K.M.G. COLLEGE OF ARTS AND SCIENCE

(AUTONOMOUS)

Approved by the Government of Tamil Nadu
Permanently Affiliated to Thiruvalluvar University, Vellore
Recognized under Section 2(f) and 12(B) of the UGC Act 1956
Accredited by NAAC (2nd Cycle) with (CGPA of 3.24/4) 'A' Grade

P.G. & RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SYLLABUS

(CHOICE BASED CREDIT SYSTEM)

Under

LEARNING OUTCOMES-BASED CURRICULUM

FRAMEWORK (LOCF)

(Effective for the Batch of Students Admitted from 2024-2025)

PREFACE

This course is designed to provide students with a working knowledge of computer concepts and essential skills necessary for work and communication in today's society. Students will learn safety, security, and ethical issues in computing and social networking. Students will also learn about input/output systems, computer hardware and operating systems. Students learn the basics of Database Management Systems (Access) as well as Personal Information Management software (Outlook). Students are also introduced to desktop publishing (Publisher), and video editing software (Movie Maker). Students will also be introduced to digital animation, 3D Design, and programming. Information Technology provides learners with a solid foundation in all major aspects of computing technology. The course covers Information Technology (IT) from the early days of computing to the current cloud computing, social media platforms, and beyond. Students will explore the fundamentals of networking, software, and programming. Students will learn to speak the complex language of information technology and gain an understanding of how to harness the power of sophisticated technology tools. The course includes pre-assessments, self-assessments, interactive exercises, videos, and games that appeal to a variety of learning styles. Narrative scenarios and case studies will give students opportunities to use critical thinking skills and apply their IT knowledge to real-world scenarios. Topics covered in this course include the evolution of information science, IT security, operating systems, computing architecture and design, programming languages, the software development life cycle, types of malware and computing attacks, networking, telecommunications, and the internet, networking devices and protocols, computer hardware and devices, database management, computing models, mobile computing, social media, cloud computing, e-commerce, ethics and IT, and IT policy and governance. The exposure to the industrial internship and MoUs with industries can open an avenue for a start-up and its progress would be followed regularly. The OBE based evaluation methods will reflect the true cognitive levels of the students as the curriculum is designed with course outcomes and cognitive level correlations as per BLOOM’s Taxonomy.

In pursuit of the Higher Education Department Policy Note 2022-23 Demand 20, Section 1.4, Tamil Nādu State Council for Higher Education took initiative to revamp the curriculum. On 27 July 2022, a meeting was convened by the Member-Secretary Dr. S. Krishnasamy enlightening the need of the hour to restructure the curriculum of both Undergraduate and Post-graduate programmes based on the speeches at the Tamil Nādu Legislative Assembly Budget meeting by the Honourable Higher Education Minister Dr K. Ponmudy and Honourable Finance Minister Dr. P. Thiagarajan. At present there are three

different modes of imparting education in most of the educational institutions throughout the globe. Outcome Based Education, Problem Based Education, and Project Based Education.

Now our Honourable Higher Education Minister announced Industry Aligned Education. During discussion, Member Secretary announced the importance of question papers and evaluation as envisaged by the Honourable Chief Secretary to Government Dr, V. IraiAnbu. This is very well imbedded in Revised Bloom's Taxonomy forms three learning domains: the cognitive (knowledge), affective(attitude), and psychomotor (skill). This classification enables to estimate the learning capabilities of students.

Briefly, it is aimed to restructure the curriculum as student-oriented, skill-based, and institution industry- interaction curriculum with the various courses under "Outcome Based Education with Problem Based Courses, Project Based Courses, and Industry Aligned Programmes" having revised Bloom's.

ABOUT THE COLLEGE

The College was established in the new millennium 2000 by the vision of late Shri.K.M.Govindarajan fondly known as Iyah, with a mission to offer higher education in the fields of Arts and Science to the needy and the poor middle class students of this area and make them fully employable and economically self-reliant. With a humble beginning of launching an elementary school named Thiruvalluvar Elementary School in the year 1952, Iyah groomed it into a Higher Secondary School and later into a college. Education was his soul and breath. The college has grown into a full-fledged educational hub offering 12 Under Graduate Programmes, 8 Post Graduate Programmes, 5 M.Phil Research Programmes and 4 Ph.D Programmes. The college has been accredited with ‘A’ grade by NAAC in 2nd cycle and recognized under section 2(f) & 12(B) of the UGC act 1956. The College is permanently affiliated to Thiruvalluvar University. The College is also acquired the status of Autonomous from the academic year 2024-2025. The College is an associate member of ICT Academy and registered member of NPTEL and Spoken Tutorials of IIT Bombay. The college is also a member of INFLIBNET and NDL.

VISION OF THE COLLEGE

Empower young men and women by educating them in the pursuit of excellence, character building and responsible citizen.

MISSION OF THE COLLEGE

Offer higher education in the fields of Arts, Science & Management to the needy and make them fully self-dependent.

QUALITY POLICY OF THE COLLEGE

KMG Students achieve the best learning results and personal growth with modern education that equip them for working life and a changing society to become deserving citizens.

ABOUT THE DEPARTMENT

The Department of Computer Science was established in the year 2000 with a view to fulfill the dynamic needs of IT sector all over the world. The department is well equipped with all basic and latest resources. The department comprises of well qualified and dedicated faculty members. The Department aims to make the students use their intellectual caliber for effective and quick acquisition. The Department runs the following courses.

VISION OF THE DEPARTMENT

- To provide a pleasant and friendly environment for learning in discipline of computer science to mobilize students towards serving a globalized technological society.

MISSION OF THE DEPARTMENT

- To ensure that every student is proficient with necessary computer skills.
- To inculcate strong ethical values, professional behavior and leadership abilities in students character so as to work with a commitment to the progress of the nation.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. Professional Excellence: Graduates will demonstrate competency and excellence in their chosen fields of study, applying theoretical knowledge to practical situations effectively.

2. Character Development: Graduates will exhibit strong moral and ethical character, upholding values of integrity, honesty, and respect for others in both personal and professional endeavors.

3. Leadership and Citizenship: Graduates will emerge as responsible leaders and active citizens, contributing positively to their communities and society at large through their actions and initiatives.

4. Continuous Learning: Graduates will engage in lifelong learning and professional development activities, adapting to evolving technologies, methodologies, and societal needs.

5. Self-Dependency and Entrepreneurship: Graduates will possess the skills and mindset necessary to be self-reliant and entrepreneurial, capable of creating opportunities for themselves and others through innovation and initiative.

6. Effective Communication and Collaboration: Graduates will demonstrate proficiency in communication skills, both verbal and written, and exhibit the ability to collaborate effectively with diverse teams and stakeholders.

7. Global Perspective: Graduates will have a broad understanding of global issues and perspectives, demonstrating cultural sensitivity and adaptability in multicultural environments.

PROGRAM OUTCOMES (POs)

On successful completion of the programme, the students will be able to:

POs	Graduate Attributes	Statements
PO1	Disciplinary Knowledge	Acquire detailed knowledge and expertise in all the disciplines of the subject.
PO2	Communication Skills	Ability to express thoughts and ideas effectively in writing, listening and confidently Communicate with others using appropriate media
PO3	Critical Thinking	Students will develop aptitude Integrate skills of analysis, critiquing, application and creativity.
PO4	Analytical Reasoning	Familiarize to evaluate the reliability and relevance of evidence, collect, analyze and interpret data.
PO5	Problem Solving	Capacity to extrapolate the learned competencies to solve different kinds of non-familiar problems.
PO6	Employability and Entrepreneurial Skill	Equip the skills in current trends and future expectations for placements and be efficient entrepreneurs by accelerating qualities to facilitate startups in the competitive environment.
PO7	Individual and Team Leadership Skill	Capability to lead themselves and the team to achieve organizational goals and contribute significantly to society.
PO8	Multicultural Competence	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.
PO 9	Moral and Ethical awareness/reasoning	Ability to embrace moral/ethical values in conducting one's life.
PO10	Lifelong Learning	Identify the need for skills necessary to be successful in future at personal development and demands of work place.

PROGRAM SPECIFIC OUTCOMES (PSOs)

On successful completion of the M.Sc., Information Technology, the students will be able to:

PSOs	Statements
PSO1	Posses the knowledge in the field of Information Technology through theory and practical
PSO2	Demonstrate high-level expertise in the fields Information Technology and research. Use software development tools, software systems, and modern computing platforms.
PSO3	Communicate Information Technology concepts, designs, solutions, implement effectively and also professionally.

Correlation Rubrics:

High	Moderate	Low	No Correlation
3	2	1	-

Mapping of PSOs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PSO1	3	3	2	3	2	1	2	3	-	3
PSO2	3	2	2	2	3	3	2	1	-	3
PSO3	3	3	3	3	3	3	2	3	-	2

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Subject and Credit System- M.Sc., Information Technology

(Effective for the Batch of Students Admitted from 2024-2025)

Semester	Part	Category	Course Code	Course Title	Ins.Hrs/ Week	Credit	Maximum Marks		
							Internal	External	Total
SEMESTER - I	Part I	Core-1	APCIT11	Python Programming	07	05	25	75	100
		Core-2	APCPIT12	Practical: Python Programming	07	05	25	75	100
		Core-3	APCPIT13	Practical: Web Development using Word Press	06	04	25	75	100
		Elective I (Choose any One)	APEIT14A	Data structures	05	03	25	75	100
			APEIT14B	Compiler Design					
			APEIT14C	Natural Language Processing.					
			APEIT14D	Block Chain Technology					
		Elective II (Choose any One)	APEIT15A	Operating Systems.	05	03	25	75	100
			APEIT15B	Digital Computer Architecture.					
			APEIT15C	Human Computer Interaction.					
			APEIT15D	Big Data Analytics					
	Semester Total				**30**	**20**			
SEMESTER - II	Part I	Core-4	APCIT21	Database System	05	05	25	75	100
		Core-5	APCPIT22	Practical: RDBMS	06	05	25	75	100
		Core-6	APCPIT23	Practical: Mobile Development	06	04	25	75	100
		Elective III (Choose any One)	APEIT24A	Networks and Security	04	03	25	75	100
			APEIT24B	Cloud Computing					
			APEIT24C	Biometric Techniques					
			APEIT24D	Information Security					
		Elective IV (Choose any One)	APEIT25A	Software Engineering	04	03	25	75	100
			APEIT25B	Object Oriented Analysis and Design					
			APEIT25C	Software Project Management					
			APEIT25D	Cyber Security					
	Part II	SEC1	APSIT26	Mobile Development	03	02	25	75	100
		Compulsory Paper	APHR20	Human Rights	02	02	25	75	100
			APMOOC20	MOOC	-	02	-	100	100
	Semester Total				**30**	**26**			

Semester	Part	Category	Course Code	Course Title	Ins.Hrs/ Week	Credit	Maximum Marks		
							Internal	External	Total
SEMESTER - III	Part - I	Core-7	APCIT31	Advanced Java	06	05	25	75	100
		Core-8	APCPIT32	Practical: Advanced Java	06	05	25	75	100
		Core-9	APCIT33	Open Source Technologies	06	05	25	75	100
		Core-10	APCPIT34	Practical: Open Source Technologies	05	04	25	75	100
		Elective V (Choose any One)	APEIT35A	Research Methodology	04	03	25	75	100
			APEIT35B	Internet of Things					
			APEIT35C	Trends in computing					
			APEIT35D	E-Commerce					
	Part - II	SEC2	APSIT36	Industry Module – Mini Project done with in the campus	03	02	25	75	100
		Compulsory	APIIT37	Internship/Industrial Activity	-	02	100	-	100
	Semester Total				**30**	**26**			
SEMESTER - IV	Part - I	Core-11	APCIT41	ASP. Net with C# Programming	06	05	25	75	100
		Core-12	APCPIT42	Practical: ASP.NET with C# Programming	06	05	25	75	100
		Core-13	APPIT43	Project with viva voce-Industry related project and carried out in the industry	10	07	25	75	100
		Elective VI (Choose any One)	APEIT44A	Intelligent Systems	04	03	25	75	100
			APEIT44B	Introduction to Robotics			25	75	100
			APEIT44C	Virtual and Augmented Reality					
			APEIT44D	Big Data Analytics			25	75	100
	Part - II	SEC3	APSIT45	Professional Competency Skill Enhancement Course Term Paper & Seminar Presentation – Staff supervisor should select and assign different Advanced Technology topics to the students. The students must give presentation of the allotted topic in the respective class hours. The document of the presentation of respective topic allotted to them must be prepared and submitted with soft binding (around 50 to 100 Pages). – Evaluation is done by the External examiners similar to Project Viva voce.	04	02	25	75	100
	Part III	Compulsory Paper	APEA40	Extension Activity	-	01	100	-	100
	Semester Total				**30**	**23**			

Consolidated Semester wise and Component wise Credit distribution

Parts	Semester-I	Semester-II	Semester-III	Semester-IV	Total Credits
Part-I	20	20	22	20	82
Part-II	-	06	04	02	12
Part-III	-	-	-	01	01
Total	20	26	26	23	**95**

*Part I, Part II and Part II components will be separately taken into account for CGPA calculation and classification for the post graduate programme and has to be completed during the duration of the programme as per the norms, to be eligible for obtaining the PG degree.

COURSE DESCRIPTORS

Title of the Course	PYTHON PROGRAMMING	**Hours/Week**	7
Course Code	APCIT11	**Credits**	5
Category	CORE I	**Year & Semester**	I & I
Prerequisites	Basic understanding on object oriented programming concepts.	**Regulation**	2024

Objectives of the course:

- To acquire programming skills in core Python and to develop database applications in Python

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Core Python: Introduction - Python Basics: Comments - Statements and syntax - variable Assignment - Identifiers - Python objects : Built-in-types - Internal types - Standard Type operators - Standard type Built-in-functions. Numbers : Introduction to Numbers - Integers - Floating point numbers - Complex numbers - Operators - Built-in and factory functions – Conditionals and Loops -Sequences : Strings, Lists and Tuples	CO1	K1, K2
UNIT-II	Mapping and set types.- Functions and functional programming: Introduction - Calling functions - Creating functions - passing functions - Formal arguments - Variable - Length Arguments - Functional Programming - Variable Scope – Recursion	CO2, CO3	K1, K2
UNIT-III	Modules: Modules and Files – namespaces - Importing Modules - Features - Built-in functions. Object Oriented Programming: Introduction - Object Oriented Programming – Encapsulation Inheritance – Polymorphism - Errors and Exceptions: Introduction – Exceptions in Python.	CO2, CO3	K1, K2
UNIT-IV	GUI Programming: Introduction – Using Widgets: Core widgets- Generic widget properties – Labels – Buttons – Radio Buttons – Check Buttons – Text – Entry – List Boxes – Menus – Frame – Scroll Bars – Scale – Data Visualization using Grid and Graph.	CO4	K1, K2,K3,K5
UNIT-V	Database Programming: Connecting to a database using MySQL - Creating Tables - INSERT-UPDATE - DELETE - READ operations **Case Studies**: analyzing and visualizing data using Grid and Graph, Database Access with Python, Web Designing using Python.	CO5	K1,K2, K3, K6

Recommended Text Books

1. Wesley J. Chun, (2007), "Core Python Programming", Pearson Education, Second Edition – (Unit I,II,III).
2. 2. Charles Dierbach, (2015), "Introduction to Computer Science Using Python A Computational ProblemSolving Focus", Wiley India Edition- (Unit III- Object Oriented Programming)
3. 3. Martin C Brown, (2018), "The Complete Reference Python", McGraw Hill Education (India) Private Limited – (Unit IV)

Reference Books

1. Mark Lutz, (2013), "Learning Python Powerful Object Oriented Programming", O"reilly Media, 5 th Edition.
2. Timothy A. Budd, (2011), "Exploring Python", Tata MCGraw Hill Education Private Limited, First Edition.
3. Allen Downey, Jeffrey Elkner, Chris Meyers, (2012), "How to think like a computer scientist: learning with Python"

Website and e-learning source

1.http://interactivepython.org/courselib/static/pythond
2. http://www.ibiblio.org/g2swap/byteofpython/read/
3. http://www.diveintopython3.net/
4. http://docs.python.org/3/tutorial/index.html

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Explain the basic concepts in python language.	K1, K2
CO2	Apply the various data types and identify the usage of control statements, loops, functions and modules in python for processing the data	K1, K2
CO3	Analyze and solve problems using basic constructs and techniques of python.	K1, K2
CO4	Assess the approaches used in the development of interactive application.	K1, K2,K3,K5
CO5	To build real time programs using python	K1,K2, K3, K6

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

COURSE DESCRIPTORS

Title of the Course	PYTHON PROGRAMMING – PRACTICAL	**Hours/Week**	7
Course Code	APCIT12	**Credits**	5
Category	CORE II	**Year & Semester**	I & I
Prerequisites	Basic understanding of C, C++ and Java programming languages	**Regulation**	2024

Objectives of the course:

- This course gives practical experience in Python basics, Object Oriented programming like Classes, Inheritance, and Polymorphism, GUI Applications and Database connection.

S.No	List of Excersice	COs	Cognitive Levels
1	Python Basic programs	CO1	K1, K2
2	Control Structures	CO1	K1, K2
3	Lists	CO2	K2, K3
4	Functions and Recursions	CO1	K1, K2
5	Modules	CO1, CO2	K1, K2, K3
6	String Processing	CO1, CO2	K1, K2, K3
7	Dictionaries and Sets	CO1, CO2	K1, K2, K3
8	Classes and Objects using Machine learning Tools	CO3, CO4	K1, K2, K4,K5
9	Polymorphism using Machine learning Tools	CO3, CO4	K1, K2, K4,K5
10	Inheritance using Machine learning Tools	CO3, CO4	K1, K2, K4,K5
11	GUI Application with Data Visualization	CO4, CO5	K1, K2, K3, K5, K6
12	Working with Database	CO4, CO5	K1, K2, K3, K5, K6

Recommended Text Books

1. Wesley J. Chun, (2007), "Core Python Programming", Pearson Education, Second Edition

Reference Books

1. Mark Lutz, (2013), "Learning Python Powerful Object Oriented Programming", O"reilly Media, 5 th Edition.
2. Timothy A. Budd, (2011), "Exploring Python", Tata MCGraw Hill Education Private Limited, First Edition.
3. Allen Downey, Jeffrey Elkner, Chris Meyers, (2012), "How to think like a computer scientist: learning with Python"
4. Aditya Kanetkar , Yashavant Kanetkar,(2023) "Let us Python" – 6th Edition Publication: bpb

Website and e-learning source

1. http://interactivepython.org/courselib/static/pythonds
2. http://www.ibiblio.org/g2swap/byteofpython/read/
3. http://www.diveintopython3.net/
4. http://docs.python.org/3/tutorial/index.html
5. *https://youtu.be/eFByJkA3ti4?si=hqjcyt4sX2CpYe9m*

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Understand the significance of control statements, loops and functions in creating simple programs.	K1, K2
CO2	Apply the core data structures available in python to store, process and sort the data.	K2, K3
CO3	Analyze the real time problem using suitable python concepts	K2, K4
CO4	Assess the complex problems using appropriate concepts in python	K1, K2, K5
CO5	Develop the real time applications using python programming language.	K1, K2, K3, K6

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

COURSE DESCRIPTORS

Title of the Course	WEB DEVELOPMENT USING WORD PRESS - PRACTICAL	**Hours/Week**	6
Course Code	APCPIT13	**Credits**	4
Category	CORE III	**Year & Semester**	I & I
Prerequisites	Basic understanding on HTML and CSS	**Regulation**	2024

Objectives of the course:

- The primary course objective of this paper is to learn the fundamentals of basic web concepts, HTML, DHTML, JavaScript and Word Press

UNITS	Contents	COs	Cognitive Levels
For each UNIT at least 2 Lab exercises should be carried out using the specified components in the syllabus			
UNIT-I	Introduction to HTML - Lists - Adding Graphics to HTML Documents - Tables -Linking Documents - Frames- Developing HTML Forms	CO1	K1, K2
UNIT-II	Dynamic HTML - Cascading Style Sheets - Use of SPAN Tag - External Style Sheets -Use of DIV Tag - Developing Websites	CO1, CO2	K1, K2, K3
UNIT-III	Introduction to JavaScript - JavaScript in Web Pages - Advantages - Writing JavaScript into HTML - Basic Programming Techniques - Operators and Expressions- JavaScript Programming Construct: Conditional Checking, Controlled Loops, Functions: Built-in Functions, User-Defined Functions - Placing Text in a Browser - Dialog Boxes.	CO2, CO3	K1,K2, K3, K4
UNIT-IV	JavaScript Document Object Model: Introduction - Understanding Objects in HTML - Handling Events using JavaScript. Forms used by a Website: Form Object - Built-in Objects.	CO2, CO4	K1,K2, K3, K5
UNIT-V	Word Press: Installation - Stetting and administration- Word press: Theming basics - Our First Word Press Website - Theme Foundation - Menu and navigation - Home page - Dynamic Sidebars and Widgets - Page - archive Page results - Testing and Launching	CO5	K1,K2,K3, K6

Recommended Text Books

1. Ivan N. Bayross, (2005), Web Enabled Commercial Applications Development Using HTML, DHTML, JavaScript, perlCGI, 3rd Edition, BPB Publications. (Unit I, II, III and IV)

2. Jesse Friedman,(2012), Web Designer's Guide to WordPress: Plan, Theme, Build, Launch (Voices That Matter), 1st Edition , New Riders. (Unit V)

Reference Books

1. N.P. Gopalan, J. Akilandeswari, (2009), Web Technology: A Developer‟s Perspective, Eastern Economy Edition, PHI Learning Private Limited.
2. Deitel&Deitel, (2000), Internet and World Wide Web How to program, Prentice Hall.
3. Jon Duckett, (2004), Beginning Web Programming with HTML, XHTML, and CSS, Wiley Publishing, Inc.

Website and e-learning source

1. http://www.sergey.com/web_course/content.html
2. http://www.pageresource.com/jscript/index.html
3. http://www.peachpit.com/guides/content.aspx
4. https://www.tutorialspoint.com/wordpress/index.html

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Identify the tools which will be suitable for the requirement of the webpage.	K1, K2
CO2	Implement Java script and Style Sheets effectively in the Web Pages	K1,K2, K3
CO3	Analyze the different tools and built-in functions available to be applied in the webpage	K1,K2, K3, K4
CO4	Rate the design and effectiveness of the Web Pages created.	K1,K2, K3, K5
CO5	Design and publish a website using Word press	K1,K2, K3, K6

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

COURSE DESCRIPTORS

Title of the Course	DATA STRUCTURES	**Hours/Week**	5
Course Code	APEIT14A	**Credits**	3
Category	ELECTIVE I (EC1)	**Year & Semester**	I & I
Prerequisites	Basic understanding of programming and foundational concepts in computer science	**Regulation**	2024

Objectives of the course:

- To become familiar with the various data structures and their applications and to increase the understanding of basic concepts of the design and use of algorithms.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction and Overview: Definitions – Concept of Data Structures – Overview of Data Structures – Implementation of Data Structures – Arrays: Definition – One Dimensional Array – Multidimensional Arrays: Two Dimensional Array – Sparse Matrices – Three dimensional and n-dimensional Arrays – Stacks : Introduction – Definition – Representation of Stack – Operations on Stack – Applications of Stacks: Evaluation of Arithmetic Expressions – Implementation of Recursion - Tower of Hanoi Problem	CO1, CO2	K1, K2
UNIT-II	Queues: Introduction – Definition – Representation of Queues – Various Queue Structures : Circular Queue – Deque – Priority Queue – Applications of Queues : Simulation – CPU Scheduling in a Multiprogramming Environment – Round Robin Algorithm – Linked Lists: Single Linked List – Circular Linked List – Double Linked List – Circular Double Linked List – Applications of Linked List: Polynomial Representation	CO2, CO3	K1, K2, K3, K4
UNIT-III	Trees: Basic Terminologies – Representation of Binary Tree: Linear Representation – Linked Representation – Operations: Traversals – Types of Binary Trees: Expression Tree – Binary Search Tree – Splay tree	CO3, CO4	K3, K4
UNIT-IV	Sorting: Bubble Sort, Insertion Sort, Selection Sort, Shell Sort – Quick Sort - Merge Sort - Radix Sort - Heap Sort – Searching: Linear Search - Binary Search	CO3, CO4	K3, K4
UNIT-V	Graphs: Introduction – Graph representation and its operations – Path Matrix – Graph Traversal - Application of DFS – Shortest Path Algorithm - Minimum Spanning Tree : Prim‟s Algorithm – Kruskal‟s Algorthim - Greedy – Knapsack – Back Tracking – 8 Queens	CO4, CO5	K4, K5

Recommended Text Books

1.Debasis Samantha (2013), Classic Data Structures, Second Edition, PHI Learning Private Limited.

2. P. Sudharsan, J. John Manoj Kumar, C & Data Structures, Third Edition, RBA Publications. Unit 4: Chapter 14, Unit 5: Chapter 13

3. Ellis Horowitz, SartajSahni, Sanguthevar Rajeshakaran, (2007), Fundamentals of Computer Algorithms, Second Edition, Universities Press (P) Limited

Reference Books

1. Sara Baase, (1991), Computer Algorithms – Introduction to Design and Analysis, Addison- Wesley Publishing Company 2. Robert Kruse, C.L.Tondo, Bruce Leung, Data Structures and Program Design in C ,2nd Edition, PHI Publications.

Website and e-learning source

1. http://www.cs.sunysb.edu/~skiena/214/lectures/
2. http://datastructures.itgo.com/graphs/dfsbfs.html
3. http://oopweb.com/Algorithms/Documents/PLDS210/Volum eFrames.html
4. http://discuss.codechef.com/questions/48877/data-structuresand-algorithms
5. http://code.tutsplus.com/tutorials/algorithms-and-datastructures--cms-20437

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Outline the basic data structures	K1
CO2	Identify the different operations and memory representations	K1, K2
CO3	Interpret different techniques with their complexities	K1, K2,K3, K4
CO4	Compare the applications of various data structures	K1, K2,K3, K4
CO5	Choose an algorithm to solve simple problems suited for appropriate situations	K1, K2,K3, K4, K5

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

COURSE DESCRIPTORS

Title of the Course	COMPILER DESIGN	**Hours/Week**	5
Course Code	APEIT14B	**Credits**	3
Category	ELECTIVE I (EC1)	**Year & Semester**	I & I
Prerequisites	Basic knowledge in one of the programming language and data structures	**Regulation**	2024

Objectives of the course:

- To acquire the knowledge about the compiler design and to understand the different phases of Compiler.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Compilers & Translators, Need of Translators, Structure of a Compiler, Phases, Lexical Analysis, Syntax Analysis, Intermediate Code Generation, Code Optimization, Code Generation, Book Keeping, A Symbol Table in brief, Semantic Analysis, L-value, r-values, Error Handling	CO1	K1, K2
UNIT-II	Rules of Lexical Analyser, Need for Lexical Analysis, Input Buffering, Preliminary Scanning, A simple Approach to the Design of Lexical Analysers, Transition Diagrams, Regular Expression, String & Languages, Finite Automata, Nondeterministic Automata, Deterministic Automata, From regular Expression to Finite Automata, Context free Grammars, Derivations & Parse Trees, Parsers, Shift Reduce Parsing, Operator-Precedence Parsing	CO1, CO2	K1, K2
UNIT-III	Symbol Table Management, Contents of a Symbol Table, Names & Symbol table records, reusing of symbol table spaces, array names, Indirection in Symbol Table entries, Data Structures for Symbol Tables, List, Self Organizing Lists, Search Trees, Hash Tables, Errors, Reporting Errors, Sources of Errors Syntactic Errors, Semantic Errors, Dynamic Errors, Lexical Phase Errors, Minimum Distance Matching, Syntactic Phase Error, Time of Detection, Ponic mode, Case study on Lex and Yacc	CO2	K1, K2
UNIT-IV	Principal Sources of Optimization, Inner Loops, Language Implementation Details Inaccessible to the User. Further Optimization, Algorithm Optimization, Loop Optimization , Code Motion, Induction Variables, Reduction in Strength, Basic Blocks, Flow Graphs, DAG Representation of Basic Blocks, Value Numbers & Algebraic Laws, Global Data Flow Analysis, Memory Management Strategies , Fetch Strategy, Placement Strategies, Replacement Strategies, Address Binding, Compile Time, Load Time, Execution Time, Static Loading, Dynamic Loading, Dynamic Linking	CO3, CO4	K2, K3, K4

UNIT-V	Problems in Code Generation, a Simple Code Generator, Next-Use Information, Register Descriptors, Address Descriptors, Code Generation Algorithm, Register Allocation & Assignment, Global Register Allocation, Usage Counts, Register Assignment for Outer Loops, Register Allocation by Graph Coloring, Code Generation from DAG's, Peep-Hole Optimization, Redundant Loads & Stores, Un-Reachable Code, Multiple Jumps, Algebraic Simplifications, Use of Machine Idioms	CO4, CO5	K3, K4, K5

Recommended Text Books

1. Compilers: Principles, Techniques & Tools, Second Edition by A. V. Aho, Monicas. Lam, Ravi Sethi, J. D. Ullman

Reference Books

1. Dhamdhere D.M., "Compiler Construction: Theory and Practice", McMillan India Ltd., 1983
2. Holub Allen, "Compiler Design in C", Prentice Hall of India, 1990

Website and e-learning source

1) 1. https://www.geeksforgeeks.org/compiler-design-tutorials/
2. https://www.tutorialspoint.com/compiler_design/
3. https://www.javatpoint.com/compiler-tutorial
4. https://onlinecourses.nptel.ac.in/noc19_cs01/preview
5. http://ecomputernotes.com/compiler-design

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Identify the major phases of compilation and the functionality of LEX and YACC	K1, K2
CO2	Describe the functionality of compilation process and symbol table management.	K1, K2
CO3	Apply the various parsing, optimization techniques and error recovery routines to have a better code for code generation.	K2, K3
CO4	Analyze the techniques and tools needed to design and implement compilers.	K3, K4
CO5	Test a compiler and experiment the knowledge of different phases in compilation.	K4, K5

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

COURSE DESCRIPTORS

Title of the Course	NATURAL LANGUAGE PROCESSING	**Hours/Week**	5
Course Code	APEIT14C	**Credits**	3
Category	ELECTIVE I (EC1)	**Year & Semester**	I & I
Prerequisites	Basic understanding of natural language and linguistics	**Regulation**	2024

Objectives of the course:

- To learn the fundamentals of natural language processing and to understand the role of CFG, semantics of sentences and pragmatics.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance	CO1, CO2	K1, K2, K4
UNIT-II	Word Level Analysis: Unsmoothed N-grams, Evaluating Ngrams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rulebased, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models	CO3	K1, K2, K3
UNIT-III	Syntactic Analysis: Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures	CO4	K1, K2, K5
UNIT-IV	Semantics and Pragmatics: Requirements for representation, FirstOrder Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selection restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods	CO2	K1, K2, K4
UNIT-V	Discourse Analysis and Lexical Resources: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC)	CO4, CO5	K1, K2, K5, K6

Recommended Text Books

1. Daniel Jurafsky, James H. Martin;Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech; Pearson Publication; 2014.

2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python , First Edition, OReilly Media, 2009

Reference Books

1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015. 2. Richard M Reese, ―Natural Language Processing with Java , O_Reilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

Website and e-learning source

1. http://www.cse.iitb.ac.in/~pb/papers/nlp-iitb.pdf
2. https://www.nitk.ac.in/faculty/dr-sarika-jain
3. https://www.simplilearn.com/tutorials/artificial-intelligencetutorial/what-is-natural-language-processing-nlp
4. https://www.sas.com/en_us/insights/analytics/what-isnatural-language-processing-nlp.html
5. https://towardsdatascience.com/your-guide-to-naturallanguage-processing-nlp-48ea25

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Describe the concepts of morphology, syntax, semantics, discourse & pragmatics of natural language	K1,K2
CO2	Identify various linguistic and statistical features relevant to the basic NLP task, namely, spelling correction, morphological analysis, parsing and semantic analysis	K1,K2,K4
CO3	Classify the text into an organized group using a set of handicraft linguistic rules with appropriate NLP processes and algorithms	K1,K2,K3
CO4	Analyze the system with various language analysis methods and interpret the results	K1,K2,K5
CO5	Assess NLP systems, identify and suggest solutions for the shortcomings	K1,K2,K6

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

COURSE DESCRIPTORS

Title of the Course	BLOCKCHAIN TECHNOLOGY	**Hours/Week**	5
Course Code	APEIT14D	**Credits**	3
Category	ELECTIVE I (EC1)	**Year & Semester**	I & I
Prerequisites	Basic knowledge of networking and cyber security concepts	**Regulation**	2024

Objectives of the course:

- To study the basics of Blockchain technology, private and public Blockchain, and smart contract. This paper familiarizes the students to explore various aspects of Blockchain technology like application in various domains

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Introduction of Cryptography and Blockchain** : Definition of Blockchain - Blockchain Technology Mechanisms & Networks - Blockchain Origins - Objective of Blockchain - Blockchain Challenges - Transactions and Blocks - P2P Systems - Keys as Identity - Digital Signatures, Hashing, and public key cryptosystems - private vs. public Blockchain	CO1, CO2	K1, K2, K4
UNIT-II	**Bitcoin and Cryptocurrency** : Bitcoin Terminology- The Bitcoin Network - The Bitcoin Mining Process - Mining Developments - Bitcoin Wallets - Decentralization and Hard Forks - Ethereum Virtual Machine (EVM) - Merkle TreeDouble- Spend Problem - Blockchain and Digital CurrencyTransactional Blocks - Impact of Blockchain Technology on Cryptocurrency	CO3	K1, K2, K3
UNIT-III	**Introduction to Ethereum** : Introduction to Ethereum - Consensus Mechanisms- Metamask Setup - Ethereum Accounts - Transactions - Receiving Ethers- Smart Contracts	CO4	K1, K2, K5
UNIT-IV	**Introduction to Hyperledger and Solidity Programming** : Definition of Hyperledger - Distributed Ledger Technology & its Challenges - Hyperledger & Distributed Ledger Technology - Hyperledger Fabric -Hyperledger Composer - Solidity - Language of Smart Contracts - Installing Solidity & Ethereum Wallet - Basics of Solidity - Layout of a Solidity Source File & Structure of Smart Contracts - General Value Types	CO2	K1, K2, K4
UNIT-V	**Blockchain Applications :** Internet of Things -Medical Record Management System - Domain Name Service and Future of Blockchain -Alt Coins	CO4, CO5	K1, K2, K5, K6

Recommended Text Books

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained", Second Edition, Packt Publishing, 2018
2. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction" Princeton University Press, 2016
3. Antonopoulos and G. Wood, "Mastering Ethereum: Building Smart Contracts and Dapps", O'Reilly Publishing, 2018

Reference Books

1. Antonopoulos, Mastering Bitcoin, O'Reilly Publishing, 2014
2. D. Drescher, Blockchain Basics. Apress, 2017

Website and e-learning source

1. https://nptel.ac.in/courses/106/104/106104220/#
2. https://archive.nptel.ac.in/courses/106/105/106105235/
2. https://www.udemy.com/course/build-your-blockchain-az/
3. https://eduxlabs.com/courses/blockchain-technologytraining/?tab=tab-curriculum
4. https://www.geeksforgeeks.org/consensus-algorithms-inblockchain/
5. https://ec.europa.eu/programmes/erasmus-plus/project-resultcontent/eb79d492-327b-43d8-b479-dd0fd9fd4490/BLISS%2003 T3%20Unit%201%20slides%20v3.0%20final%20controled.pptx

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Understand and explore the working of Block chain technology	K1,K2
CO2	Identify the security and privacy implications of block chain technology	K1,K2
CO3	Apply the learning of solidity to build de-centralized apps on Ethereum	K1,K2,K3
CO4	Analyze the working of Smart Contracts and the working of Hyperledger	K1,K2,K4
CO5	Assess the methods relevant for design, development and operation of block chain based applications	K1,K2,K6

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

COURSE DESCRIPTORS

Title of the Course	OPERATING SYSTEMS	**Hours/Week**	5
Course Code	APEIT15A	**Credits**	3
Category	ELECTIVE II (EC2)	**Year & Semester**	I & I
Prerequisites	Basic understanding of working principles of computer and about hardware and software components	**Regulation**	2024

Objectives of the course:

- To develop fundamental knowledge of Operating systems, to become familiar with CPU Scheduling, memory and file management concepts, to learn concepts and programming techniques of Linux.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction : Evolution of Operating System - Structure - Processes - The Process Concepts - Inter Process Communication - IPC Problems - Scheduling Levels - Preemptive Vs Non- Preemptive Scheduling - Scheduling Algorithms: First Come First Served - Shortest Job First - Shortest Remaining Time Next - Three Level Scheduling - Round Robin Scheduling - Priority Scheduling -Multiple Queues - Shortest Process Next - Guaranteed Scheduling - Lottery Scheduling - Fair-Share Scheduling - Thread Scheduling	CO1, CO5	K1, K2, K4, K5
UNIT-II	Swapping - Virtual Memory - Page Replacement Algorithm - Segmentation	CO3, CO4	K1, K2, K3, K4
UNIT-III	Deadlock - Examples of Deadlock - Detection - Recovery - Avoidance - Prevention – Semaphore -Shared Memory	CO5	K1,K2, K4, K5
UNIT-IV	File System - Files - Directories - I/O Management - Disks - Disk Arm Scheduling Algorithm	CO5	K1,K2, K4, K5
UNIT-V	Introduction to Linux: Introducing Shell Programming - Linux File Systems - Linux File system calls - Implementation of Linux File systems - Linux Commands - Directory Oriented Commands - File Oriented Commands - Communication Oriented Commands- General Purpose Commands	CO2	K1,K2,K3

Recommended Text Books

1. Andrew S. Tanenbaum, (2001), Modern Operating Systems, 2nd Edition, Prentice Hall of India.
2. B.Mohamed Ibrahim, (2005) Linux Practical Approach, Firewall Media.

Reference Books

1. Silberchatz, Galvin, Gagne, (2003), Operating Systems Concepts, 6th Edition Wiley India Edition.
2. JhonGoerzen, (2002), Linux Programming Bible, 4th Edition, Wiley- dreamtech India (P) Ltd.

Website and e-learning source

1. https://www.webopedia.com/TERM/O/operating_system.html
2. https://www.tutorialspoint.com/operating_system/operating_system_tutorial.pdf
3. http://iips.icci.edu.iq/images/exam/AbrahamSilberschatz-Operating-System-Concepts---9th2012.12.pdf
4. https://www.informatics.indiana.edu/rocha/academics/i101/p dfs/os_intro.pdf
5. New folder

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Outline the fundamental concepts of an OS and their respective functionality	K1, K2
CO2	Demonstrate the importance of open-source operating system commands	K1, K2,K3
CO3	Identify and stimulate management activities of operating system	K1, K2, K3
CO4	Analyze the various services provided by the operating system	K1,K2, K4
CO5	Interpret different problems related to process, scheduling, deadlock, memory and files	K1, K2, K4, K5

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

COURSE DESCRIPTORS

Title of the Course	DIGITAL COMPUTER ARCHITECTURE	**Hours/Week**	5
Course Code	APEIT15B	**Credits**	3
Category	ELECTIVE II (EC2)	**Year & Semester**	I & I
Prerequisites	Basic knowledge in Digital Design and Computer Architecture	**Regulation**	2024

Objectives of the course:

- To provide a comprehensive introduction of the basic design of a computer and the interdependence and interoperation between the various components inside a computer.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Data Representation - Data Types - Number Systems - Decimal and Alphanumeric Representation - Complements - (r-1)"s complement - (r"s) complement - Fixedpoint Representation - Floating-point Representation - Binary Codes - Gray Codes - Decimal Codes - Alphanumeric Codes – Error Detection Codes	CO1	K1, K4
UNIT-II	Digital Computers - Logic Gates - Boolean Algebra - KMap Simplification - Combinational Circuits - Half Adder - Full Adder - SR, D, JK and T Flip Flops - Sequential Circuits - State Table - State Diagram - Digital Components: Integrated Circuits - Decoders - NAND Gate Decoder - Encoders - Multiplexers - Registers - Shift Registers - Binary Counters - Memory Unit	CO2, CO3, CO4	K1,K2, K3, K4
UNIT-III	Register Transfer and Micro-operations: Register Transfer Language - Register Transfer - Bus and Memory Transfers - Arithmetic Micro-operations - Logic Micro-operations - Shift Micro- operations - Arithmetic Logic Shift Unit. Computer Organization and Programming: Instruction Codes - Computer Registers - Computer Instructions - Timing and Control - Instruction Cycle - Memory Reference Instructions - Input-Output and Interrupt	CO4	K1,K2, K3, K4
UNIT-IV	Central Processing Unit: General Register Organization - Instruction Formats - Addressing Modes - Data Transfer and Manipulation - Program Control. I/O Organization: Peripheral Devices - I/O Interface - Asynchronous Data Transfer - Modes of Transfer - Priority Interrupt - DMA	CO4, CO5	K1,K2, K3, K4
UNIT-V	Memory Organization and CPU: Memory Hierarchy - Main Memory - Auxiliary Memory - Associative Memory - Cache Memory - Virtual Memory - Memory Management Hardware	CO5	K1,K2, K3, K4

Recommended Text Books

1. M. Morris Mano, "Computer System Architecture", Prentice Hall of India, 2001

Reference Books

1. John P. Hayes, "Computer Architecture and Organization", Tata McGraw Hill, 1996.
2. V C Hamatcher et al, "Computer Organization", Tata McGraw Hill, 1996.

Website and e-learning source

1. http://www.labri.fr/perso/strandh/Teaching/AMP/Common/Stran dh-Tutorial/Dir.html
2. http://www.computer-pdf.com/architecture/
3. http://www.uotechnology.edu.iq/depcse/lectures/3/
4. http://www.csie.nuk.edu.tw/~kcf/course/ComputerArchitecture/
5. http://www.ecs.csun.edu/~cputnam/Comp546/Putnam/Cach e%20Memory.pdf(UnitV: Cache Memory)

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Demonstrate the fundamental concept of binary representation and codes, combinational circuits, Instruction formats, register operations and memory organization	K1, K4
CO2	Explain the various types of flip flops, different types of micro operations, as well as the addressing modes in the instruction set	K1,K2
CO3	Apply the various number conversion systems and simplification of equations using K-map	K1,K2,K3
CO4	Analyze the various design of combinational circuits and flip flops to design a computer	K1,K2,K3,K4
CO5	Distinguish the major components of a computer including CPU, memory, I/O and storage	K1,K2,K3,K4

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

COURSE DESCRIPTORS

Title of the Course	HUMAN COMPUTER INTERACTION	**Hours/Week**	5
Course Code	APEIT15C	**Credits**	3
Category	ELECTIVE II (EC2)	**Year & Semester**	I & I
Prerequisites	Understanding the impact of human factors and Computer Science fundamentals	**Regulation**	2024

Objectives of the course:

- To provide a comprehensive introduction of the basic design of a computer and the interdependence and interoperation between the various components inside a computer.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Foundations: The Human: Introduction-Input-Output Channels- Memory. The Computer: Introduction- Text Entry Devices- Display Devices- Memory. The Interaction: Introduction – Models of Interaction-Frameworks and HCI Ergonomics-Interaction Styles-Elements of the WIMP Interface-Interactivity - The Context of the Interactions	CO1	K1
UNIT-II	Design Process: Design Basics- Introduction - Process- User Focus- Scenarios- Navigation Design- Screen Design and Layout-Interaction and Prototyping. Design RulesIntroduction- Principles to Support Usability-GuidelinesGolden Rules and Heuristics-HCI Patterns	CO2	K1, K2, K3
UNIT-III	Implementation Support: Introduction - Elements of Windowing Systems - Programming the Application- Using Toolkits-User Interface Management Systems. Evaluation Techniques: What is an Evaluation- Goal of EvaluationEvaluation Through Expert Analysis-Choosing an Evaluation Method	CO3	K1, K2, K3,K4
UNIT-IV	Universal Design: Introduction - Universal Design Principles-Designing for Diversity. User Support: Introduction-Requirements of User Support-Approaches to User Support-Adaptive Help Systems-Designing User Support Systems	CO4	K1, K2, K5
UNIT-V	Models: Cognitive Models: Introduction-Goals and TaskLinguistic Models-Challenge of Display Based SystemPhysical and Device Models - Cognitive Architectu	CO5	K1, K2, K3,K4

Recommended Text Books

1. Alan dix, Janet finlay, Gregory D. Abowd and Russell Beale,(2004),Human Computer Interaction, 3rd edition, Pearson Education

Reference Books

1 John C. Caroll, (2002), Human Computer Interaction in the new millennium, Pearson Education

2. Jenny Preece, Yvonne Rogers, Helen Sharp (2019), Interaction Design: Beyond Human–Computer Interaction,fifth edition, John Wiley & Sons In

Website and e-learning source

1. http://courses.iicm.tugraz.at/hci/
2. http://www.hcibook.com/hcibook/downloads/pdf/exercises.pdf
3. http://www.idemployee.id.tue.nl/g.w.m.rauterberg/lectures.html

4.http://user.medunigraz.at/andreas.holzinger/holzinger/papersen/HCI/Workshop/forISSEP%202005.pdf

5. http://universaldesign.ie/What-is-Universal-Design/The7-Principles/ (Unit IV: Universal Design Principles)

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Describe typical human–computer interaction (HCI) models, styles, and various historic HCI paradigms	K1
CO2	Identify the usability and the beneficiary factors of User support systems	K1, K2
CO3	Analyze the core theories, models and methodologies in the field of HCI	K1, K2, K3,K4
CO4	Evaluate interactive systems based on the human factor theories	K1, K2, K5
CO5	Elaborate an interactive system based on the design principles, standards and guidelines	K1, K2, K3,K4

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

COURSE DESCRIPTORS

Title of the Course	Big Data Analytics	**Hours/Week**	5
Course Code	APEIT15D	**Credits**	3
Category	ELECTIVE II (EC2)	**Year & Semester**	I & I
Prerequisites	Basic idea of Data warehousing, basic programming.	**Regulation**	2024

Objectives of the course:

- Understand the Big Data Platform and its Use cases, Map Reduce Jobs
- To identify and understand the basics of cluster and decision tree
- To study about the Association Rules, Recommendation System
- To learn about the concept of stream
- Understand the concepts of NoSQL Databases

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Evolution of Big data - Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value - Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — Map Reduce and YARN — Map Reduce Programming Model	CO1	K1
UNIT-II	Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions .- Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes Theorem — Naïve Bayes Classifier.	CO2	K1, K2, K3

UNIT-III	Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association& finding similarity - Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches.	CO3	K1, K2, K3,K4
UNIT-IV	Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform(RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics	CO4	K1, K2, K5
UNIT-V	**NoSQL Databases** : Schema-less Models : Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores - Tabular Stores - Object Data Stores - Graph Databases Hive - Sharding — Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R.	CO5	K1, K2, K3,K4

Recommended Text Books

AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.

Reference Books

1. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers, 2013
2. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.

Website and e-learning source

1. https://www.simplilearn.com
2. https://www.sas.com/en_us/insights/analytics/big-data-analytics.html
3. https://archive.nptel.ac.in/courses/106/104/106104189/

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Work with big data tools and its analysis techniques.	K1
CO2	Analyze data by utilizing clustering and classification algorithms.	K3, K4
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data	K1, K2, K3
CO4	Perform analytics on data streams.	K1, K2, K4
CO5	Learn NoSQL databases and management.	K1, K2, K3

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

COURSEDESCRIPTORS

Title of the Course	Database System	**Hours/Week**	5
Course Code	APCIT21	**Credits**	5
Category	Core-4	**Year& Semester**	I & II
Prerequisites	Fundamental Computer Knowledge that Includes the hardware and memory storage.	**Regulation**	2024

Objectives of the course:

- To under stand the basic DBMS models, architecture, query and to normalize the database.
- To Learn Transaction Processing, Recovery and Distributed Database.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction: Database System Applications-Purpose of Database Systems-View of Data- Database Users and Administrators. Relational Database: Structure of Relational Databases- Databases Schema- Keys-Schema Diagrams-Formal Relational Query Languages :Relational Algebra- Tuple Relational Calculus	CO1	K1,K2
UNIT-II	Database Design: Overview of Design Process-The Entity Relationship Model-Constraints- Removing Redundant Attributes in Entity Sets-Entity-Relationship Diagrams-Reduction to Relational Schemas-Extended E-R features -Alternative Notations for Modeling Data. Relational Database Design: Features of Good Relational Design-Functional Dependency-Normalization: 1NF,2NF,3NF,BCNF,4NF,5NF-FunctionalDependency Theory	CO2, CO3	K1,K2
UNIT-III	Transaction Management: Transaction Concept Simple Transaction Model-Storage Structure- Transaction Atomicity and Durability-Transaction Isolation- Serializability. Concurrency Control: Lock Based Protocols-Locks- Granting of Locks-Two Phase Locking Protocol-Timestamp Based Protocol- Recovery System: Failure Classification-Recovery and Atomicity: Log Records-Database Modification-Concurrency Control and Recovery-Recovery Algorithm- **Database Recovery Management**	CO2, CO3	K1,K2
UNIT-IV	Distributed Database: Homogeneous and Heterogeneous Databases-Distributed Data storage- Distributed Transactions-Commit Protocols-Concurrency Control in Distributed Databases-Distributed Query Processing. – **Equivalence of Transformation of queries – Transforming Global Queries into Fragment Queries-** Case study :Mongo DB	CO4	K1, K2,K3,K5

UNIT-V	SQL-Table Fundamentals-Viewing Data - Inserting-Deleting - Updating - Modifying - Constraints - Functions - Grouping – Sub queries - Joins - Views.PL/SQL: Introduction -PL/SQL Block –Data Types And Variables - Control Structure - Cursors - PL/SQL Security - Locks. PL/SQL Database Objects: Exception Handling-Packages-Procedures and Functions-Database Triggers	CO5	K1,K2,K3, K6

Recommended Text Books

1. Abraham Silberchatz, Henry F.Korth,S.Sudarshan, DatabaseSystemsConcepts,7th Edition, Tata Mcgraw Hill.
2. IvanBayross,SQL,PL/SQLTheProgrammingLanguageofORACLE,Fourthedition,BPB Publications UnitIV&V

Reference Books

1. AtulKahate, Introduction to Database Management systems, Pearsoneducation.
2. CarloZaniolo, Stefano Ceri,Christos Faloustsos, R.T.Snodgrass, V.S.Subrahmanian,(1997), Advanced Database Systems, Morgan Kaufman.
3. GeorgeKoch,KelvinLoney,(2002),Oracle9i:TheCompleteReference,OraclePress,Tata McGrawHill Publication.
4. RamezElmasri,ShamkantB.Navathe(2014),"DatabaseSystems",Sixthedition,Pearson Education, New Delhi

Website and e-learning source

1. *http://www.slideshare.net/SalamaAlbusaidi/emergingdatabase-technology-multimedia-database*
2. *http://www.tutorialspoint.com/plsql/index.htm*
3. *http://www.tutorialspoint.com/plsql/index.htm*

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Explain the relational databases and uses of PL/SQL	K1,K2
CO2	Apply Schema, ER-Model, normalization, transaction, concurrency ,and recovery on tables using SQL and PL/SQL.	K1,K2
CO3	Analyze and manage relational & distributed ,database, transaction, concurrency control and query languages	K1,K2
CO4	Assess databases based on models and Normal Forms.	K1,K2,K3,K5
CO5	Design and construct able and manipulate it effectively using PL/SQL database objects	K1,K2,K3,K6

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

COURSEDESCRIPTORS

Title of the Course	RDBMS-Practical	**Hours/Week**	6
Course Code	APCPIT22	**Credits**	5
Category	Core-5	**Year& Semester**	I&II
Prerequisites	Basic understanding of SQL queries	**Regulation**	2024

Objectives of the course:

- TheprimaryCourseObjectiveofthispaperistolearnandimplementSQL&PL/SQL.

S. No	List of Exercises	COs	Cognitive Levels
1	DDL Commands	CO1-CO5	K1-K5
2	DML Commands	CO1-CO5	K1-K5
3	DCL Commands	CO1-CO5	K1-K5
4	Usage of Sub Queries in DML and Create-SQL	CO1-CO5	K1-K5
5	Solving queries using built-in functions	CO1-CO5	K1-K5
6	Simple programs in PL/SQL block	CO1-CO5	K1-K5
7	Exception Handling in PL/SQL	CO1-CO5	K1-K5
8	Programs using Implicit Cursors	CO1-CO5	K1-K5
9	Programs using Explicit Cursors	CO1-CO5	K1-K5
10	Programs using Explicit Cursors	CO1-CO5	K1-K5
11	Procedures &User-defined functions	CO1-CO5	K1-K5
12	Creation of Triggers	CO1-CO5	K1-K5

Recommended Text Books

1.IvanBayross,SQL,PL/SQLTheProgrammingLanguageofORACLE,Fourthedition,BPB Publications

Reference Books

1.RamezElmasri,ShamkantB.Navathe(2014),"DatabaseSystems",Sixthedition,Pearson Education, New Delhi

Website and e-learning source

1. http://www.slideshare.net/SalamaAlbusaidi/emergingdatabase-technology-multimedia-
2. http://www.tutorialspoint.com/dbms/index.htm
3. **http://www.tutorialspoint.com/plsql/index.htm**

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	CognitiveLevel
CO1	Choose appropriate SQL queries and PL/SQL blocks for the database.	K1-K5
CO2	Implement SQL and PL/SQL blocks for the given problem effectively.	K1-K5
CO3	Analyze the problem and Exceptions using queries and PL/SQL blocks.	K1-K5
CO4	Validate the database for normalization using SQL and Pl/SQL blocks.	K1-K5
CO5	Design Data base tables, create Procedures, user-defined functions and Triggers.	K1-K5

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

COURSEDESCRIPTORS

Title of the Course	Mobile Development-Practical	**Hours/Week**	6
Course Code	APCPIT23	**Credits**	4
Category	Core-6	**Year& Semester**	I&II
Prerequisites	Basic understanding on Java Programming	**Regulation**	2024

Objectives of the course:

ToprovidethestudentswiththebasicsofAndroidSoftwareDevelopmenttools,development of software on mobile platforms and deploying software to mobile devices.

S.No	List of Exercises	COs	Cognitive Levels
	Unit - I		
1	Develop an Application that uses Basic Components	CO1-CO5	K1- K5
2	Develop an application that uses GUI Components, font and colors	CO1-CO5	K1-K5
	Unit - II		
1	Develop an Android app to demonstrate the usage of TimePicker to set alarm clock.	CO1-CO5	K1-K5
2	Create an Android application for displaying pictures.	CO1-CO5	K1-K5
	Unit - III		
1	Write an application that uses Intent and Activity	CO1-CO5	K1-K5
2	Develop an Application that uses Calculator	CO1-CO5	K1-K5
	Unit - IV		
1	Implement an application that uses Options Menu	CO1-CO5	K1-K5
2	Create an Application that uses Context Menu	CO1-CO5	K1-K5
	Unit - V		
1	Develop an application for SMS Messaging	CO1-CO5	K1-K5
2	Develop an application that makes use of Database	CO1-CO5	K1-K5

Recommended Text Books

Wei–MengLee,(2012),BeginningAndroid4ApplicationDevelopment,WileyIndiaEdition

Reference Books

1. OnurCinar,(2012),AndroidAppswithEclipse,Apress,Springer(India)PrivateLimited.

2. RetoMeier,(2010),ProfessionalAndroid2ApplicationDevelopment,WileyIndiaEdition

Website and e-learning source

1. http://devcloper.android.com/training/basics/firstapp/index.html
2. www.vogella.com/articles/Android/article.html
3. www.coreservlets.com/android-tutorial/
4. www.edumobile.org/android/category/android-beginner-tutorial
5. http://www.androidhive.info/2011/11/android-sqlitedatabase-tutorial/(Unit V: Ex. No.3 (SQ Lite Database)

Course Learning Outcomes(for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Demonstrate the set up and configuration of Android Development Environment.	K1,K2
CO2	ApplythenecessaryUIcomponentswithdifferentstyles,themes,views,and layouts	K1,K2,K3
CO3	Examine and implement their queried services such as messaging, mailing, Multimedia concepts for the given problem	K1,K2,K3,K4
CO4	Test and debug the Android applications with different inputs.	K1,K2,K3,K5
CO5	Create mobile applications that make use of various and void features, Functions and database tasks	K1,K2,K3,K6

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

COURSEDESCRIPTORS

Title of the Course	Network sand Security	**Hours/Week**	4
Course Code	APEIT24A	**Credits**	3
Category	Elective III	**Year& Semester**	I & II
Prerequisites	Basic knowledge about computer networks	**Regulation**	2024

Objectives of the course:

- To become familiar with the various data structures and their applications and to increase the understanding of basic concepts of the design and use of algorithms.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Uses of Computer Networks – Network Hardware – Line Configuration – Topology–Transmission Modes–Reference Models: OSI Reference Model – TCP/IP Reference Model –Physical Layer: Guided Transmission Media – Wireless Transmission–Communication Satellites–Public Switched Telephone Network: Local Loop–Multiplexing–Switching	CO1, CO2	K1,K2
UNIT- II	Data Link Layer : Design Issues-Error Detection and Correction-Network Layer: Design Issues–Routing Algorithms :Shortest Path Routing– Distance Vector Routing–Link State Routing–Broad cast Routing– Multicast Routing–Congestion Control	CO2, CO3	K1,K2, K3,K4
UNIT-III	Network Layer in the Internet: IP Addresses –Transport Layer: Elements of Transport Protocols: Addressing – Connection Establishment – Connection Release–Application Layer: Domain Name System–Email: Architecture and Services	CO3, CO4	K3,K4
UNIT-IV	Network Security: Introduction to Cryptography - Symmetric - Key Cryptography - Asymmetric- key Cryptography – Security Services: Message Confidentiality - Message Integrity - Message Authentication – Digital Signature-Entity Authentication–Security in the Internet: IP Security-SSL/TLS: SSL services-SSL Protocols -Firewalls	CO3, CO4	K3,K4
UNIT-V	Security for Wireless Networks :Introduction–Protecting the wireless networks–Physical Security–Authentication and access control-Smartphone Security: Security Threats-Steps to smart phone security– Websites and Web application Security :Definition– Available Technologies -Threats-Strategies. Case Studies :To study recent Wi-Fi and Smartphone technologies	CO4, CO5	K4,K5

Recommended Text Books

1. AndrewS.Tanenbaum,DavidJ.Wetherall(2022),ComputerNetworks,PrenticeHallofIndia,V Edition. (Unit I - Unit - III) Unit I – Chapter 1,2 Unit II – Chapter 3,5 Unit III – Chapter 5,6,7
2. BehrouzA.Forouzan,(2017),DataCommunicationsandNetworking,TataMcGraw-Hill PublishingCompanyLimited,IVEdition.(UnitIV)UnitIV-Chapter30,31,32

Reference Books

1. Charles P.Pfleeger, Shari Lawrence P fleeger (2002),SecurityinComputing,3rdEdition,Pearson Education.
2. JamesF.Kurose,KeithW.Ross(2005),ComputerNetworking,3rdEdition,Addison Wesley,.
3. WilliamStallings(2006),CryptographyandNetworkSecurity:PrinciplesandPractice,3rdEdition, PHI.

Website and e-learning source

1. 1.http://wndw.net/pdf/wndw3-en/ch09-security-for-wirelessnetworks.pdf(UnitV-WirelessNetworks Security)
2. https://www.fcc.gov/sites/default/files/smartphone_master_document.pdf(UnitV-Stepstosmartphone security)
3. https://www.csoonline.com/article/3241727/mobilesecurity/6-mobile-security-threats-you-should-take seriously-in-2019.html (Unit V – Smart Phone Security Threats)
4. https://kgk.uni-obuda.hu/sites/default/files/12_Kadena.pdf(UnitV–SmartPhoneSecurityThreats)
5. https://www.goodfirms.co/glossary/web-security/(UnitV–Web Secure

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Outline the concepts and fundamentals of data communication and computer networks	K1
CO2	Identify the usage and importance of layered model, network security and web security	K1,K2
CO3	Classify the techniques based on required application	K1,K2,K3,K4
CO4	Analyze the significant applications of protocols and layers used in data Communication and networking	K1,K2,K3,K4
CO5	Explain the functionality of various techniques and algorithms that works at different layers	K1,K2,K3,K4,K5

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

COURSEDESCRIPTORS

Title of the Course	CLOUDCOMPUTING	**Hours/Week**	4
Course Code	APEIT24B	**Credits**	3
Category	Elective III	**Year& Semester**	I&II
Prerequisites	Basic knowledge on software system Specifically on Operating System	**Regulation**	2024

Objectives of the course:

- Understand the different concepts of cloud computing and its services

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction: Cloud Computing Basics :Cloud Computing Overview-Applications of cloud computing Intranets and the cloud– First movers in the cloud-Benefits-limitationsofcloudcomputing–SecurityConcerns–Cloud Computing Services–Salesforce.com	CO1	K1,K2
UNIT- II	Cloud Computing Technology: Hardware and Infrastructure–Clients–Security– Network– Services-Cloud Storage– Standards– Cloud Computing at work :Software as a Service–Software Plus Services–Developing Applications	CO1, CO2	K1,K2
UNIT-III	Virtual Machines and Virtualization: Introduction - Understanding Virtualization-History of Virtualization –Leveraging Blade Servers Server Virtualization – Desktop Virtualization – Virtual Networks – Data Storage Virtualization.DataStorageinCloud:EvolutionofNetworkStorage–Cloud based data Storage Advantages and disadvantages of Cloud based data storage-Cloud based Backup systems-File Systems Cloud based Block Storage	CO2	K1,K2
UNIT-IV	Migrating into a Cloud: Introduction– Broad approaches of Migrating into cloud –The Seven Step Models of Migrating into a Cloud. Mobile Cloud Computing :Evolution of Mobile Computing–Mobile Cloud Eco System Mobile Players	CO3, CO4	K2,K3,K4
UNIT-V	Data security in cloud: Introduction – Current state of data security – Homo sapiens and Digital Information – Cloud Computing and Data security Risk –Cloud Computing and Identity–The Cloud, Digital Identity and Data Security-Content Level Security-Pros and Cons	CO4, CO5	K3,K4,K5

Recommended Text Books

1. 1.AnthonyT.Velte,TobyJ.Velte,RobertElsenpeter,"CloudComputing:APractical Approach", McGrawHill(2017)
2. Kris Jamsa ,"Cloud Computing" Jones and Barlett Student Edition 2016

Reference Books

1. Rajkumar Byya, James Broberg, Andrzej Goscinski, "Cloud Computing Principles and Paradigms", Wiley &sons

Website and e-learning source

1. https://swayam.gov.in/nd1_noc20_cs55/

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Articulate the main concepts, key technologies of cloud computing in terms Of strengths, limitations and applications.	K1,K2
CO2	Categorizethearchitectureandinfrastructureofcloudcomputingsuchas IaaS and SaaS	K1,K2
CO3	Explain the concept of virtual machines and virtualization	K2,K3
CO4	Apply suitable storage algorithms in cloud computing	K3,K4
CO5	Be expose in broad approaches of migrating into a cloud and mobile cloud computing, Describe about the data security concepts in cloud computing	K4,K5

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

COURSEDESCRIPTORS

Title of the Course	Biometric Techniques	**Hours/Week**	4
Course Code	APEIT24C	**Credits**	3
Category	Elective III	**Year& Semester**	I & II
Prerequisites	Basic knowledge of computer vision and cyber Security concepts	**Regulation**	2024

Objectives of the course:

- To acquire the knowledge about the compiler design and to understand the different phases of Compiler.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction: Biometric Fundamentals - Biometrics Vs Traditional Techniques - Benefits of Biometrics in Identification Systems - Key Biometric Terms and Processes: Verification, Identification and Biometric Matching-Accuracy in Biometric Systems :False Match Rate ,False Non-Match Rate ,Failure to Enroll Rate, Derived Metrics	CO1	K1,K2
UNIT- II	Physiological Biometrics: Finger Scan: Components-How it works-Competing Technologies- Deployments-Strengths and Weaknesses. Facial Scan: Components-How it Works Competing Technologies-Deployments-Strengths and Weaknesses	CO1, CO2	K1,K2
UNIT-III	Other Physiological Biometrics: Iris Scan: Components- How it Works-Competing Technologies-Deployments Strengths and Weaknesses. Voice Scan: How it Works Competing Technologies-Deployments-Strengths and Weaknesses .Other Physiological Biometrics: Hand Scan and Retina Scan	CO2	K1,K2
UNIT-IV	Behavioral Biometrics: Signature Scan and Keystroke Scan: How it Works-Competing Technologies Deployments-Strengths and Weaknesses. Esoteric Biometrics: Vein Pattern- Facial Thermograph-DNA- Sweat Pores- Hand Grip-Finger Nail Bed –Body Odor-Ear Gait-Skin Luminescence-Brain Wave Pattern-Foot Print and Foot Dynamics	CO3, CO4	K2,K3,K4
UNIT-V	Biometric Applications: Categorizing Biometric Applications - Application Areas: Criminal and Citizen Identification, Surveillance, PC/Network Access, E-Commerce/Telephony and Retail/ATM-Costs to Deploy-Issues In Deployment-Biometric Standards- **Multi Modal Biometric Concepts**	CO4, CO5	K3,K4,K5

Recommended Text Books

1. Samir Nanavati, Michael Thieme, Raj Nanavati,(2018),Biometrics –Identity Verification in a Networked World, Wiley-dream tech India Pvt Ltd, New Delhi

2. JohnD.Woodward,NicholasM.Orlans,PeterT.Higgins,Biometrics:theultimatereference,Dreamtech Press(2017)

Reference Books

1.AnilKJain,PatrickFlynn,ArunARoss,(2008),Hand book of Biometrics, Springer

Website and e-learning source

1. http://www.sans.org/readingroom/whitepapers/authentication/biometric-scanning/
2. http://www.biometrics.gov/documents/biointro.pdf
3. http://www.cse.unr.edu/~bebis/CS790Q/Lect/IntroBiometrics.pdf
4. http://www.planetbiometrics.com/creo_files/upload/articlefiles/btamvol1update.pdf
5. http://www.biometrics.gov/documents/biointro.pdf(UnitV:BiometricApplications)

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Outline the existing theories ,methods and interpretations in the field of biometrics	K1,K2
CO2	Identify the deployment areas, competing technologies, strength and Weakens of various Physiological and Behavioral Biometrics	K1,K2
CO3	Analyze various Application areas, Biometric security issues and Biometric standards	K2,K3
CO4	Assess the methods relevant for design, development and operation of biometric access control systems	K3,K4
CO5	Determineidentification/verificationsystemstovalidatetheuseridentity andtechnologicalupliftsinbiometricscomparedtotraditionalsecuring mechanisms	K4,K5

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

COURSEDESCRIPTORS

Title of the Course	Information Security	**Hours/Week**	4
Course Code	APEIT24D	**Credits**	3
Category	Elective III	**Year& Semester**	I & II
Prerequisites	Understand network security threats, security services, and countermeasures	**Regulation**	2024

Objectives of the course:

This course has been designed for students to learn and understand

- The fundamental concepts of Security.
- The various methods and learning algorithms in Security.
- The underlying mathematical relationships within and across Cryptographic algorithms.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction to Information Security : Attacks, Vulnerability, Security Goals, Security Services and mechanisms- Number Theory-Euclidean algorithm-Modular Arithmetic-Fermat and Euler Algorithm- The Chinese reminder Algorithm- Classical Encryption Techniques –Symmetric Cipher model-Substitution Techniques-Transposition Techniques	CO1	K1,K2,K3
UNIT-II	Block Cipher and Data Encryption Standard-strength of DES-Strength Of DES-Advanced Encryption Standard-AES structure- AES Transformation Function-AES Key Expansion. –Public key Cryptography- RSA Algorithm-Differ Hellman Key Exchange-Elgamal Cryptographic System-Elliptic curve Arithmetic-Elliptic Curve Cryptography-Pseudo Random Generation	CO2	K3
UNIT-III	**Cryptographic Hash Functions**-Secure Hash Functions-Message Authentication Code-HMAC-DAA-CMAC-**Digital Signatures**-Elgamal Digital Signature Scheme- Schnorr Digital Signature Scheme- NIST Digital Signature Scheme-**Key Management and Distribution**- using symmetric Encryption- Using Asymmetric Encryption-X.509 Certificates	CO3	K4
UNIT-IV	Network Access Control –Extensible Authentication Protocol- Cloud Computing- Cloud Security Risk and Counter measures- Data protection in Cloud- Cloud Saas- Transport layer Security-Web Security Considerations-Https-SSH- wireless Network Security-IP Security-IDS-Firewalls	CO4	K4,K5
UNIT-V	**Non-Cryptographic Protocol Vulnerabilities**: DoS and D DoS, Session Hijacking and Spoofing, Pharming attacks. Software Vulnerabilities - Phishing, Buffer Overflow, Format String attacks, SQL Injection.	CO5	K2

Recommended Text Books

1. Cryptography And Network Security Principles And Practice, 7th Edition, William Stallings
2. Security in Computing, Fourth Edition, by Charles P. P fleeger, Pearson Education.

Reference Books

1. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall.
2. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall.

Website and e-learning source

1. https://www.barcodesinc.com/articles/cryptography-links.htm?srsltid=AfmBOoq4TLu0yniWCOhbXbvogG86LWf-1FCE0gA67oXlxmZLlfgv8l0v

Course Learning Outcomes (for Mapping with Pos and PSOs)

Students will be able to

Cos	CO Description	Cognitive Level
CO1	Acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity and encryption technique	K1,K2,K3
CO2	Understand the various encryption standards and public key cryptography	K3
CO3	Make use of application protocols to design and manage a secure system.	K4
CO4	Learn the configuration and manage Web and Transport layer Security	K4,K5
CO5	Learn about the Non Cryptographic protocol vulnerabilities	K2

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

COURSEDESCRIPTORS

Title of the Course	Software Engineering	**Hours/Week**	4
Course Code	APEIT25A	**Credits**	3
Category	Elective IV	**Year& Semester**	I & II
Prerequisites	Basic knowledge of software programs	**Regulation**	2024

Objectives of the course:

- This paper familiarizes the students with the knowledge of basic Software engineering methods and practices and gives hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development..

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction: A Generic View of Process - Process Models: The Waterfall Model-Incremental Model-Evolutionary Model-Specialized Model-The Unified Process-Agile Process- Agile process Models Exercise: Choose any one project and do the following exercises for the chosen project a. Student Result Management System b. Library management system c. Online course reservation system d. Railway reservation system e. Recruitment system f. Stock Maintenance System Write the Problem Statement for a suggested system of relevance	CO1, CO5	K1,K2, K4,K5
UNIT-II	System Engineering: System Engineering Hierarchy - System Modeling - Requirements Engineering: Tasks- Initiating The Process-Eliciting Requirements-DevelopingUseCases-NegotiatingRequirements-Validating Requirements - Building the Analysis Models: Data modeling concepts - Scenariobased-Floworiented-ClassbasedModelingExercise:Preparation Of Software Requirement Specification Document	CO3, CO4	K1,K2, K3,K4
UNIT-III	Design Engineering: Design Concepts - Design Models - Pattern Based Design - Architectural Design - Component Level Design: Component – Class Based and Conventional Components Design –User Interface Design: Analysis and Design Exercise: Draw DFD and Use Case diagram for the Chosen project using any CASE tools	CO5	K1,K2,K4, K5

UNIT-IV	Testing Strategies: Software Testing- Strategies: Conventional-Object Oriented-Validation Testing-System Testing: Recovery -Security-Stress - Performance - Testing Tactics: Testing Fundamentals- Black Box - White Box-BasisPath-ControlStructureExercise:Developtestcasesandperform Various testing using any one of the testing tools	CO5	K1,K2,K4, K5
UNIT-V	Estimation : Software project Estimation - Empirical Estimation models - Risk management : Software Risks - Risk Identification - Risk Projection - Risk Mitigation, Monitoring and Management - Quality Management: Quality Concepts - Quality Assurance -Software Reliability- Quality Standards Case Studies: Develops Tools Exercise: Perform Estimation of effort using FP Estimation for chosen system and prepare Gantt Chart/PERT Chart for the same.	CO2	K1,K2,K3

Recommended Text Books

1. RogerPressman.S.,"SoftwareEngineering:APractitioner'sApproach",9th Edition, McgrawHill, 2023

Reference Books

1. RichardFailey,"SoftwareEngineeringConcepts",TataMcGraw-Hill,2019.
2. P.Fleeger,"SoftwareEngineering",PrenticeHall,2016
3. CarloGhezzi,MehdiJazayari,DinoMandrioli,"FundamentalsofSoftwareEngineering",Prentice Hall Of India 1991.
4. Sommerville,"SoftwareEngineering"7th Edition:AddisonWesley,2020

Website and e-learning source

1. http://productdevelop.blogspot.in/2011/03/what-areformal-technical-reviews-ftr.html
2. http://basicqafundamentals.blogspot.in/2011/03/difference-between-alpha-testing-beta.html
3. https://www.wiziq.com/tutorials/software-engineering
4. http://www.jkinfoline.com/software-engineering.html
5. http://www.freetutes.com/systemanalysis/
6. http://www.softwaretestingstuff.com/2007/09/whitebox-testing.html(UnitIV:WhiteBoxTesting)

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Recognize the software process models including the specification, design, implementation, and testing for a software project	K1,K2
CO2	Utilize recent and advanced tools necessary for software project development, testing, management and reuse	K1, K2,K3
CO3	Compare and contrast various design, testing and quality issues	K1,K2,K3
CO4	Prioritize the requirements and risk accordingly that meet user expected performance, maintenance and quality	K1,K2,K4
CO5	Design software projects with well-defined architecture, modules, Components and interfaces	K1,K2,K4,K5

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

COURSEDESCRIPTORS

Objectives of the course:

Title of the Course	Object Oriented Analysis and Design	**Hours/Week**	4
Course Code	APEIT25B	**Credits**	3
Category	Elective IV	**Year& Semester**	I & II
Prerequisites	Basic understanding of at least one of the object-oriented programs	**Regulation**	2024

- The primary objective is to understand the principles & requirements and apply the UML(Unified Modeling Language) and tools for OOA and Design..

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Object Basics: Object-oriented Philosophy–Object–Object State, Behaviors and Methods. Encapsulation and Information Hiding–Class Hierarchy–Polymorphism, Aggregation, Object Containment, Meta Classes.	CO1	K1,K4
UNIT-II	Object Oriented Methodologies: Rumbaugh Object Model, Booch Methodology- Jacobson Methodology, Patterns, Frameworks and Unified Approach.	CO2, CO3, CO4	K1,K2,K3, K4
UNIT-III	Object Oriented Analysis: Business Object Analysis–Use Case Driven Approach–Use Case Model. Object Analysis–Noun Phrase Approach–CRC–Identifying Object Relationships and Methods.	CO4	K1,K2,K3, K4
UNIT-IV	Object Oriented Design: The Design Process–Design Axioms–Corollaries – Design Patterns – Designing Classes. Software Quality: Tests- Testing Strategies–Test Cases–Test Plan–Continuous Testing–Miers Debugging Principles.	CO4, CO5	K1,K2,K3, K4
UNIT- V	UML and Programming: Introduction – State and Dynamic Models – UML Diagrams–Class Diagrams–Use Case Diagrams-UML Dynamic Modeling. Case Studies: Rational Rose – Real Time Applications: Student Result Management System –Library management system – Online course reservation system	CO5	K1,K2,K3, K4

Recommended Text Books

1. AliBrahami,ObjectOrientedSystemsDevelopment,Tata-McGrawHill,NewDelhi.(2017)

Reference Books

1. Martin Fowler, Kendall Scott, UML Distilled-Applying the Standard Object Modeling Language, Addition Wesley.
2. GradyBooch,(1994),Object-orientedAnalysisandDesignwithapplications,2ndEdition,Addition Wesley.

Website and e-learning source

1. http://www.slideshare.net/helghareeb/object-orientedanalysis-and-design-12164752
2. http://www.uml-diagrams.org/uml-object-orientedconcepts.html
3. http://www.tutorialspoint.com/object_oriented_analysis_design/index.htm
4. https://www.mppmu.mpg.de/english/kluth_oo_intro.pdf

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

Cos	CO Description	Cognitive Level
CO1	Recognize the concepts and principles of object-oriented analysis, design and Testing	K1,K4
CO2	Demonstrate the importance of system development process using various Approaches and choose there levant technique for a system in each phases of SDLC	K1,K2
CO3	Differentiate various object-oriented analysis, design and testing methods and models.	K1,K2,K3
CO4	Assess various analysis, design and testing strategies appropriate to build high- performance object-oriented system.	K1,K2,K3,K4
CO5	Design Object oriented systems using object modeling techniques and analyze them for correctness and quality.	K1,K2,K3,K4

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

COURSEDESCRIPTORS

Title of the Course	Software Project Management	**Hours/Week**	4
Course Code	APEIT25C	**Credits**	3
Category	Elective IV	**Year& Semester**	I & II
Prerequisites	Basic knowledge about the fundamentals of Software project development	**Regulation**	2024

Objectives of the course:

- The primary objective is to define and highlight importance of software project management and to become familiarize in formulating software management metrics & strategy in managing projects.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models-The SEICMM-International Organization for Standardization.	CO1	K1
UNIT-II	Managing Domain Processes - Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project -Project Planning - Creating the Work Breakdown Structure-Approaches to Building a WBS-Project Milestones -Work Packages- Building a WBS for Software.	CO2	K1,K2,K3
UNIT-III	Tasks and Activities- Software Size and Reuse Estimating-The SEICMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed.	CO3	K1,K2, K3,K4
UNIT-IV	Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Leveling Resource Assignments-Map the Schedule to a Real Calendar -Critical Chain Scheduling	CO4	K1,K2,K5
UNIT-V	Quality: Requirements – The SEICMM -Guidelines - Challenges -Quality Function Deployment - Building the Software Quality Assurance - Plan – Software Configuration Management: Principles-Requirements-Planning And Organizing-Tools-Benefits-Legal Issues in Software- Case Studies: Railway reservation system – Recruitment system – Stock Maintenance System	CO5	K1,K2, K3,K4

Recommended Text Books

1. RobertT.Futrell,DonaldF.Shafer,LindaI.Safer,"QualitySoftwareProjectManagement", Pearson Education Asia 2020

Reference Books

1. PankajJalote,"SoftwareProjectManagementinPractice",AddisonWesley2017
2. Hughes,"SoftwareProjectManagement",TataMcGrawHill2004,5th Edition.2015

Website and e-learning source

1. https://highered.mheducation.com/sites/0077109899/information-center-view/
2. https://www.tutorialspoint.com/software_engineering/software_project_management.htm
3. https://www.smartsheet.com/content/software-projectmanagement
4. https://www.philadelphia.edu.jo/academics/lalqoran/uploads/SPM_Chapter_1-%202016%204.ppt
5. https://cs.gmu.edu/~kdobolyi/cs421/projectmanagement.ppt

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CODescription	CognitiveLevel
CO1	Understanding of project management fundamentals such as project planning, risk management and quality assurance	K1
CO2	Choose the appropriate scheduling and testing techniques to build a quality product	K1,K2
CO3	Apply different cost estimation techniques and quality measures for software development	K1,K2, K3,K4
CO4	Differentiate various software development models and methodologies, planning activities and scheduling methods	K1,K2,K5
CO5	Asses the importance of software project documentation and identify the Methods to create project documentation, including requirements documents, design documents, and project plans	K1,K2, K3,K4

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

COURSEDESCRIPTORS

Title of the Course	Cyber Security	**Hours/Week**	4
Course Code	APEIT25D	**Credits**	3
Category	Elective IV	**Year& Semester**	I & II
Prerequisites	Fundamentals of Security Concepts, Ethical Hacking, Digital Forensics	**Regulation**	2024

Objectives of the course:

This course has been designed for students to learn and understand

- The need for cyber security and its related threats and attacks.
- The methods for secure communication in the cyber world.
- The best practices and regulations related to cyber security.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Basics of Cyber crime** Introduction - Cyber Threat – Definition of Cyber Crime – Classification – Current Threats and Trends – Diversity of Cyber Crime–Cyber Hate Crimes–Cyber Terrorism-Need For cyber security.	CO1	K1
UNIT-II	**Responding to Cyber crime** Cyber Strategy – National Security Strategy – Cyber Security Strategy–Organized Crime Strategy–Cyber Crime Strategy-Policy Cyber Crime – International Response – National Cyber Security Structure–Strategic Policy Requirements–Police And Crime Commissioners.	CO2	K1,K2,K3
UNIT-III	**Investigating Cyber Crime** Preventing Cyber Crime –Password Protection–Get Safe Online–Cyber Security Guidance for Business-Cyber Crime Investigation Skills–Criminal Investigation–Code of Ethics –Evidence–Hi-Tech Investigations–Capturing and Analyzing Digital Evidence.	CO3	K1,K2, K3,K4

UNIT-IV	**Foundations of Digital Forensics** Introduction to Digital Forensics - Forensic Software and Hardware - Analysis and Advanced Tools - Forensic Technology and Practices - Forensic Ballistics and Photography - Face-Iris and Fingerprint Recognition-Audio Video Analysis-Windows System Forensics- Linux System Forensics-Network Forensics	CO4	K1,K2,K5
UNIT-V	**Case Studies** Latest Study Topics on Cyber Crime and Investigations-Recent Cyber Crime Cases –Recent Digital Forensics Cases–Bridging the Gaps in Cyber Crime Investigations between the Cyber securities take holders.	CO5	K1,K2, K3,K4

Recommended Text Books

*1.*ThomasHalt,AdamM.BosslerandKathrynC.SeigfriedSpellar,(2017),

"CybercrimeandDigitalForensics:AnIntroduction",RoutledgeTaylorandFrancisGroup

Reference Books

1. Bernadette H Schell, Clemens Martin,(2004),"Cybercrime", ABC–ClioInc, California.

Website and e-learning source

1.CyberSecurityandPrivacy-Course(nptel.ac.in)

Course Learning Outcomes(for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Understand the concepts of cybercrime	K1
CO2	Describe the Cyber Crime Strategy.	K2
CO3	Identify the Cyber Crime Investigation Methodology.	K3
CO4	Generalize the knowledge on Digital Forensics.	K3
CO5	Apply the Cyber Crime and Digital Forensics concepts in real-time scenarios	K3

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

COURSEDESCRIPTORS

Title of the Course	Skill Enhancement Course-SEC-Mobile Development	**Hours/Week**	2
Course Code	APSIT26	**Credits**	3
Category	Skill Enhancement Course	**Year& Semester**	I&II
Prerequisites	Basic understanding on Java Programming	**Regulation**	2024

Objectives of the course:

- Toprovideacomprehensiveintroductionofthebasicdesignofacomputerandtheinterdependenceand interoperation between the various components inside a computer.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Getting Started with Android Programming–Using Eclipse for Android Development – Using Android Emulator -Getting to know the Android User Interface: Understanding the Components of a Screen	CO1	K1
UNIT-II	Designing your User Interface with views :Basic Views–Picker Views–List Views - Displaying Pictures	CO2	K1,K2,K3
UNIT-III	Activities, Fragments and Intents :Understanding Activities–Applying Styles and Themes to an Activity–Displaying a Dialog Window–DisplayingaProgressDialog–LinkingActivitiesUsingIntents–Fragments.	CO3	K1,K2, K3,K4
UNIT-IV	Menus with Views : Option Menu–Context Menu. Utilizing the Action Bar: Adding Action Items to the Action Bar–Customizing the Action Items and Application Icon-Working with Audio and Video.	CO4	K1,K2,K5
UNIT-V	Messaging: SMS Messaging – Sending E- Mail- Data Persistence: Creating and Using Databases–Developing Android Services–Publishing Android Applications	CO5	K1,K2, K3,K4

Recommended Text Books

1. Wei–MengLee,(2012),BeginningAndroid4ApplicationDevelopment,WileyIndiaEdition

Reference Books

1. OnurCinar,(2012),AndroidAppswithEclipse,Apress,Springer(India)PrivateLimited.

2. RetoMeier,(2010),ProfessionalAndroid2ApplicationDevelopment,WileyIndiaEdition

Website and e-learning source

1. http://devcloper.android.com/training/basics/firstapp/index.html
2. www.vogella.com/articles/Android/article.html
3. www.coreservlets.com/android-tutorial/
4. www.edumobile.org/android/category/android-beginner-tutorial
5. http://www.androidhive.info/2011/11/android-sqlitedatabase-tutorial/(UnitV:Ex.No.3(SQLite Database)

Course Learning Outcomes(for Mapping with POs and PSOs)

Students will be able to

Cos	CO Description	Cognitive Level
CO1	Demonstrate the setup and configuration of Android Development Environment.	K1
CO2	Apply the necessary UI components with different styles, themes, views, and layouts	K1,K2
CO3	Examine and implement the required services such as messaging, mailing, multimedia concepts for the given problem	K1,K2, K3,K4
CO4	Test and debug the Android applications with different inputs.	K1,K2,K5
CO5	Create mobile applications that make use of various and roid features, functions and database tasks	K1,K2, K3,K4

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

COURSE DESCRIPTORS

Title of the Course	Advanced Java	Hours/Week	06
Course Code	APCIT31	Credits	05
Category	Core-7	Year & Semester	II & III
Prerequisites	Basic understanding on Java concepts	Regulation	2024

Objectives of the course:

- To understand the basic concepts of core principles of the Java language and gain knowledge to develop dynamic Web applications using applet, servlet, jsp and JavaBean.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	The Genesis of Java: Java's Magic, The Java Buzzwords-An Overview of Java - Data types, Variables, Arrays-Operators-Control Statements- Introducing Classes – A Close Look at Methods and Classes-Inheritance	CO1	K1, K2
UNIT-II	String Handling Functions – Collections Framework: Collection Classes, String Tokenized, Date, Calendar – Abstract Classes - Packages and Interfaces: Packages – Access Protection Importing Packages – Interfaces	CO2	K1, K2, K3
UNIT-III	The Applet Class-Event Handling – Introducing the AWT: Working with windows, graphics and Text, Using AWT Controls, Layout Managers and Controls – Developing JavaServer Pages - RMI	CO3	K1, K2, K3, K4
UNIT-IV	Exception Handling: Exception types – Creating your own exceptions - Multithreaded Programming: Creating a Thread, Creating Multiple Threads, Using isAlive() and join(), Thread Priorities, Synchronization, Inter-thread Communication, Suspending, Resuming and Stopping Threads –	CO4	K1, K2, K3, K4, K5
UNIT-V	Developing Servlets -Structuring Web application with the MVC pattern – Sessions and Cookies - Using JSP tags with JavaBeans-JDBC – JU Testing	CO5	K1, K2, K3, K4, K5

Recommended Text Books

1. Herbert Schildt, (2004), "Java 2: The Complete Reference", Fifth Edition,Tata McGraw Hill, New Delhi.
2. Joel Murach, (2008), "Andrea Steelman,,Murach‟s JavaServlets and JSP", Second Edition, Shroff Publishers

Reference Books

1. Matthew Mac Donald, (2002), "ASP.NET : The Complete Reference", MC Graw Hill.
2. VladaMatena, (2003), "Applying Enterprise JavaBeans", Second Edition, Addison Wesley.
3. Cay S Horstmann& Gary Cornell, Core Java Vol II Advanced Features, Eighth Edition, Addison Wesley.
4. Bruce W Perry (2004), Java Servlets & JSP Cook Book, Second edition, O"reilly Media.

Website and e-learning source

1. http://netbeans.org/kb/docs/javaee/javaee-intro.html
2. http://www.jsptube.com/
3. http://articles.sitepoint.com/article/java-servlets-1
4. http://www.java-tips.org/java-tutorials/tutorials/introduction-to-java-servlets-with-netbeans.html
5. http://download.oracle.com/javase/tutorial/javabeans/index.html
6. http://www.javapoint.com/steps-to-connect-to-the-datadase-in-java/

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

Cos	CO Description	Cognitive Level
CO1	Understand and explain programming language constructs, Java mechanisms, OOP and Internet programming concepts	K1, K2
CO2	Apply logical constructs as well as include Object oriented features, Packages, Interfaces, Exceptions and Threads , JDBC, Internet programming technologies	K1, K2, K3
CO3	Compare and contrast classical and advanced Java in terms of features, architecture, platform and technologies	K1, K2, K3, K4
CO4	Choose an approach to solve real world problem from the acquired knowledge of Java	K1, K2, K3, K4, K5
CO5	Create programs that make strong use of classes and objects and develop JDBC,GUI, Web and Enterprise based applications	K1, K2, K3, K4, K5

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

COURSE DESCRIPTORS

Title of the Course	Advanced Java-Practical	Hours/Week	06
Course Code	APCPIT32	Credits	05
Category	Core-8	Year & Semester	II & III
Prerequisites	Basic understanding of core Java, JSP and HTML	Regulation	2024

Objectives of the course:

- This course gives practical training in basics and advanced Java programming like applet, Servlets, JSP and Java Beans.

S.No	List of Exercise	COs	Cognitive Levels
1	Write a java program using Classes and Objects to print the student details.	CO1 - CO5	K1 – K6
2	Write a java program for implementing classes by finding the area of triangle and square.		
3	Write a java program for sorting a given list of names in ascending order.		
4	Write a java program to add some colors in a list and print the list of colors using collections.		
5	Write a java program to display Date and Calendar		
6	Write a java program to create User defined package and demonstrate various access modifiers		
7	Write a java program to draw graphic images by using applets.		
8	Write a java program to simulate traffic signals using beans with JSP tags.		
9	Implementation of socket programming		
10	Write a java program to implement exception handling mechanism.		
11	To write a java program to demonstrate the Mouse Event Handlers.		

12	Write a java program to display all running threads in java.		
13	To write a java program using servlet for client request parameters.		
14	To write a java program to create a bean that counts the number of Mouse Clicks.		
15	To write a java program that connects a Database using JDBC and displays all records in a table		

Recommended Text Books

1. Herbert Schildt, (2004), "Java 2: The CompleteReference", Fifth Edition,Tata McGraw Hill, New Delhi.
2. Joel Murach, (2008), "Andrea Steelman, ,Murach‟s Java Servlets and JSP", Second Edition, Shroff Publishers

Reference Books

1. Bruce W Perry (2004), Java Servlets & JSP Cook Book, Second edition, O‟reilly Media.

Website and e-learning source

1. http://netbeans.org/kb/docs/javaee/javaee-intro.html
2. http://www.jsptube.com/
3. http://articles.sitepoint.com/article/java-servlets-1
4. http://www.java-tips.org/java-tutorials/tutorials/introduction-to-java-servlets-with-netbeans.html
5. http://download.oracle.com/javase/tutorial/javabeans/index.html

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

Cos	CO Description	Cognitive Level
CO1	Demonstrate understanding and use of different Java mechanisms for efficient application development	K1, K2, K3, K4, K5, K6
CO2	Use an appropriate development environment to write, compile and run Java Programs	K1, K2, K3, K4, K5, K6
CO3	Analyze the problem and apply the appropriate problem solving method with the required building blocks and mechanisms of Core and Advanced Java	K1, K2, K3, K4, K5, K6
CO4	Test the correctness and consistency of the Java program with different inputs	K1, K2, K3, K4, K5, K6
CO5	Create simple applications that make use of core java concepts and develop JDBC, GUI, Web and Enterprise based applications	K1, K2, K3, K4, K5, K6

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

COURSE DESCRIPTORS

Title of the Course	Open Source Technologies	Hours/Week	06
Course Code	APCIT33	Credits	05
Category	Core-9	Year & Semester	II & III
Prerequisites	Basic understanding of computer programming, Internet and HTML / XHTML	Regulation	2024

Objectives of the course:

- To learn the efficiency of Open Source Technology and to train to have a good practical knowledge of how to write successful PHP and Ruby code and utilizing a database using PHP.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	PHP: Introduction – Creating a PHP page – Running PHP page – HTML and PHP – Printing Text – Comment Statements – Working with variables – Storing data in variables - Interpolating strings – Constants - Understanding Internal Data types – Operators – Flow Control – Strings: String Functions - Converting to and from strings - Formatting text strings - Working with numbers.	CO1	K1, K2
UNIT-II	Date and Time - Create an Array - Use an Associative Array - Functions to Work with Arrays - Work with Arrays of Arrays - Create and Use Functions	CO2	K1, K2, K3
UNIT-III	Reading Data in web pages: Handling various controls – PHP Browser-Handling power: Data Validation - File Handling : Opening a file – Reading Text from a file – Closing a file- Working with Databases: Creating , Inserting , Accessing , Updating , Deleting and Sorting Database - Work with Cookies and Sessions	CO3	K1, K2, K3, K4
UNIT-IV	PERL: PERL overview – PERL parsing rules – Variables and Data – Statements and Control structures – Subroutines, Packages, and Modules- Working with Files –Data Manipulation.	CO4	K1, K2, K3
UNIT-V	Framework: Introduction to python framework – Django: Introduction – Django project and server configuration – MVT Design pattern – view - Template – URL Mapping – Static file Handling – Session and Cookies – Database Connectivity	CO5	K1, K2, K3

Recommended Text Books

1. Steven Holzner, (2016), "PHP: The Complete Reference", McGraw Hill Education Private Limited, Indian Edition. (Unit I, II)
2. RachnaKapur, Mario Briggs, Tapas Saha, Ulisses Costa, Pedro Carvalho, Raul F. Chong, Peter Kohlmann (2010), "Getting Started with Open Source Development", DB2 on Campus Book Series. (Unit III)
3. http://indexof.es/Ruby/Beginning%20Ruby%20On%20Rails.pdf (Unit IV)
4. http://www.cs.uni.edu/~wallingf/teaching/agile- may2010/ruby/programming-ruby.pdf(Unit V)

Reference Books

1. W. Jason Gilmore (2010), "Beginning PHP &MySql", Apress.
2. Joel Murach, Ray Harris (2010), "PHP and MySQL",Shroff Publishers & Distributors
3. Larry Ullman (2008), "PHP 6 and MySQL 5", Pearson Education.
4. John Coggeshall (2006), "PHP 5", Pearson Education.
5. Michale C. Glass (2004), "Beginning PHP, Apache, MySQL Web Development", Wiley DreamTech Press.

Website and e-learning source

1. http://www.w3schools.com/php/
2. http://howtostartprogramming.com/PHP/
3. http://www.massey.ac.nz/~nhreyes/MASSEY/159339/Lectures/Lecture%2011%20-%20PHP%20-%20Part%205%20-%20CookiesSessions.pdf
4. http://www.tutorialspoint.com/mysql/

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Demonstrate the setup and configuration of development environment to write PHP	K1, K2
CO2	Select the appropriate language fundamentals and techniques to write and compile PHP	K1, K2, K3
CO3	Examine the bugs and analyze how to prevent and remove the bugs	K1, K2, K3, K4
CO4	Select the appropriate language fundamentals and techniques to write and compile PERL programs	K1, K2, K3
CO5	Demonstrate the python framework – Development of application in Django framework.	K1, K2, K3, K4,K5,K6

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

COURSE DESCRIPTORS

Title of the Course	Open Source Technologies-Practical	Hours/Week	05
Course Code	APCPIT34	Credits	04
Category	Core-10	Year & Semester	II & III
Prerequisites	Basic understanding of computer programming, PHP,PERL,DJANGO	Regulation	2024

Objectives of the course:

- To learn the efficiency of Open Source Technology and to train to have a good practical knowledge of how to write successful PHP and Ruby code and utilizing a database using PHP.

S.No	List of Exersices	COs	Cognitive Levels
1	To create a PHP program for sum of n numbers using while loop.	CO1 – CO5	K1 – K6
2	To create a PHP program to find the number is Odd or Even using for loop		
3	To create a PHP program to add two matrices using Multidimensional array		
4	To create a PHP program to demonstrate the Date and Time Functions.		
5	To create a PHP program to perform Simple Arithmetic operations using User Defined Functions		
6	To perform Read/Write operation in a file using PHP		
7	To perform create,insert,delete,select and update operations using MYSQL.		
8	To write a program for the Demonstration of Cookies and Session using PHP		
9	To find whether the given number is Odd or Even using RUBY		
10	To perform sorting operations using PERL.		
11	To perform simple arithmetic operations using blocks in PERL.		
12	To find the Fibonacci series using PERL.		

Recommended Text Books

1. Steven Holzner, (2016), "PHP: The CompleteReference", McGraw Hill Education Private Limited, Indian Edition. (Unit I, II)
2. RachnaKapur, Mario Briggs, Tapas Saha, Ulisses Costa,Pedro Carvalho, Raul F. Chong, Peter Kohlmann(2010), "Getting Started with Open Source Development", DB2 on Campus Book Series. (Unit III)
3. http://indexof.es/Ruby/Beginning%20Ruby%20On%20Rails.pdf
4. http://www.cs.uni.edu/~wallingf/teaching/agile-may2010/ruby/programming-ruby.pdf

Reference Books

1. W. Jason Gilmore (2010), "Beginning PHP &MySql",Apress.
2. Joel Murach, Ray Harris (2010), "PHP and MySQL",Shroff Publishers & Distributors
3. Larry Ullman (2008), "PHP 6 and MySQL 5", Pearson Education.
4. John Coggeshall (2006), "PHP 5", Pearson Education.
5. Michale C. Glass (2004), "Beginning PHP, Apache, MySQL Web Development", Wiley DreamTech Press.

Website and e-learning source

1. http://www.w3schools.com/php/
2. http://howtostartprogramming.com/PHP/
3. http://www.massey.ac.nz/~nhreyes/MASSEY/159339/Lectures/Lecture%2011%20-%20PHP%20-%20Part%205%20-%20CookiesSessions.pdf
4. http://www.tutorialspoint.com/mysql/

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Demonstrate the setup and configuration of development environment to write PHP and Ruby Scripts	K1, K2, K3, K4, K5, K6
CO2	Select the appropriate language fundamentals and techniques to write and compile PHP and Ruby programs	K1, K2, K3, K4, K5, K6
CO3	Examine the bugs and analyze how to prevent and remove the bugs	K1, K2, K3, K4, K5, K6
CO4	Test and debug the application with sample inputs to check the correctness and consistency of the scripts	K1, K2, K3, K4, K5, K6
CO5	Create simple programs that make use of various PHP and Ruby features and functions and solve web application and database tasks using PHP	K1, K2, K3, K4, K5, K6

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

COURSE DESCRIPTORS

Title of the Course	Research Methodology	Hours/Week	04
Course Code	APEIT35A	Credits	03
Category	Elective V	Year & Semester	II & III
Prerequisites	Basic critical and writing skills	Regulation	2024

Objectives of the course:

- To impart knowledge and skills required for research problem formulation, analysis, solutions, technical paper writing and drafting and filing patents..

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Research Methodology: Objectives and motivation of research - Types of research - Research approaches - Significance of research - Research methods verses methodology - Research and scientific method - Importance of research methodology - Research process - Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations- Criteria of good research. Defining the research problem: Definition of research problem – Problem formulation - Necessity of defining the problem – Technique involved in defining a problem.	CO1	K1, K2
UNIT-II	Literature Survey and Data Collection: Importance of literature survey - Sources of information - Assessment of quality of journals and articles - Information through internet. Effective literature studies approaches, analysis, plagiarism, and research ethics. Data - Preparing, Exploring, examining and displaying.	CO2	K1, K2, K3
UNIT-III	Research Analysis and Design: Meaning of research design - Need of research design - Different research designs – Basic principles of experimental design - Developing a research plan - Design of experimental set-up - Use of standards and codes. Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation.	CO3	K1, K2, K3, K4
UNIT-IV	Intellectual Property Rights: Nature of Intellectual Property: Patents, Designs, Trade and Copyright- Process of Patenting and Development: technological research, innovation, patenting, development- Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.	CO4	K1, K2, K3, K4

UNIT-V	Patent Rights: Scope of Patent Rights- Licensing and transfer of technology- Patent information and databases- Geographical Indications - New Developments in IPR: Administration of Patent System, IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs -Licenses, Licensing of related patents, patent agents, Registration of patent agents.	CO5	K1, K2, K3, K4

Recommended Text Books

1. R. Ganesan, "Research Methodology for Engineers", MIPPublishers, Chennai, 2011.
2. Catherine J. Holland, "Intellectual property: Patents,Trademarks, Copyrights, Trade Secrets", ntrepreneur Press, 2007.

Reference Books

1. Peter S. Menell ,Mark A. Lemley, Robert P. Merges,"Intellectual Property in the New Technological "Vol. IPerspectives, 2021.
2. Laura R. Ford,"The Intellectual Property of Nations: Sociological and Historical Perspectives on a
3. RatanKhananabis and Suvasis Saha, "Research Methodology", Universities Press, Hyderabad, 2015.
4. David Hunt, Long Nguyen, Matthew Rodgers, "Patent searching: tools & techniques", Wiley, 2007.
5. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners" 2010

Website and e-learning source

1. https://www.coursera.org/courses?query=research%20methodology
2. https://www.researchgate.net/topic/Research-Methodology
3. https://www.wto.org/english/tratop_e/trips_e/intel1_e.htm
4. https://www.isical.ac.in/~palash/research-methodology/RM-lec9.pdf
5. https://mrcet.com/downloads/digital_notes/CSE/Mtech/I%20Year/RESEARCH%20METHODLOGY.pdf

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Understanding of research, IPR and patent fundamentals	K1, K2
CO2	Identify the issues involved in research, IPR and patent filing	K1, K2, K3
CO3	Apply suitable instrumentation and sampling techniques for the research studies and recognize the framework for protecting IPR and process for obtaining patents	K1, K2, K3, K4
CO4	Analyze data, and interpret research findings using appropriate methods and importance of IPR and patent protection in promoting research and development	K1, K2, K3, K4
CO5	Design and develop research reports, research proposals, academic papers and patents	K1, K2, K3, K4

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

COURSE DESCRIPTORS

Title of the Course	**Internet of Things**	**Hours/Week**	**04**
Course Code	**APEIT35B**	**Credits**	**03**
Category	**Elective V**	**Year & Semester**	**II & III**
Prerequisites	**Basic understanding of computer hardware components and networking concepts**	**Regulation**	**2024**

Objectives of the course:

- The primary objective of this course is to impart the knowledge on IoT Architecture, Protocol, various technologies and the application areas relating to IoT implementations.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction to IoT - Introduction to Internet of Things: Introduction- Physical Design of IoT- Logical Design of IoT- IoT Enabling Technologies - IoT Levels & Deployment Template	CO1	K1, K2
UNIT-II	Domain Specific IoT: Introduction-Home Automation-Cities- Environment-Energy-Retail- Logistics-Agriculture-Industry- Health & Lifestyle. IoT and M2M: Introduction - M2M- Difference between IoT and M2M - SDN and NFV for IoT.	CO2	K1, K2, K3
UNIT-III	M2M to IoT- An Architectural Overview: Building an Architecture-Main design principles and needed capabilities-An IoT Architecture Outline-Standard Considerations. M2M and IoT Technology Fundamentals: Devices and Gateways-Local and wide area Networking-Data Management.	CO3	K1, K2, K3
UNIT-IV	IoT Architecture - Architecture Reference Model: Introduction- Reference Model and Architecture- IoT Reference Model: IoT Domain Model-Information Model-Functional Model- Communication Model-Safety, Privacy, Trust, Security Model IoT.	CO4	K1, K2, K3, K4
UNIT-V	Implementation Examples: The Smart Grid-Introduction-Smart Metering-Smart House-Smart energy city. Case Study: Commercial Building automation today and in the future.	CO5	K1, K2, K3, K4

Recommended Text Books

1. ArshdeepBahga, Vijay Madisetti, ―Internet of Things – Ahands-on approach, Universities Press, 2015 (Unit I and II)

2. Jan Holler, VlasiosTsiatsis , Catherine Mulligan, Stamatis ,Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Elsevier, 2014(Unit III, IV and V).

Reference Books

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ―IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017

2. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Key applications and Protocols, Wiley, 2012

3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting the Internet of Things, Springer, 2011.

Website and e-learning source

1. https://www.tutorialspoint.com/internet_of_things/
2. https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/
3. https://www.slideshare.net/khusuma/domain-specific-iot(Unit-II)
4. https://www.slideshare.net/PascalBodin/an-introduction-to-m2m-iot-technologies
5. https://www.smartgrid.gov/the_smart_grid/smart_grid.html

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Outline the fundamental concepts and Terminologies of IoT	K1, K2
CO2	Determine the IoT enabling technologies, M2M and IoT, fundamentals and technological challenges faced by IoT in terms of Safety, privacy and trust	K1, K2, K3
CO3	Identify the different levels, models and standards of IoT and application areas in domain specific IoT	K1, K2, K3
CO4	Analyze the physical design, logical design, architecture Overview of M2M and IoT and reference models of IoT Architecture	K1, K2, K3, K4
CO5	Assess the application areas and illustrate the implementation of IoT	K1, K2, K3, K4

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

COURSE DESCRIPTORS

Title of the Course	Trends in computing	Hours/Week	04
Course Code	APEIT35C	Credits	03
Category	Elective V	Year & Semester	II & III
Prerequisites	Basic critical and writing skills	Regulation	2024

Objectives of the course:

- To understand the concepts and infrastructure of cloud computing and its business applications. To understand the scope, design and model of grid computing. Knowledge about the reduction of energy use, waste, and other environmental impacts of Information Technology systems.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Cloud Computing: Basics: Overview – Applications – Intranets and the Cloud – First Movers in the Cloud – Organization and Cloud Computing: Benefits – Limitations – Security Concerns- The Business Case for Going to the Cloud: Cloud Computing Services - Deleting Datacenter.	CO1	K1, K2, K3
UNIT-II	Hardware and Infrastructure: Clients – Security – Network – Services- Accessing the Cloud: Platforms - Cloud Storage: Overview – Cloud Storage Providers. Developing Applications: Google – Microsoft - Local Cloud and Thin Clients: Virtualization – Server Solutions – Thin Clients – Migrating to the Cloud.	CO2	K1, K2, K3
UNIT-III	Quantum Computing: Quantization of single mode field, quantization of multimode f ields, eigen states, annihilation and creation operators, wave packets and time evolution, general idea of squeezed states	CO3	K1, K2, K3,K4
UNIT-IV	Grid Computing: Introduction - Benefits – Grid Terms and Concepts: Types of Resources – Jobs and Applications – Scheduling, Reservation and Scavenging – Grid Software Components – Grid user role: User Perspective – Administrator Perspective - Design: Building grid architecture - Models – Topologies – Phases and Activities.	CO4	K1, K2, K3,K4
UNIT-V	Green Computing: Introduction - History of Green Computing - Regulations and Industry Initiative - The Demons behind Green Computing - Approaches to Green Computing - Role of IT vendors - Green Computing Tips - Future is Green.	CO5	K1, K2, K3,K4

Recommended Text Books

1.Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, "Cloud Computing - A practical Approach" McGraw Hill, 2010.

2. Bart Jacob, Michael Brown, Kentaro Fukui, and NiharTrivedi, "Introduction to Grid Computing" ,IBM Redbook, 2005.

Reference Books

1. George Reese, "Cloud Application Architectures: Building Applications and Infrastructures in the cloud", O"Reilly Media Inc., 2009.

2. Halper Fern, Kaufman Marcia, Bloor Robin, Hurwit Judith, "Cloud Computing for Dummies ", Wiley India Pvt Ltd ,2009.

3. J. Velete, Anthony T. Velete, Robert Elsenpeter, "Green IT –Reduce Your Information System"s Environmental Impact While Adding to the Bottom Line", McGraw-Hill ,2008.

4. Bud E. Smith ," Green Computing: Tools and Techniques for Saving Energy, Money, and Resources", Auerbach Publications , 2013.

Website and e-learning source

1. http://www.siteground.com/tutorials/cloud/cloud_computing_infrastructure.html
2. http://thecloudtutorial.com/
3. http://studymafia.org/wp-content/uploads/2015/11/CSE-Green-Computing-Report.pdf
4. http://www.znu.ac.ir/data/members/dastjerdi_mohammad/Book11.pdf
5. http://www.cs.kent.edu/~farrell/grid06/lectures/grid01.pdf

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Outline the history, applications, benefits and limitations of Cloud, Grid and Green computing	K1, K2, K3
CO2	Describe the cloud infrastructure services, virtualization and determine how applications can be developed using cloud services	K1, K2, K3
CO3	To understand the basic language, apparatus and methods of quantum mechanics.	K1, K2, K3,K4
CO4	Analyse the migrations and security concerns of cloud, different grid models, resources and also identify how the distributed computing environments can be built from lower level services	K1, K2, K3,K4
CO5	Assess the business cases of cloud, and also various laws, approaches and protocols for regulating green IT	K1, K2, K3,K4

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

COURSE DESCRIPTORS

Title of the Course	**E-Commerce**	**Hours/Week**	**04**
Course Code	**APEIT35D**	**Credits**	**03**
Category	**Elective V**	**Year & Semester**	**II & III**
Prerequisites	**Well defined business plan, effective marketing Strategy and strong focus on customer services and logistics.**	**Regulation**	**2024**

Objectives of the course:

- This course provides an introduction to information systems for business and management. It is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction: Infrastructure for Electronic Commerce Networks Packet Switched Networks - TCP/IP Internet protocol - Domain name Services - Web Service Protocols - Internet applications - Utility programs -Markup Languages - Web Clients and Servers - Intranets and Extranets - Virtual private Network.	CO1	K1, K2, K3
UNIT-II	Core Technology: Electronic Commerce Models Shopping Cart Technology Data Mining - Intelligent Agents - Internet Marketing XML and E-Commerce	CO2	K1, K2, K3
UNIT-III	Inter/Intra Organizations Electronic Commerce: EDI EDI application in business legal, Security and Privacy issues - EDI and Electronic commerce Standards Internal Information Systems - Macro forces - Internal commerce Workflow Automation and Coordination Customization and Internal commerce-Supply chain Management.	CO3	K1, K2, K3
UNIT-IV	Security: Threats to Network Security Public Key Cryptography Secured Sockets Layer - Secure Electronic Transaction - Network Security Solutions - Firewalls.	CO4	K1, K2, K3, K4
UNIT-V	Electronic Payment Systems: Real world Payment Systems - Electronic Funds Transfer Digital Payment -Internet Payment Systems - Micro Payments - Credit Card Transactions –E-commerce Deployment in Industry Case Studies.	CO5	K1, K2, K3

Recommended Text Books

1. Ravi Kalakota and Andrew B Whinston, Frontiers of Electronic commerce, Addison Wesley, 1996

Reference Books

1. Baskar - E-Commerce Framework Technologies and Applications 2nd Edition, 2006, TMH, New Delhi.
2. Pete Loshin, Paul A Murphy, Electronic Commerce, 2nd Edition, Jaico Publishers 1996.
3. David Whiteley, e-Commerce: Strategy, Technologies and Applications, McGraw Hill, 2000.

Website and e-learning source

1. http://notes4learners.blogspot.com
2. https://www.academia.edu/8099032/e_commerce_notes
3. https://examupdates.in/e-commerce-full-notes/
4. https://www.javatpoint.com/html-tutorial
5. http://www.echoecho.com/html.html

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

COs	CO Description	Cognitive Level
CO1	Analyze the impact of E-commerce on business models and strategy.	K1, K2, K3
CO2	Describe the major types of E-commerce.	K1, K2, K3
CO3	Explain the process that should be followed in building an E-commerce presence.	K1, K2, K3
CO4	Identify the key security threats in the E-commerce environment.	K1, K2, K3, K4
CO5	Describe how procurement and supply chains relate to B2B E-commerce.	K1, K2, K3

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

COURSE DESCRIPTORS

Title of the Course	ASP. Net with C# Programming	**Total Hours**	06
Course Code	APCIT41	**Credits**	05
Category	Core-11	**Year & Semester**	II & IV
Prerequisites	Basic understanding on object oriented programming with IDEs	**Regulation**	2024

Objectives of the course:

- To understand the basics structure of C# programming and the components of Active Server Pages which provide sufficient knowledge to work with SQL Server using Microsoft ADO.NET

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**The C# Language:** Basics- Variables and Data Types – Variable Operations - Object Based Manipulation - Conditional logic - Loops - Methods - Types, Objects and Namespaces- Delegates.	CO1	K1, K2, K3
UNIT-II	**ASP.NET 4.5 Essentials**: Introduction to ASP.NET : Benefits of ASP.NET Framework - Overview of ASP.NET Framework 4.5 - Introduction to visual studio 2012 IDE - ASP.NET 4.5 Overview - Developing a Web Application - File Types in ASP.NET 4.5- Exploring ASP.NET web pages - Understanding ASP.NET 4.5 Directives- Application File - Using states: Application State - Session State -View State – Cookies - Postback and Cross - page posting.	CO2	K1, K2, K3
UNIT-III	**Web Forms**: Standard controls: Label control-Button Control- TextBox Control-Literal Control- PlaceHolder Control- HiddenField Control - Navigation controls: TreeView, Menu and SiteMapPath - Validation controls -Rich controls: Calendar Controls- AdRotator control.	CO3	K4
UNIT-IV	**LINQ Queries** : Standard Query operators: Filtering operators- Projection operators-Sorting operators-Grouping operators-set operators-Aggregate operators -Lambda Expressions – Working with Login controls: Login control- Password Recovery control - Create User Wizard control-Change Password control – Event Methods - Exception Handling.	CO4	K4, K5
UNIT-V	**ADO.NET Fundamentals**: Configuring your Database - ADO.NET Basics- Direct Data Access - Disconnected Data Access -Data Binding : Data Binding with ADO.NET- Data Source Controls - The Data Controls : The GridView - Formatting the GridView - Selecting a GridView Row- Editing, Sorting and Paging the GridView- Crystal Report – Case Studies: E-Commerce Web Site Development-Inventory Management System- Library Management System	CO5	K4, K5

Recommended Text Books

1. Kogent (2013), ASP.NET 4.5 Black Book – DreamtechPress,New Delhi (Unit 2,3,4)
2. Matthew MacDonald (2010), Beginning ASP.NET 4 in C#, Apress.(Unit 1,5)

Reference Books

1.Greg Buczek(2002), ASP.NET Developer‟s guide, Tata McGraw Hill Publications.
2.Jesse Liberty, (2002), Programming C#, 3.0, O‟Reilly Press.
3.J.Sharp, (2009), Microsoft Visual C# 2008 Step by Step, PHI Learning Private Ltd.
4.Christian Nagel et al., (2007), Professional C# 2005 with .NET 3.0, Wiley India.
5.Herbert Schildt,(2010), C# 4.0 The Complete Reference, Tata McGraw Hill Publications

Website and e-learning source

1. www.homeandlearn.co.uk/csharp/csharp.html
2. http://msdn.microsoft.com/en-us/library//aa645596.aspx
3. http://www.csharpkey.com/csharp/
4. http://www.w3schools.com/aspnet/default.asp
5. http://www.maconstateit.net/tutorials/ASPNET20/default.htm
6. http://csharp-station.com/Tutorial/AdoDotNet/Lesson01 (Unit V: ADO.NET Fundamentals)
7. http://www.c-sharpcorner.com/UploadFile/009464/usecrystal-report-in-Asp-Net-using-C-Sharp/

Course Learning Outcomes (for Mapping with POs and PSOs)
On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Outline the features of C# and ASP.NET concepts to understand the real time applications	K1, K2, K3
CO2	Identify the salient properties of C# programming concepts and ASP .NET Application	K1, K2, K3
CO3	List the various stages involved in creating a web form	K4
CO4	Select the appropriate web controls to develop the web forms	K4, K5
CO5	Construct a database driven web applications with the facilitated web services.	K4, K5

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

COURSE DESCRIPTORS

Title of the Course	ASP.NET with C# Programming-Practical	**Total Hours**	06
Course Code	APCPIT42	**Credits**	05
Category	Core-12	**Year & Semester**	II & IV
Prerequisites	Basic understanding on the concept like C, C++, C#, ASP	**Regulation**	2024

Objectives of the course:

- To understand the basics structure of C# programming and the components of Active Server Pages which provide sufficient knowledge to work with SQL Server using Microsoft ADO.NET

Program	Contents	COs	Cognitive Levels
1	Write the basic Programs for C#.	CO1 – CO5	K1 – K6
2	Write a program using ASP.NET with C# Delegates.		
3	Write a program for Lambda Expressions in ASP.NET with C#.		
4	Write a program using LINQ (Language Integrated Query)		
5	Write a program for Web Sever Controls Using in ASP.NET with C#.		
6	Write a program using AdRotator, Calendar Controls in ASP.NET with C#.		
7	Write a program using Validation controls.		
8	Write a program using ASP.NET with C# Menu Control.		
9	Write a program with Cookies, View State Management, Session in ASP.NET With C#.		
10	Develop Database Applications using Data Grid in ASP.NET with C#		
11	Create a Crystal Report program in ASP.NET with C#.		
12	Develop Database Applications using AI & ML in ASP.NET with C#		

Recommended Text Books

1. Kogent (2013), ASP.NET 4.5 Black Book –DreamtechPress,New Delhi

Reference Books

1. Herbert Schildt,(2010), C# 4.0 The Complete Reference, Tata McGraw Hill Publications.

Website and e-learning source

http://www.csharpkey.com/csharp/
http://www.w3schools.com/aspnet/default.asp

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Demonstrate simple programs using C# programming concepts such as classes, objects, method overloading	K1 – K6
CO2	Solve complex programs using delegates, Lambda expression and LINQ	
CO3	Analyze the usage of web server controls, calendar controls, validation controls and menu controls in asp.net application	
CO4	Evaluate the role of Cookies, View state and Session state in creating an web Application	
CO5	Design a data driven web application by connecting to the data sources	

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

COURSE DESCRIPTORS

Title of the Course	Project with viva voce-Industry related project and carried out in the industry	**Total Hours**	10
Course Code	APCPIT43	**Credits**	07
Category	Core-13	**Year & Semester**	II & IV
Prerequisites	Current tools and Programming knowledge	**Regulation**	2024

COURSE DESCRIPTORS

Title of the Course	Intelligent Systems	**Total Hours**	04
Course Code	APEIT44A	**Credits**	03
Category	Elective VI	**Year & Semester**	II & IV
Prerequisites	Basic knowledge of data mining concepts	**Regulation**	2024

Objectives of the course:

To acquire knowledge on various intelligent system techniques and methodologies and to have enriched knowledge on Knowledge representation, problem solving, and learning methods in solving particular engineering problems.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Artificial Intelligence:** AI problems - AI Search Techniques - **Problem Search:**-Production Systems – Problem Characteristics – Production system characteristics- **Heuristic Search techniques**: Generate and Test – Hill Climbing – Constraint Satisfaction, Means-end analysis**.**	CO1	K1, K2, K3
UNIT-II	**Knowledge representation issues:** Representations and mappings – Approaches to Knowledge representations –- Frame problem –. **Using Predicate Logic:** Representing simple facts in logic - Representing Instance and ISA relationships – Computable functions and predicates – Resolution.	CO2	K1, K2, K3
UNIT-III	**Representing knowledge using rules**: Procedural Vs Declarative knowledge – Logic programming – Forward Vs Backward reasoning – Matching – Control knowledge. **Knowledge representation summary**: Syntactic and Semantic spectrum of representation-Logic and slot – and filler structures-Other representational techniques.	CO3	K3, K4
UNIT-IV	**Rule-based expert systems**: Introduction- Rules as a knowledge representation technique- players- Structure- Forward chaining and backward chaining inference techniques. **Fuzzy expert systems**: Introduction- Fuzzy sets- Linguistic variables and hedges- Operations – Fuzzy rules - Building a fuzzy expert system – AI Tools: Introduction .	CO4	K3, K4
UNIT-V	**Artificial neural networks**: Neuron- perception- Multilayer neural networks- - The Hopfield network **Robotics**: Introduction-Robot hardware-Perception- Moving-Robotic software architecture – Case Studies: Robotics using AI & ML Tools.	CO5	K3, K4

Recommended Text Books

1. Elaine rich and Kelvin Knight, "Artificial Intelligence ", Tata McGraw hill Publication, 3ndEdition, 2009. [Unit -I,II,III], Unit I : Chapters 1, 2, 3, Unit II : Chapters 4, 5, Unit III : Chapters 6, 11
2. Artificial Intelligence: A Guide to Intelligent Systems, 3rd edition, Michael Negnevitsky, Addison Wesley, 2011.[Unit IV-Chapter 1,2,4,V-Chapter 6]
3. Artificial Intelligence a modern Approach "– Stuart Russell & Peter Norvig, 3rd Edition Pearson Education [Unit V-Chapter 25-Robotics]

Reference Books

1. "Artificial Intelligence a modern Approach "– Stuart Russell & Peter Norvig, 3rd Edition, Pearson Education.
2. "Artificial Intelligence ", George F Luger , 4thEdition , Pearsons Education Publ, 2002.
3. "Foundations of Artificial Intelligent And Expert Systems", V S Janaki Raman, K Sarukesi, P Gopalakrishnan, Macmillan India Limited.

Website and e-learning source

1. https://www.techopedia.com/definition/190/artificialintelligence-ai
2. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligent_systems.htmL
3. https://data-flair.training/blogs/heuristic-search-ai/
4. http://teaching.csse.uwa.edu.au/units/CITS7212/Lectures/Students/Fuzzy.pdf
5. http://engineering.nyu.edu/mechatronics/smart/pdf/Intro2Robotics.pdf

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Outline the applicability, strength and weakness of artificial intelligence in solving computational problems	K1, K2, K3
CO2	Demonstrate the role of knowledge representation, problem solving and learning in Intelligent-system engineering	K1, K2, K3
CO3	Identify the characteristics of AI, Knowledge representation, Experts systems and its variants with ANN and robotics.	K3, K4
CO4	Analyze a comprehensive background in both software and hardware to work with the future of robotics and adaptive systems	K3, K4
CO5	Assess the scientific background through various real time examples	K3, K4

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

COURSE DESCRIPTORS

Title of the Course	Introduction to Robotics	**Total Hours**	04
Course Code	APEIT44B	**Credits**	03
Category	Elective VI	**Year & Semester**	II & IV
Prerequisites	Understanding of basic physics	**Regulation**	2024

Objectives of the course:

To introduce students to fundamental components, functionality of Robotic systems and to provide knowledge in the design and development challenges in the field of robotics.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Introduction**-Definition of Automation-Mechanization Vs Automation - Advantages-Goals-Social Issues-Types-Current Emphasis in Automation-Issues in automation in Factory Operations-Strategies of Automation.	CO1	K1, K2
UNIT-II	**Introduction** - History of Robots - Definition – NLP - Laws of Robotics – Characteristics – Components - Comparison of the Human and the Robot Manipulator - Robot Wrist and End of Arm Tools-Robot Terminology - Robotic Joints - Classification-Selection - Workcell - Robotics and Machine Vision - Applications	CO2	K1, K3, K4
UNIT-III	**Robot Components**: **Sensors**: Exteroceptors Sensors –Tactile Sensors -Proximity Sensors-Range Sensors-Machine Vision Sensors-Velocity Sensors-Proprioceptors-Robots with sensors-**End Effectors**: Grippers-selection of grippers-Gripping mechanism- tools-Types of Grippers- **Drives**: Pneumatic, Hydraulic, Electric Actuators	CO3	K1, K4
UNIT-IV	**Transformations**: Introduction to Manipulator Kinematics - Homogeneous Transformations - Robot Kinematics-Manipulator Path Control-Robot Dynamics- **Robot Programming Techniques**: Online programming- Lead - through Programming - Offline Programming-Task Level Programming-Motion Programming-Robot Programming Languages-Robot languages and its types	CO4	K1, K4, K5
UNIT-V	**Applications of Robots**: Robot Capabilities-Application of Robots-Manufacturing Applications-Material handling applications **Robotics and Artificial Intelligence:** Vision-Voice communication –Planning –Modeling -Adaptive control -Error monitoring and recovery-Autonomy and intelligence in robots-Expert systems in robotics.	CO5	K4, K5

Recommended Text Books

1. Gupta.A.K, Arora. S. K., Industrial Automation and Robotics, Mercury Learning and Information, 2017(Unit I,II,III,IV,V)
2. Mikell P Groover, "Industrial Robotics", Mc GrawHill, 2012.(Unit III: Drives :Fundamentals of Robot technology - Robot Drive systems, Unit IV: Transformations)
3. D.J.Todd, "Fundamentals of Robot Technology", An Introduction to Industrial Robots, Teleoperators and Robot Vehicles, Wiley,1986.(Unit V:Robotics and Artificial Intelligence)

Reference Books

1. Thomas. K. Rufuss, "Robotics and Automation Handbook",CRC Press, 2018
2. Ghoyal.K., Deepak Bhandari, "Automation and Robotics", S.K.Kataria& Sons Publishers, 2012.
3. John.J. Craig, "Introduction to Robotics: Mechanics and Control", Pearson, 2018.
4. Gonzalez, Fu Lee, Robotics: Control, Sensing, Vision and Intelligence, Wiley, 1998

Website and e-learning source

1. https://builtin.com/robotics
2. https://www.elprocus.com/robot-sensor/
3. https://sp-automation.co.uk/the-top-seven-types-ofrobots/
4. https://robots.ieee.org/learn/types-of-robots/
5. https://www.intel.in/content/www/in/en/robotics/typesand-applications

Course Learning Outcomes (for Mapping with POs and PSOs)
On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Outline the anatomy, specifications and applicability of Robotic system	K1, K2
CO2	Demonstrate the role of kinematics and dynamic behavior of robots with programming techniques	K1, K3, K4
CO3	Identify the characteristics and functionality of robots in various sectors.	K1, K4
CO4	Analyze the various functionality of robotic systems with respect to software and hardware components	K1, K4, K5
CO5	Assess the scientific background of robotic systems through various real time examples	K4, K5

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

COURSE DESCRIPTORS

Title of the Course	Virtual and Augmented Reality	**Total Hours**	04
Course Code	APEIT44C	**Credits**	03
Category	Elective VI	**Year & Semester**	II & IV
Prerequisites	Basic knowledge of computer graphics	**Regulation**	2024

Objectives of the course:

To provide knowledge on basic principles of virtual & augmented reality and have the ability to use its technology as a platform for real-world applications.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Virtual Reality**: The Three I's of VR – History – Early commercial VR Technology – Components of a VR System – **Input Devices:** Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces**.**	CO1	K1, K2
UNIT-II	**Output Devices:** Graphics Displays – Sound Displays – Haptic Feedback - **Computer Architecture for VR:** The Rendering Pipeline- PC Graphics Architecture - **VR Programming:** Toolkits and Scene Graphs – Traditional and Emerging Applications of VR.	CO2	K1, K2
UNIT-III	**Augmented Reality**: Introduction – **Augmented Reality concepts:** Working Principle of AR –Concepts related to AR- Ingredients of an Augmented Reality Experience.	CO3	K3
UNIT-IV	Augmented Reality Hardware– Augmented Reality Software– Software to create content for AR Application – AR & VR Tools and Technologies.	CO4	K3, K4
UNIT-V	**Augmented Reality Content:** Introduction- Creating Content for Visual, Audio, and other senses – Interaction in AR – **Mobile Augmented Reality:** Introduction – Augmented Reality Applications Areas - Collaborative Augmented Reality	CO5	K4, K5

Recommended Text Books

1. Grigore C. Burdea and Philippe Coiffet, "Virtual Reality Technology", Wiley Student Edition , Second Edition (Unit I: Chapter 1,2 & Unit II: Chapter 3,4,6,8 & 9)
2. Alan B. Craig(2013), "Understanding Augmented Reality: Concepts and Applications"(Unit III: Chapter 1, 2, Unit IV : Chapter 3, 4 & Unit V: Chapter 5,6,8)
3. Jon Peddie (2017), "Augmented Reality: Where We Will All Live", Springer, Ist Edition (Unit IV: Chapter 7 (Tools & Technologies)

Reference Books

1. Alan Craig & William R. Sherman & Jeffrey D. Will, MorganKaufmann(2009), "Developing Virtual Reality Applications: Foundations of Effective Design", Elsevier(Morgan Kaufmann Publishers)
2. Paul Mealy (2018), "Virtual and Augmented Reality",Wiley
3. Bruno Arnaldi & Pascal Guitton & Guillaume Moreau(2018),"Virtual Reality and Augmented Reality: Myths and Realities", Wiley

Website and e-learning source

1. Manivannan, M., (2018), "Virtual Reality Engineering," IIT Madras, https://nptel.ac.in/courses/121106013
2. Dube, A., (2020), "Augmented Reality - Fundamentals and Development," NPTEL Special Lecture Series, https://www.youtube.com/watch?v=MGuSTAqlZ9Q
3. http://msl.cs.uiuc.edu/vr/
4. http://www.britannica.com/technology/virtual reality/Livingin-virtual-worlds
5. https://mobidev.biz/blog/augmented-reality-developmentguide

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Outline the basic terminologies, techniques and applications of VR and AR	K1, K2
CO2	Describe different architectures and principles of VR and AR systems	K1, K2
CO3	Use suitable hardware and software technologies for different varieties of virtual and augmented reality applications	K3
CO4	Analyze and explain the behavior of VR and AR technology relates to human perception and cognition	K3, K4
CO5	Assess the importance of VR/AR content and interactions to implement for the real-world problem	K4, K5

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

COURSE DESCRIPTORS

Title of the Course	Big Data Analytics	**Total Hours**	04
Course Code	APEIT44D	**Credits**	03
Category	Elective VI	**Year & Semester**	II & IV
Prerequisites	Understand the Big Data Platform and its Use cases.	**Regulation**	2024

Objectives of the course:

To understand big data. To learn and use NoSQL big data management. To learn mapreduce analytics using Hadoop and related tools. To work with map reduce applications. To understand the usage of Hadoop related tools for Big Data Analytics

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**ESSENTIALS OF BIG DATA AND ANALYTICS**: Data, Characteristics of data and Types of digital data, Sources of data, Working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data; Overview of business intelligence, Data science and Analytics, Meaning and Characteristics of big data analytics, Need of big data analytics, Classification of analytics, Challenges to big data analytics, Importance of big data analytics, Basic terminologies in big data environment.	CO1	K1, K2, K3
UNIT-II	**HADOOP** : Introducing Hadoop, Need of Hadoop, limitations of RDBMS, RDBMS versus Hadoop, Distributed computing challenges, History of Hadoop , Hadoop overview, Use case of Hadoop, Hadoop distributors, HDFS (Hadoop Distributed File System) , Processing data with Hadoop, Managing resources and applications with Hadoop YARN (Yet another Resource Negotiator), Interacting with Hadoop Ecosystem.	CO2	K2, K3
UNIT-III	**MAPREDUCE PROGRAMMING**: Introduction , Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression, Real time applications using MapReduce, Data serialization and Working with common serialization formats, Big data serialization formats.	CO3	K3
UNIT-IV	**HIVE**: Introduction to Hive, Hive architecture, Hive data types, Hive file format, Hive Query Language (HQL), User-Defined Function (UDF) in Hive	CO4	K3, K4
UNIT-V	**PIG**: The anatomy of Pig , Pig on Hadoop, Pig Philosophy, Use case for Pig; ETL Processing , Pig Latin overview , Data types in Pig , Running Pig , Execution modes of Pig, HDFS commands, Relational operators, Piggy Bank , Word count example using Pig.	CO5	K3

Recommended Text Books

1.Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
2. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
3.Vignesh Prajapati, Big data analytics with R and Hadoop, SPD 2013.
4.E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
5.Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
6.Alan Gates, "Programming Pig", O'Reilley, 2011.

Reference Books

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", 1st Edition, Wrox, 2013. 2. Chris Eaton, Dirk Deroos et. al., "Understanding Big data", Indian Edition, McGraw Hill, 2015.
3. Tom White, "HADOOP: The definitive Guide", 3rd Edition, O Reilly, 2012.
4. Vignesh Prajapati, "Big Data Analytics with R and Hadoop", 1st Edition, Packet Publishing Limited, 2013.

Website and e-learning source

1. https://www.bmc.com/blogs/big-data-vs-analytics/
2. https://www.thoughtspot.com/data-trends/analytics/big-data-analytics
3. https://www.sas.com/en_in/insights/analytics/big-data-analytics.html
4. https://www.happiestminds.com/insights/big-data-hadoop/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Describe big data and use cases from selected business domains.	K1, K2, K3
CO2	Explain NoSQL big data management.	K2, K3
CO3	Install, configure, and run Hadoop and HDFS.	K3
CO4	Perform map-reduce analytics using Hadoop.	K3, K4
CO5	Use Hadoop-related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.	K3

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