2, K4)
3.4 Routing Protocols for Wireless Sensor Networks (K3, K6)
3.5 Routing Challenges and Design Issues in Wireless Sensor Networks (K3, K4)
3.6 Routing Strategies in Wireless Sensor Networks (K4)

Unit IV

4.1 Transport Control Protocols for Wireless Sensor Networks: Traditional Transport Control Protocol (K1, K3)
4.2 Examples of Existing Transport Control Protocols (K2, K4)
4.3 Performance of Transport Control Protocols (K3, K6)
4.4 Middleware for Wireless Sensor Networks: Middleware Architecture (K2, K3)
4.5 MiLAN - IrisNet – AMF (K3)
4.6 DSWare – CLMF (K3, K6)

Unit V

5.1 Networks Management for Wireless Sensor Networks: Traditional Network Management Models (K1)
5.2 Network Management Issues (K1, K2)
5.3 Other Issues Related to Network Management (K2)
5.4 Operating System for WSN: TinyOS – MagnetOS (K2, K3)
5.5 MANTIS – OSPM (K4, K6)
5.6 EMERALDS – PicOS (K4, K6)

Text Books:

1. Kazem Sohraby, Daniel Minoli, Taieb Znati (2010), Wireless Sensor Networks Technology, Protocols and Applications, Wiley Publications.

Reference Books:

1. Holger Karl and Andreas Willig (2011). Protocols and Architectures for Wireless Sensor Networks. WILLEY Publication.
2. P.Nicopolitidis, M.S. Obaidat, G.I Papadimitriou, A.S. Pomportsis (2003). Wireless Network, New Delhi: John Wiley & Sons (ASIA).

Open Educational Resources (OER):

1. https://www.geeksforgeeks.org/wireless-sensor-network-wsn/
2. https://www.youtube.com/watch?v=ycaz99NogS4&list=PLJ5C_6qdAvBHroAfekCO7K4xphEF74UPc
3. https://www.youtube.com/watch?v=PrnNKZJj-Oc

SEMESTER II

PICSE20 - DIGITAL IMAGE PROCESSING

Year: I **Sem:** II	**Course Code:** PICSE20	**Title of the Course:** Digital Image Processing	**Course Type:** Theory	**Course Category:** Independent Elective	**H/W** -	**Credits** 2	**Marks** 100

Course Objectives

1. To study the image fundamentals and mathematical transforms necessary for image processing.
2. To study the image enhancement techniques.
3. To understand the fundamentals of Color Image Processing.
4. To study image restoration procedures.
5. To study Region based Segmentation procedures.

Course Outcomes (COs)

1. Understand the basics of Graphics
2. Understand the fundamentals and applications of digital image processing and be aware about intensity transformations.
3. Explore knowledge about image processing fundamentals.
4. Know about various noise models and transformation techniques.
5. Able to know the structure of XML and to design and store data in XML

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	L	M	L	M	H
CO2	M	L	L	M	L	M
CO3	H	M	L	M	H	M
CO4	M	H	L	M	L	M
CO5	L	L	M	M	L	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I

1.1 Introduction to Computer Graphics - Video Display Devices (K1, K2)
1.2 Raster Scan Systems -Random Scan Systems - Interactive Input Devices (K1)
1.3 Hard Copy Devices - Graphics Software - Output Primitives (K1, K3)
1.4 Line Drawing Algorithms: DDA Algorithm- Initializing Lines - Line Function.(K1, K4)
1.5 Two dimensional geometric transformations – Matrix representations and homogeneous coordinates (K1)
1.6 Three dimensional concepts; Three-dimensional object representations – Polygon surfaces (K1, K3)

Unit II

2.1 Digital Image Processing – Introduction – The Origins of Digital Image Processing (K1, K2)
2.2 Classification of Digital Images – Image Types - Examples of Fields That Use Digital Image Processing (K1)
2.3 Fundamental Steps In Digital Image Processing – Components of An Image Processing System (K1, K2)
2.4 Intensity Transformation and Spatial Filtering (K3)
2.5 Background – Some Basic Intensity Transformation Functions (K3)
2.6 Different types of Transformation functions (K1, K4)

Unit III

3.1 Histogram Processing – Fundamentals of Special Filtering (K1, K2)
3.2 Smoothing Spatial Filters – Sharpening Spatial Filters (K2, K3)
3.3 Color Image Processing – Color Fundamentals – Color Models (K3)
3.4 Implementing Web Services (K4)
3.5 To Pseudo color Image Processing – Basics of Full-Color Image Processing – Color Transformation. (K4, K5)
3.6 Smoothening and Sharpening (K4)

Unit IV

4.1 Image Restoration and Reconstruction – A model of the Image Degradation/Restoration process (K5)
4.2 Noise Models – Spatial and Frequency properties of Noise – Some important Noise Probability Density Functions (K2)
4.3 Periodic Noise – Estimation of Noise Parameters – Restoration in the Presence of Noise only (K1, K3)
4.4 Spatial Filtering – Mean Filters – Order Statistic Filters (K3)
4.5 Adaptive Filters – Estimating the Degradation Function (K4)
4.6 Estimation by Image Observation – Estimation by Experimentation – Estimation by Modelling. (K3, K5)

Unit V

5.1 Region Based Segmentation – Region Growing (K5)
5.2 Region Splitting and Merging (K1, K2)
5.3 Segmentation Using Morphological Watersheds. (K1)
5.4 Background – Dam Construction (K1, K2)
5.5 Watershed Segmentation Algorithm. (K1, K3)

5.6 The use of motion in segmentation (K5)

Text Books:

1. Rafael C. Gonzalez & Richard E. Woods (2018). Digital Image Processing. FourthEdition. Pearson Edition.

Reference Books:

1. Yogesh M. Rajput (Ramesh R. Manza Dnyaneshwari D. Patil (2017). Projects in Digital Image Processing. Spd Edition.
2. Jayaraman (2012). Digital Image Processing. Tata McGraw-Hill Education.
3. Burger WilhemEt (2010). Al Principles of Digital Image Processing: Fundamental Techniques springerutics publication.

Open Educational Resources (OER):

1. https://www.tutorialspoint.com/dip/index.htm
2. https://www.javatpoint.com/digital-image-processing-tutorial
3. https://www.geeksforgeeks.org/digital-image-processing-basics/

SEMESTER II

PICSF20 – STEGANOGRAPHY AND DIGITAL WATERMARKING

Year: I **Sem:** II	**Course Code:** PICSF20	**Title of the Course:** Steganography and Digital Watermarking	**Course Type:** Theory	**Course Category:** Independent Elective	**H/W** -	**Credits** 2	**Marks** 100

Course Objectives

1. To provide the importance of digital watermarking and Steganography.
2. To discuss the properties of watermarking and Steganography systems.
3. To discuss the different models of watermarking and Steganography.
4. To understand the various evaluation metrics.
5. To examine various applications of watermarking and Steganography.

Course Outcomes (COs)

1. Discuss the need for watermarking and steganography
2. Distinguish between watermarking and steganography
3. Elaborate on the various models of watermarking and steganography.
4. Point out various steganalysis algorithms.
5. Show how watermarking and steganography can be applied to various applications and evaluate them.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	L	H	L	L	M
CO2	M	L	L	H	M	L
CO3	M	H	L	M	L	M
CO4	H	M	M	M	M	L
CO5	L	M	M	H	M	L

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I

1.1 Information Hiding (K1)
1.2 Steganography and Watermarking (K1)
1.3 History of Watermarking (K1)
1.4 History of Steganography (K1)
1.5 Importance of Digital Watermarking (K1)
1.6 Importance of Steganography (K1)

Unit II

2.1 Steganographic Communication: The Channel - The BuildingBlocks - Notation and Terminology, Information (K4)
2.2 Theoretic Foundations of Steganography (K4)
2.3 Cachin's Definition of Steganographic Security - Practical Steganographic Methods (K4)
2.4 Statistics Preserving Steganography - Model-Based Steganography - Steganalysis Scenarios(K4)
2.5 Detection, Forensic Steganalysis. The Influence of the Cover Work on Steganalysis (K4)
2.6 Some Significant Steganalysis Algorithms, LSB Embedding and the Histogram Attack (K4)

Unit III

3.1 Properties – Evaluating watermarking systems(K5)
3.2 Notation – Communications (K5)
3.3 Communication based models – Geometric models (K5)
3.4 Mapping messages into message vectors (K5)
3.5 Error correction coding (K5)
3.6 Detecting multi-symbol watermarks – Attacks (K5)

Unit IV

4.2 Communications: Components of Communications Systems (K4)
4.3 Classes of Transmission Channels - Secure Transmission (K4)
4.4 Communication-Based Models of Watermarking Basic Model, Watermarking as Communications with Side Information at the Transmitter (K4)
4.5 Watermarking as Multiplexed Communications - Geometric Models of Watermarking - Distributions and Regions in Media Space (K4)
4.6 Marking Spaces - Modeling Watermark Detection by Correlation, Linear Correlation, Normalized Correlation, Correlation Coefficient (K4)

Unit V

5.1 Applications of Watermarking - Broadcast Monitoring (K6)
5.2 Copyrights, Proof of Ownership, Transaction Tracking (K6)
5.3 Content Authentication, Copy Control, Device Control, Legacy Enhancement(K6)
5.4 Applications of Steganography (K6)
5.5 Steganography for Dissidents (K6)
5.6 Steganography for Criminals (K6)

Text Books:

1. Ingemar J. Cox, Mathew L. Miler, Jefrey A. Blom, Jesica Fridrich, Ton Kalker – "Digital Watermarking and Steganography" Morgan Kaufmann Publishers, 2008.

Reference Books:

1. Ingemar Cox, Mathew Miler, Jefrey Blom, Jesica Fridrich and Ton Kalker "Digital Watermarking and Steganography" Morgan Kaufmann Publishers, Nov 2007.
2. Jesica Fridrich, "Steganography in Digital Media: Principles, Algorithms, and Applications", Cambridge University press, 2010.
3. Michael Arnold, Martin Schmucker, Stephen D. Wolthusen, "Techniques and Aplications of Digital Watermarking and Contest Protection", Artech House, London, 2003.

Open Educational Resources (OER):

1. https://www.elsevier.com/books/digital-watermarking-and-steganography/cox/978-0-12-372585-1.
2. https://books.google.co.in/books?id=wcAZ-QEthqkC&printsec=frontcover#v=onepage&q&f=false.
3. https://www.youtube.com/watch?v=zQ15474JACs.
4. https://www.youtube.com/watch?v=habrsC934-4.
5. https://books.google.co.in/books?hl=en&lr=&id=9R0vDwAAQBAJ&oi=fnd&pg=PR7&dq=Techniques+and+Applications+of+Digital+Watermarking+and+Content+Protection&ots=rz3UqebAHW&sig=LZ2Wfpmtsg5U2PgiMXN7WzivhP4#v=onepage&q=Techniques%20and%20Applications%20of%20Digital%20Watermarking%20and%20Content%20Protection&f=false.
6. https://books.google.co.in/books?id=AApEDwAAQBAJ&printsec=frontcover&dq=Digital+Watermarking+and+Steganography&hl=en&sa=X&ved=2ahUKEwi_trzRkJDrAhWL63MBHTeyAtcQuwUwAHoECAQQBw#v=onepage&q=Digital%20Watermarking%20and%20Steganography&f=false.

SEMESTER III

PICSG20 – CLOUD SOLUTION WITH AZURE

Year: II **Sem:** III	**Course Code:** PICSG20	**Title of the Course:** Cloud Solution with Azure	**Course Type:** Theory	**Course Category:** Independent Elective	**H/W** -	**Credits** 2	**Marks** 100

Course Objectives

1. To study the decision on adoption of cloud computing by a prospective cloud services consumer enterprise, including possible significant benefits of its adoption, in order to ensure informed and accountable information technology (IT) related decision-making.
2. To study the IT governance control framework was used to systematically identify and categories significant benefits of the adoption of cloud computing by an enterprise (including governmental organisations and business).
3. To apply cloud computing adoption that was discovered include scale benefits and the transformation of a capital expense to a scalable operational expense.
4. To study the benefits, framework of Azure
5. To understand the services of Azure.

Course Outcomes (COs)

1. Understand the basics of Cloud Computing with Azure and its services.
2. Implement the services of Azure.
3. Learn various solutions in Azure.
4. To develop application based Azure Solutions.
5. Develop and deploy applications in Azure.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	M	L	M	L	M
CO2	H	M	M	H	M	L
CO3	L	M	H	M	L	M
CO4	M	L	M	L	M	L
CO5	L	M	M	L	M	L

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I

1.1 Getting started with Azure – Technical requirements (K1, K2)
1.2 What is Cloud Computing? (K1, K2)
1.3 What problems does it solve? – What is Azure? (K2)
1.4 How do I start using Azure? (K2, K3)
1.5 Extending Directory Services to Azure (K2, K6)
1.6 Terminology to remember with Azure (K3, K4)

Unit II

2.1 Moving Existing Apps to Azure – Technical requirements (K1, K2)
2.2 How I approach the discussion: Rehost, Refactor, Re-architect, Rewrite(K3, K6)
2.3 Creating resources in the Azure Portal (K2, K6)
2.4 Migrating to Azure: Saas Migrations, Office 365**(**K3)
2.5 IaaS: PowerShell and ARM Template: Deploy- AzureResourceGroup.ps1, azure deploy Parameters json, asuredeploy. json (K3, K5)
2.6 PaaS: Deploy-Azure-Website and Database. parameters.json, Deploy-Azure-Website and Database. template. json(K4, K5)

Unit III

3.1 Building Solutions in Azure –Technical Requirements – Azure blueprints (K2)
3.2 Key Vault : VNet,Mobile,IoT,AI and Machine Learning(K2, K3)
3.3 Understanding responsibility: Infrastructure as a Service, Platform as a Service, Software as a Service, Azure Active Directory- Plan for Success (K3, K6)
3.4 Architecture styles: Common application Patterns ,How to make technology choices(K4, K5)
3.5 Designing applications in Azure:App Services (K2, K3)
3.6 Database Services, Storage accounts, CosmosDB,Microservices / Containers , Real-world examples (K4, K6)

Unit IV

4.1 Understanding the Infrastructure behind Solutions Built in Azure – Technical requirements (K1, K2)
4.2 Setting up your development environment – Managing cost (K3)
4.3 How I approach guidance- Understanding Infrastructure as Code – Developing locally (K2, K4)
4.4 How I develop locally – Security center – Application authentication (K4)
4.5 Dependency Injection – Logging – Data Storage- Understanding service lifetimes (K2, K3)
4.6 Adding Intelligence to your solutions- Using Application Insights –Leveraging on-premises resources (K1, K3, K6)

Unit V

5.1 Deploying Solutions to Azure- Technical requirements –Deploying solutions in Azure (K1, K2)
5.2 What is devOps?: Azure Boards, Azure Artifacts, Azure Pipelines, Azure Test Plans (K2, K3)
5.3 How I use Azure DevOps- What are deployment slots? (K3)
5.4 How Azure helps with DevOps – Putting it all together Technical requirements- Dashboards (K1, K2, K6)
5.5 Azure Advisors: High Availability Advisor,Security Advisor / Security Center, Performance Advisor, Cost Advisor (K2, K3)
5.6 Monitoring: Core capabilities, Shared capabilities, Infrastructure capabilities, Application capabilities (K4, K6)

Text Books:

1. Greg Leonardo (2018) - Hands – On Cloud Solutions With AZURE – Packt Publication.

Reference Books:

1. Mustafa Toroman (2018), Hands on Cloud Administration in AZURE – Packt Publication.
2. Neil Peterson (2016), Get started guide for AZURE IT Operators - Microsoft Publication.
3. David Chappell (2009), Introducting Windows AZURE –Microsoft Publication.

Open Educational Resources (OER):

1. https://azure.microsoft.com/en-in/
2. https://www.youtube.com/watch?v=n24OBVGHufQ

SEMESTER III

PICSH20 – INTRODUCTION TO BLOCK CHAIN TECHNOLOGY

Year: II **Sem:** III	**Course Code:** PICSH20	**Title of the Course:** Introduction to Block Chain Technology	**Course Type:** Theory	**Course Category:** Independent Elective	**H/W** -	**Credits** 2	**Marks** 100

Course Objectives

1. Understand how blockchain systems (mainly Bitcoin and Ethereum) work
2. To securely interact with them,
3. Design, build, and deploy smart contracts and distributed applications,
4. Integrate ideas from blockchain technology into their own projects.
5. To increase trust, security, transparency, and traceability of data.

Course Outcomes (COs)

1. Understand design principles of Bitcoin and Ethereum.
2. Learn the Simplified Payment Verification protocol.
3. Describe and understand the differences between the most prominent block chain structures and permissioned block chain service providers.
4. Understand the crypto currency mechanism by sending and reading transactions.
5. Evaluate security, privacy, and efficiency of a given block chain system in various applications

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	H	L	M	L	M
CO2	M	L	M	L	M	L
CO3	M	M	L	H	M	L
CO4	L	M	H	L	H	M
CO5	M	H	L	L	L	H

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I

1.1 Basics: Distributed Database (K1)
1.2 Two General Problem, Byzantine General Problem and Fault Tolerance (K2)
1.3 Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete (K1, K2)
1.4 Cryptography: Hash function (K1, K2)
1.5 Digital Signature – ECDSA (K1, K3)
1.6 Memory Hard Algorithm, Zero Knowledge Proof (K1, K2)

Unit II

2.1 Blockchain: Introduction, Structure of a Block(K2)
2.2 Block Header (K2)
2.3 Block Identifiers-Block Header Hash and Block Height (K3, K4)
2.4 The Genesis block (K2)
2.5 Linking Blocks in the Blockchain (K3)
2.6 Merkle Trees- Simplified Payment Verification (SPV) (K3, K4)

Unit III

3.1 Distributed Consensus: Nakamoto consensus (K2, K4)
3.2 Proof of Work, Proof of Stake (K2, K4)
3.3 Proof of Burn (K2, K4)
3.4 Difficulty Level (K4)
3.5 Sybil Attack (K2, K4)
3.6 Energy utilization – alternate(K5)

Unit IV

4.1 Cryptocurrency: History (K1)
4.2 Distributed Ledger (K3)
4.3 Bitcoin protocols - Mining strategy and rewards (K1, K3)
4.4 Ethereum - Construction, DAO (K3)
4.5 Smart Contract –GHOST (K2, K3)
4.6 Vulnerability- attacks, Sidechain- Namecoin (K3)

Unit V

5.1 Cryptocurrency Regulation: Stakeholders (K3, K4, K5)
5.2 Legal Aspects-Crypto currency Exchange (K3, K4, K5)
5.3 Black Market and Global Economy (K3, K4, K5)
5.4 Applications: Internet of Things (K3, K4, K6)
5.5 Medical Record Management System (K6)
5.6 Domain Name Service and future of Blockchain (K6)

Text Books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).
2. Andreas M. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Published by O'Reilly Media, Inc (2010)

Reference Books:

1. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
2. DR. Gavin Wood, “ETHEREUM: A Secure Decentralized Transaction Ledger” Yellow paper.2014.
3. Daniel Drescher,Blockchain Basics: A Non-Technical Introduction in 25 Steps, kindle Edition (13 April 2017)

Open Educational Resources (OER):

1. https://unglueitfiles.s3.amazonaws.com/ebf/05db7df4f31840f0a873d6ea14dcc28d.pdf
2. https://www.youtube.com/watch?v=_M7oDW6v8js
3. https://blockchainlibrary.org/2017/10/most-cited-ethereum-publications/

SEMESTER III

PICSI20 – EMBEDDED SYSTEM

Year: II **Sem:** III	**Course Code:** PICSI20	**Title of the Course:** Embedded System	**Course Type:** Theory	**Course Category:** Independent Elective	**H/W** -	**Credits** 2	**Marks** 100

Course Outcomes (COs)

1. Understand the Concepts of Embedded Systems.
2. Recognize the concepts of Network devices.
3. Gain the knowledge of Device Drivers and Interrupts Servicing Mechanism.
4. Acquire the knowledge of Real Time Operating Systems.
5. Understand Program Modeling Concepts.

CO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	M	L	M	M	L
CO2	M	L	M	H	M	M
CO3	L	M	M	M	L	H
CO4	M	M	L	M	L	M
CO5	H	M	L	L	M	L

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	L	L	M	L	M
CO2	M	H	L	H	M	L
CO3	H	L	M	H	L	M
CO4	H	M	L	L	M	L
CO5	L	M	L	H	M	L

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I

1.1 Introduction to Embedded Systems: Embedded Systems (K2, K4)
1.2 Processor Embedded into a System – Embedded Hardware and Software (K4)
1.3 SOC and use of VLSI Circuit design Technology (K3, K4)
1.4 Complex System Design and Processor (K4)
1.5 Design Process in Embedded System and Design Examples (K4, K5)
1.6 Classification of Embedded Systems (K4)

Unit II

2.1 Devices and Communication Buses for Devices Networks: IO types (K2)
2.2 Serial Communication Devices – Parallel Devices Port (K2, K4)
2.3 Interfacing Features in Device Ports – Wireless Devices (K2, K5)
2.4 Timer and Counting Devices – Watchdog Timer (K2, K4)
2.5 Real Time Clock - Networked Embedded Systems (K4, K6)
2.6 Serial Bus Communication Protocols (K2, K4)

Unit III

3.1 Device Drivers and Interrupts Servicing Mechanism: Programmed - I/O (K2, K4)
3.2 Busy-wait Approach without Interrupt Service Mechanism – ISR (K2, K4)
3.3 Interrupt Sources - Interrupts Servicing Mechanism (K2, K5)
3.4 Multiple Interrupts (K4)
3.5 Context and the Periods for Context Switching, Interrupt Latency and Deadline (K2, K4)
3.6 Classification of Processors Interrupt Servicing Mechanism from Context Saving Angle (K4)

Unit IV

4.1 Real Time Operating Systems: OS Services (K2)
4.2 Process Management – Timer and Event Functions (K2, K4)
4.3 Memory Management – Device, file and IO Subsystems Management (K2, K4)
4.4 Interrupt Routines in RTOS Environment and Handling of Interrupts Source Calls (K4, K5)
4.5 RTOS - Basic Design using RTOS (K2, K4)
4.6 RTOS Task Designing Models (K2, K4)

Unit V

5.1 Program Modeling Concepts: Program and DFG Models (K2, K4)
5.2 Finite State Model (K2)
5.3 State Machine Programming Models (K2, K5)
5.4 Modeling of Multiprocessor Systems (K4)
5.5 ADL Modeling (K4)
5.6 Embedded Software Development Process and Tools: Introduction Embedded Software Development Process and Tools (K2, K4)

Text Books:

1. Raj Kamal (2014). Embedded Systems Architecture, Programming and Design. Tata McGraw Hill Publishing Company Limited. Second Edition.

Reference Books:

1. Julio Sanchez Maria P. Canton (2017).Embedded Systems Circuits and Programming's press.
2. Jack Ganssle (2012). The Art of Designing Embedded Systems. Elsevier. Second Edition.
4. David E. Simon (2010). An Embedded Software Primer. Pearson Education.

Open Educational Resources (OER):

1. https://en.wikipedia.org/wiki/Embedded_system
2. https://www.tutorialspoint.com/embedded_systems/es_overview.htm
3. https://www.guru99.com/embedded-systems-tutorial.html
4. https://www.youtube.com/watch?v=nccWuB5ypxI&list=PLcbIZiT62e1gNZ-VWPO3rpTpXkHBMZa2n
5. https://www.youtube.com/watch?v=RcP6cYJb0ZE