C24-CURRICULUM
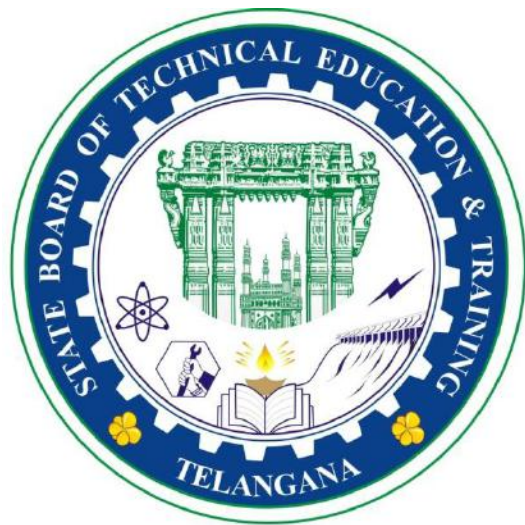
DIPLOMA IN
COMPUTER SCIENCE & ENGINEERING

Offered By

STATE BOARD OF

TECHNICAL EDUCATION AND TRAINING TELANGANA HYDERABAD

TEACHING AND EXAMINATION SCHEME

V Semester

| Sl No | Course Code | Course Name | Teaching Scheme | | | | Credits | Examination Scheme | | | | | | |
| | | | Instruction periods per week | | | Total Periods per semester | | Continuous internal evaluation | | | Semester end examination | | | |
			L	T	P			Mid Sem1	Mid Sem2	Internal evaluation	Max Marks	Min Marks	Total Marks	Min marks for Passing including internal
1	EC-501	Entrepreneurship & Startups	4	1	0	75	2.5	20	20	20	40	14	100	35
2	CS-502	.Net Programming Through C#	4	1	0	75	2.5	20	20	20	40	14	100	35
3	CS-503	Mobile Application Development	4	1	0	75	2.5	20	20	20	40	14	100	35
4	CS-504	Software Engineering	4	1	0	75	2.5	20	20	20	40	14	100	35
5	CS-505A	Internet of Things (IoT)	4	1	0	75	2.5	20	20	20	40	14	100	35
	CS-505B	Cloud Computing & Big Data												
6	CS-506A	Artificial Intelligence	4	1	0	75	2.5	20	20	20	40	14	100	35
	CS-506B	Machine Learning												
7	CS-507	.Net Programming Through C# Lab	1	0	2	45	1.25	20	20	20	40	20	100	50
8	CS-508	Mobile Application Development Lab	1	0	2	45	1.25	20	20	20	40	20	100	50
9	CS-509	Web Programming using PHP Lab	1	0	2	45	1.25	20	20	20	40	20	100	50
10	CS-510	Project Work	1	0	2	45	1.25	20	20	20	40	20	100	50
			28	6	8	630	20	200	200	200	400	164	1000	410

EC-501 – ENTREPRENEURSHIP AND STARTUPS

Course Title	Entrepreneurship And Startups	Course Code	EC-501
SEMESTER	**V SEMESTER**	Course Group	**Core**
Teaching Scheme in periods (L : T : P)	**4:1: 0**	Credits	**2.5**
Methodology	**Lecture + Tutorial**	Total Contact Periods	**75**
CIE	**60 Marks**	SEE	**40 Marks**

Pre requisites

Knowledge of Basic finance and business knowledge

Course Outcomes

On successful completion of the course, the students will be able to

Course Outcomes	
CO1	Comprehend different management practices like Leadership and Ownership, resource Institutes
CO2	Identify the dynamic role of entrepreneurship and Startups in India and Telangana State by Acquiring Entrepreneurial spirit and resourcefulness, quality, competency, and motivation
CO3	Identify Business Ideas and Develop plans to implement
CO4	Comprehend basic concepts of financial management and their application
CO5	Identify and Assess the effectiveness and suitability of various support agencies and incubators in India and Telangana State
CO6	Build Project Proposal and Understand CSR, Ethics, Ex-Im and Exit strategies

UNIT- 1 Management Practices   **Duration: 12 Periods (L: 9 – T:3)**

Explain the concept and differences between Industry - Commerce and Business - Describe various types of ownerships in the Organization - Explain different types of leadership models - Analyze the nature and importance of various functions of management.

UNIT-2 Introduction to Entrepreneurship and Start – Ups   Duration: 13 Periods (L: 10 – T:3)

Define Entrepreneurship- Discuss characteristics and functions of Entrepreneurship- Identify different types of Entrepreneurships-Compare the concepts of entrepreneur and intrapreneur and find out the motivation behind it -Distinguish between Entrepreneur and Managers - Identify 7-M Resources - Know MSME & Startup India –Startup Telangana, Start up Scheme- types, Importance, Features, Eligibility for Startup registration, Benefits

UNIT- 3 Business Ideas and their implementation   **Duration: 13 Periods (L: 10 – T:3)**

Finding Ideas and making an activity map - Develop the plans for creating and starting the business - Identify business using the ideation canvas and the business model canvas- Discuss market research related terms- Outline market mix related terms - Define Product related terminologies - Emphasize on Innovation - Explain concept of Risk and SWOT.

UNIT-4 Finance Management   **Duration: 12 Periods (L: 10 – T:2)**

Introduction – Objectives of Financial Management – Types of capitals – sources of raising capital – Start-ups funding types-venture capital funding-crowd funding-series funding- Types of budgets – production budgets – labour budgets – Concept of Profit and loss Account – Concept of balance sheet – proforma – types of taxes – brief concepts of – Excise Tax, Service Tax, Income Tax, GST and custom duty.

UNIT-5 Support Agencies and Incubators   **Duration: 13 Periods (L: 10 – T:3)**

State level and National level sources of information- various central Government institutions and their functions (like NSIC,SIDO,SISI and SSIB)- Telangana State industry policy-Demographic merits of Telangana state to set up SSIs-Names of state level institutions and their functions(Like SSIDC,DIC,APIITCO)-Banks that support SSIs like SIDBI,APSFC-Thrust areas and core sector as per Telangana state industry policy-Classification of the projects as per TSIP-Special assistance schemes for women and SC/ST entrepreneurs Features of TS-IPASS. Legal Issues – Contracts- Copyrights – Insurance- IPR- Licensing- Patents- Trade Secrets- Trademarks.

UNIT-6 - Project Proposal & Exit Strategy   **Duration: 12 Periods (L: 10 – T:2)**

To work on the development of a project proposal - Describe social responsibility and relate with economic Performance. - Explain managerial ethics - To know Ex-Im Policies - Identify suitable strategies of succession and harvesting

Reference Books

S. No	Title of Book	Author	Publication with place, Year and ISBN
1	Entrepreneurship in Action	Coulter	PHI2ndEdition
2	Entrepreneurship Development	E.Gordon &K. Natarajan	Himalaya
3	Entrepreneurship	Robert D. Hisrich& Mathew J. Manimala	McGraw Hill Education; ISBN978-1259001635
4	Entrepreneurial Development	SS Khanka	S Chand & Company;ISBN:978-8121918015
5	Entrepreneurship Development and Management	A. K. Singh	Jain Book Agency(JBA) publishes, NewDelhi
6	The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf	K&S Ranch ISBN– 978-0984999392
7	The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses	EricRies	Penguin UK ISBN– 978-0670921607
8	Entrepreneurship	Roy Rajeev	Oxford University Press; ISBN:978-0198072638
9	Industrial Engineering and Management	O.P.Khanna	Dhanpat Rai and Sons, Delhi
10	Industrial Organization and Management	Tara Chand	Nem Chand and Brothers; Roorkee
11	Industrial Management and Entrepreneurship	V.K. Sharma.	Scientific Publishers, New Delhi
12	Entrepreneurship Development and Small Business Enterprise	Poornima M Charantimath	Pearson Education;ISBN:978-8131759196
13	Entrepreneurship Development	S Anil kumar	NEWAGEIntern.Pvt Ltd;ISBN:978-8122414349

Sr. No.	Topic Key Word	Link
1	MoCI	https://www.india.gov.in/website-ministry-commerce-and-industry
2	MSME	1)https://msme.gov.in/ 2) https://www.msmex.in/learn/government-schemes-for-startups-and-msmes-in-india/
3	Start-up, Stand-up India &start-up Telangana	1) https://www.startupindia.gov.in/ 2) https://www.standupmitra.in 3) https://udyamimitra.in/page/standup-india-loans 4) https://www.ssipgujarat.in/
4	Make in India	https://www.makeinindia.com/
5	Atmanirbhar Bharat Abhiyan Vocal for Local	https://indiancc.mygov.in›uploads›2021/08
6	Skill India	https://skillindia.gov.in
7	Start-ups telangana	https://startup.telangana.gov.in/government-policies/
8	MSDE	https://www.msde.gov.in/

Suggested Learning Outcomes

Upon completion of the course the student shall be able to

CO-1:- Select suitable Management practices like leadership and Ownership, resource institutes :-

1.1 Differentiate industry, Commerce and business,

1.2 Demonstrate various types of ownerships in the organization,

1.3 Illustrate different types of leadership models,

1.4 List various functions of management

1.5 Explain the nature and importance of various functions of management.

1.6 State the need for Planning in management

1.7 Explain Staffing- Recruitment and management of talent.

1.8 List merits and Demerits of various functions of management.

1.9 Differences between Management and Administration

CO-2 :- Identify the dynamic role of entrepreneurship and Startups in India and Telangana State by Acquiring Entrepreneurial spirit and resourcefulness, quality, competency, and motivation:-

    2.1   Define Entrepreneurship

    2.2   Explore characteristics and functions of entrepreneurship

    2.3   Identify different types of Entrepreneurships

    2.4 Compare the concepts of entrepreneur and intrapreneur and find out the motivation behind it

    2.5   Distinguish between entrepreneur and managers

    2.6   Identify 7-M Resources

    2.7   Understand MSME & Start-up India

    2.8   Identify Start-up schemes in Telangana

    2.9   Interpret the importance of Start up Schemes

    2.10 List the important features of Start-up schemes in Telangana State

    2.11 Determine the Eligibility for start-up registration and understand the process

    2.12 Explore the Benefits of Start-up registration

CO-3:- Identify Business Ideas and Develop plans to implement:-

    3.1   List the steps in new business idea generation.

    3.2   List the major steps involved in idea generation

    3.3   Define brain storming, divergent thinking, creative Problem- solving.

    3.4   Illustrate SCAMPER Technique.

    3.5   List various steps involved in product Identification

    3.6   Explain various phases of creating and starting the business

    3.7   Explain marketing plan

    3.8   List key components of Financial Plan.

    3.9   List various Sources of Capital

    3.10 Identify Business opportunity and evaluation.

    3.11 Define market research related terms- Questionnaire design ,Sampling ,Market survey, Data analysis & interpretation

    3.12 Outline Marketing Mix (4Ps- product, price, promotion, place)

    3.13 Define Product Terms like PLC, Mortality Curve, New product Development Steps, Inventory, Supply Chain Management

    3.14 State the Importance of Innovation,

    3.15 Define concept of innovation

    3.16 Describe the process of innovation.

    3.17 Explain Risk analysis and mitigation by SWOT Analysis

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CO-4:-Comprehend basic concepts of financial management and their application

    4.1 Define Finance Management

    4.2 List Objectives of Financial Management,

    4.3 List Types of capitals,

    4.4 Identify Sources of raising capital

    4.5 List Start-ups funding types

    4.6 Explain Venture capital funding

    4.7 Explain Series funding

    4.8 Explain Crowd funding

    4.9 List Types of budgets-production budget – labour budget

    4.10 Explain Concept of Profit loss Account,

    4.11 Illustrate Concept of balance sheet– proforma

    4.12 List Types of taxes imposed by Central Government and State Government

    4.13 Detail concepts of – Excise Tax, Income Tax, GST and custom duty.

CO-5:- Overview of Support Agencies and Incubators:-

    5.1 Identify State level and national level sources of information on Start-ups

    5.2 Detail functions of Various central Government institutions (like NSIC,SIDO,SISI and SSIB)

    5.3 Detail important features of Telangana State industry policy.

    5.4 List Demographic merits of Telangana state to set up SSIs.

    5.5 List the Names of state level institutions that support SSIs

    5.6 Explain the role of institutions like SSIDC, DIC, APIITCO in setting up SSIs.

    5.7 Explain role of Banks that support SSIs like SIDBI, APSFC.

    5.8 Identify Thrust areas and core sector as per Telangana state industry policy.

    5.9 Classify the projects as per TSIP.

    5.10 Explain Special assistance schemes for women and SC/ST Entrepreneurers.

    5.11 List Features of TS-IPASS.

    5.12 Explain Legal Issues –Contracts-Copyrights –Insurance – IPR – Licensing-Patents-Trade Secrets-Trademarks.

CO-6:-Building Project Proposal & Understand CSR, Ethics, Ex-Im, & Exit strategies

    6.1 Outline the steps involved in Project Planning and report

    6.2 Explain Feasibility study of project

    6.3 Explain the process of Project cost estimation

    6.4 Define and explain Breakeven analysis

    6.5 Define the terms Return on investment and Return on sales

    6.6 Describe social responsibility and relate with economic Performance.

    6.7 Explain Business Ethics

    6.8 Describe Ex-Im Policies

    6.9 Identify suitable strategies of succession and harvesting.

    6.10 Explain Bankruptcy and avoidance

Other than the classroom learning, following are the suggested student-related co-curricular activities which can be undertaken to accelerate the attainment of the various outcomes in this course. Students should make a portfolio i.e. perform at least FIVE from following list of activities individually or in group (not more than 2 students). They should prepare reports of about 2-5 pages for each activity and collect/ record physical evidence for their portfolio which may be useful for their placement interviews:

i.   Develop two products from household waste (attach photographs).

ii. Download product development and innovative films from internet

iii. Prepare a collage for "Traits of successful entrepreneurs."/ "Motivation & Charms of Entrepreneurship".

iv. Invite entrepreneurs, industry officials, bankers for interaction. Interview atleast four entrepreneurs or businessman and identify

v.   Identify your hobbies and interests and convert them into business idea.

vi. Mock Business Model- Choose a product and design a unique selling preposition, brand name, logo, advertisement (print, radio, and television), jingle, packaging, and labelling for it.

vii. Develop your own website. Share your strengths and weakness on it. Declare your time bound goals and monitor them on the website.

viii. Choose any product / advertisement and analyse its good and bad points/ cost sheet/ supply chain etc. (individuals should select different ads).

ix. Compare schemes for entrepreneurship promotion of any bank.

x.   Prepare sign boards representing safety measures.

xi. Prepare a project report on following policies implemented by Telangana under Start-ups

    ELECTRONICS POLICY-2016

    Innovation policy-2016

    Industrial policy-2014 etc.,

Legends: R = Remember; U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

CO-PO Mapping Matrix

CO	Basic and Discipline Specific Knowledge PO1	Problem Analysis PO2	Design/Development of Solutions PO3	Engineering Tools, Experimentation and Testing PO4	Engineering Practices for Society, Sustainability and Environment PO5	Project Management PO6	Lifelong Learning PO 7	Linked PO
CO1	1					1		1,6
CO2	1	1			1	2	1	1,2,5,6,7
CO3	1	2	2		1	1	2	1,2,3,5,6,7
CO4	1					2	1	1,6,7
CO5	2				1		2	1,5,7
CO6	1				2	2	1	1,5,6,7

MODEL QUESTION PAPERS
STATE BOARD OF TECHNICAL EDUCATION & TRAINING:TS:HYDERABD
EC-501- ENTREPRENEURSHIP AND STARTUPS
V SEMESTER MID SEMESTER – I MODEL PAPER

Time: 1 hour   **Max. Marks:20**

PART-A   **4x1=4Marks**

NOTE: 1) Answer all questions and each carries **one** mark.

2) Answers should be brief and straight to the point and shall not be exceed three simple sentences.

1. What is merits of managements ?

2. List the functions of management?

3. Define Entrepreneurship

4. Define start-ups.

PART-B   **2X3M=6 Marks**

NOTE: 1) Answer all questions and each carries **three** marks.

2) Answers should be comprehensive and the criterion for valuation is the content but not length of the answer.

5. (a) List out the element of cost?

OR

(b) Explain about staffing and need for recruitment .

6. (a) Discuss characteristics of entrepreneurship**.**

OR

(b) Illustrate about MSME?

PART-C   **2X5M=10 Marks**

NOTE: 1) Answer all questions and each carries **five** mark.

2) Answers should be comprehensive and the criterion for valuation is the content but not length of the answer.

7. (a) Describe various types of ownerships in the organization,

OR

(b)Explain different types of leadership models,

8. (a) Compare the concepts entrepreneur and intrapreneur

OR

(b) Identify 7-M Resources

EC-501- ENTREPRENEURSHIP AND STARTUPS
V SEMESTER MID SEMESTER – II MODEL PAPER
Time: 1 hour   **Max. Marks:20**

PART-A   **4X1=04 Marks**

NOTE: 1) Answer all questions and each carries **one** mark.
 2) Answers should be brief and straight to the point and shall not be exceed three
 simple   sentences.

1. What is the full form SWOT?

2. State need for business plan?

3. Full form of GST?

4.   List types of budget ?

PART-B   **2X3M=6 Marks**

NOTE: 1) Answer all questions and each carries **three** mark.
 2) Answers should be comprehensive and the criterion for valuation is the content but
 not length of the answer.

5. (a) What is the need for planning?

OR

(b) What is mean by market planning?

6. (a) explain series funding?

OR

(b) List types of taxes imposed by Central Government and State Government

PART-C

NOTE: 1) Answer all questions and each carries **five** mark.   **2X5M=10 Marks**
 2) Answers should be comprehensive and the criterion for valuation is the content but
 not length of the answer.

7. (a) Identify different marketing mix and illustrate their importance
                                             Or
(b) Examine different business opportunities

8. (a) Explain the concept of profit loss account
                                   OR
(b) Explain briefly types of budgets .

MODEL QUESTION PAPERS
STATE BOARD OF TECHNICAL EDUCATION & TRAINING:TS:HYDERABD
EC-501- ENTREPRENEURSHIP AND STARTUPS
V SEMESTER END SEMESTER MODEL PAPE

Time: 2 Hours   **Max. Marks:40**

PART-A

Instructions: 1. Answer **ALL** questions.   8 X 1 = 8

                 2. Each question carries **ONE** mark.

1. What is mean by Marketing plan?
2. Define crowd funding.
3. What is mean by balance sheet?
4. List any two support agencies promoting entrepreneurship ?
5. Mention any two features of TS-IPASS?
6. What is mean by project planning
7. What is mean by breakeven?
8. Mention any two business ethics?.

PART-B

Instructions: 1. Answer **ALL** questions.   4 X 3 = 12

                 2. Each question carries **THREE** marks.

9. (a) List any six Telangana Start-ups schemes.
<center>OR</center>

9. (b) List functions of management
10. (a)explain about crowd funding.
<center>OR</center>

10. (b) Explain about return on investment .
11.(a) Outline the Telangana state industry policy.
<center>**OR**</center>

11.(b) Classification of the projects as per TSIP
12 (a) Mention the importance of Business Ethics?
<center>OR</center>

12. (b) Illustrate briefly about bankruptcy?

PART-C

Instructions: 1. Answer **ALL** questions.   4 X 5 = 20

                 2. Each question carries **FIVE** marks.

13.(a) Explain Marketing Mix (4Ps- product, price, promotion, place)
<center>OR</center>

13.(b) Evaluate different types of budgets?

14 (a) Explain various phases of creating and starting the business

<div align="center">OR</div>

 14(b) Explain Ex-Im policies

15 (a) Explain the Telangana state industry policy

<div align="center">**OR**</div>

 15.(b) Illustrate the special assistance schemes for women and SC/ST Entrepreurers

16(a) What is Break Even analysis? Illustrate graphically the concept of Break -Even point.

<div align="center">**OR**</div>

 16.(b) Illustrate suitable strategies of succession and harvesting.

CS-502-.NET PROGRAMMING THROUGH C#

Course Title:	**.NET PROGRAMMING THROUGH C#**	Course Code	**CS-502**
Semester	**V Semester**	Course Group	**Core**
Teaching Scheme in Periods (L:T:P)	**4:1:0**	Credits	**2.5**
Methodology	**Lecture+Tutorials**	Total Contact Periods	**75**
CIE	**60 Marks**	SEE	**40 Marks**

Pre requisites

Basic understand of object oriented programming concepts.

Course Outcomes

Upon completion of the course the student shall be able to

	Course outcome
CO1	Familiarize with Basics of .NET Framework and Visual Studio
CO2	Introduction to C#.net and oops concepts
CO3	Demonstration of Exception Handling and Multithreading
CO4	Develop programs that supplies attributes at runtime
CO5	Develop windows based applications
CO6	Develop Web Based Applications and Database access

Course Content and Blue Print of Marks for SE

Unit No	Unit Name	Periods	Questions to be set for SEE			
				R	U	A
I	**Basics of .NET Framework and Visual Studio**	15	Q4	Q1	Q9(a)	Q13(a)
II	**Introduction to C#.net**	10	Q4	Q1	Q9(a)	Q13(a)
III	**Exception Handling and Multithreading**	15	Q4	Q2	Q10(a)	Q14(a)
IV	**Advanced concepts of C#**	10	Q4	Q2	Q10(a)	Q14(a)
V	**Windows Applications development**	10	Q4 / Q3	Q5,Q6	Q9(b),Q11(a), Q11(b)	Q13(b),Q15(a), Q15(b)
VI	**Web Based Applications and Database access**	15	Q4 / Q3	Q7,Q8	Q10(b),Q12(a), Q12(b)	Q14(b),Q16(a), Q16(b)
	Total	75		8	8	8

Course Contents

UNIT1:Basics of .NET Framework and Visual Studio.   **12 periods**

Introduction to .NET Framework-features of .net framework-CLR architecture- framework and base class Library-.NET languages- Visual Studio (Integrated Development Environment) especially for c#.net-various windows-applications

UNIT2:Introduction to C#.net and oops concepts   **13 periods**

History of C#.net-Features of C#.net-Compare C#.Net Vs. C/C++-Differences between C#.Net and Java-Primitive datatypes - class, struct-enum and interface-variables- local variables and methods-constructors in classes and structures-Access control specifiers in C#-Inheritance- Arrays-Method Overloading- Method Overriding-

UNIT3:Demonstration of Exception Handling and Multithreading   **10 periods**

Introduction to Exception Handling- Predefined Exception Classes-Exception handling Mechanism-User define exception-Multithreading-Threads-Thread class properties and methods- Thread life cycle-Thread priorities

UNIT4:Develops programs that supplies attributes at runtime15periods

Indexers and Properties-Anonymous Methods-Lambda expressions- Delegates-Operators is, as and type of - Generic Programming

UNIT5:Develop windows based applications   **12 periods**

Designing aspects of C#.NET windows application forms - creating a windows application - various elements of user interface and their properties (text box, label, button, check box, radio button- list box-combo box- Enable, disable, hide and show the controls in the applications-Event handling - Menus-Deploying and distribution of windows application-

UNIT6:Develop Web Based Applications and Database access   **13 periods**

Web application-Asp.net server controls with asp.net code - Data transfer between pages.Introduction to ADO.NET -Features and advantages of ADO.NET-Connection-Dataset- Data adaptor and Command objects-typed and untyped dataset objects- Data binding to DataGrid control, text box and listbox-Navigate through a data source

Text Books:

1. Professional C# 5.0 and .NET 4.5.1 (WROX) by Christian Nagel (Author), Jay Glynn (Author), Morgan Skinner.
2. Herbert Schildt, "The Complete Reference: C# 4.0", Tata McGraw Hill, 2012.
3. C# 5.0 IN A NUTSHELL Fifth Edition by Joseph Albahari and Ben Albahari.
4. Christian Nagel et al. "Professional C# 2012 with .NET 4.5", Wiley India, 2012.

Reference Books:
1. Andrew Troelsen, "Pro C# 2010 and the .NET 4 Platform, Fifth edition, A Press, 2010.
2. Ian Griffiths, Matthew Adams, Jesse Liberty, "Programming C# 4.0", Sixth Edition, O"Reilly, 2010.
3. Sathiaseelan J. G. R, Sasikaladevi N, Programming with C# .NET PHI Learning.
4. Kogent Learning Solutions Inc., .NET 4.5 Programming (6-in-1) Dreamtech Press (2013).

Specific Learning Outcomes:

Upon completion of the course the student shall be able to

CO1:Familiarize with Basics of .NET Framework and Visual Studio

1.1 Define .NET Framework

1.2 List the features of .NET framework

1.3 DemonstrateCLR architecture

1.4 Discuss about .NET framework and base class Library

1.5 Discuss various.NET languages

1.6 List the features of Visual Studio IntegratedDevelopment Environment (IDE) especially for C#.NET

1.7 Comprehend the purpose of DesignView window, Code window, Object browser window, solution explorer window, server explorer window, error window and property window in Visual Studio IDE

1.8 List the applications of .NET

CO2:Introduction to C#.net and oops concepts

2.1 Familiarize with C#.net

2.2 List features of C#.net

2.3 Differentiate between C#.Net, C/C++ and Java

2.4 Explain Different primitive data types

2.5 Build data types using class, struct, enum, and interface

2.6 Illustrate the usage of instance variables and local variables

2.7 Explain about creation of methods

2.8 Write example program with constructors in classes and structures

2.9 Control access to members of the class with access specifiers

2.10 Discuss about inheriting classes

2.11 Process data with different types of arrays

CO3:Demonstration of Exception Handling and Multithreading

3.1 Define Exception

3.2 List Predefined Exception Classes

3.3 Handle Exceptions

3.4 Create user defined exceptions

3.5 Define Multithreading, Threads

3.6 Comprehend thread class properties and methods

3.7 Create and abort threads

3.8 List the states of thread life cycle

3.9 Create Multiple Threads

3.10 List Thread priorities

CO4:   Advanced concepts of C#

4.1   Design classes with Indexers and Properties

4.2   Define Anonymous Methods in classes
4.3   Pass Parameters and Returns values from anonymous methods
4.4   List types of Lambda expressions with examples
4.5   Illustrate Delegates functionality to other functions
4.6   Illustrate special operators is, as and typeof
4.7   List the needs of Generic Programming
4.8   Define Generic class with two parameters

CO5:Develop windows based applications

5.1   Discuss the designing aspects of C#.NET windows application form
5.2   List the steps for creating a windows application
5.3   List various elements of User Interface (UI)
5.4   List the properties of UIcontrols like text box, label, button, checkbox, radiobutton, combobox, listbox, datagrid
5.5   Develop programs using UI controls
5.6   Handle events generated by various UI controls
5.7   List the steps for creation of Menus at design time
5.8   Develop a project to control menus at run time
5.9   Create short cut keys for pull down menus
5.10 List the steps to deploy and distribute a windows application

CO6: Develop Web Based Applications and Database access

6.1   Discuss the steps for creating a web application
6.2   Describe the usage of web controls like text box, label, button, check box, radio button, Dropdown list, listbox, data grid, hyperlink, images, panel, and hidden field controls
6.3   List and describe various Data validation controls
6.4   List the importance of data transfer between pages
6.5   Uses query string, cookie and post method used to transfer data between pages with Example
6.6   Familiarize with ADO.NET
6.7   List the features and advantages of ADO.NET
6.8   Establish connection to database using Connection, Dataset, Data adapter, Data Provider and Command objects
6.9   Describe how to connect data base to C# application through server explorer
6.10 Differentiate between typed and untyped dataset objects
6.11 Access data with data adapters and typed/untyped data sets
6.12 Explain the process of data binding to DataGrid control, textbox and listbox
6.13 Explain how to navigate through a data source.

Suggested Student Activities
Note:
- ➢ **Student activity like mini-project, quizzes, etc. should be done in group of 3-5 students**
- ➢ **Each group should do any one of the following type of activity or any other similar activity related to the course with prior approval from the course coordinator and programme coordinator concerned.**
- ➢ **Each group should conduct different activity and no repetition should occur.**

1. Study Research Papers based on Deep learning and Machine Learning and submit a report.
2. Prepare a Power point Presentation on the applications and issues related to cloud computing and give a seminar on the same.
3. Conduct a Quiz on C# programming language.
4. Give a seminar on various design patterns.
5. Prepare a student database project which stores student details of CME branch.
7. Study the impact of recent technologies on health care and environment; prepare a report that addresses the issues and solutions to them.
8. Study Recent Technologies like Data Mining, Data Analysis, and Data Scientist; and write a report that distinguishes these technologies.

Suggested E-learning references
1. https://www.tutorialspoint.com/linq/linq_tutorial.pdf
2. https://wvvw.asp.net/
3. https://wvvw.tutorialspoint.com/
4. http: / /www.codeproject.com
5. http://telerikacademy.com
6. https://msdn.microsoft.com
7. https://universityxamarimcom/
8. https://sourcemaking.com/design_patterns

CO-PO Mapping Matrix

CO	Basic and Discipline Specific Knowledge	Problem Analysis	Design/Development of Solutions	Engineering Tools, Experimentation and Testing	Engineering Practices for Society, Sustainability and Environment	Project Management	Lifelong Learning	Linked PO
	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	
CO1	2	2	2	2			2	1,2,3,4,7
CO2	2	2	2	2			2	1,2,3,4,7
CO3	2	1	1	1			2	1,2,3,4
CO4	2	1	1	2		2	2	1,2,3,4,5,7
CO5	3	2	2	2		2	2	1,2,3,4,5,7
CO6	2	2	2	2		2	2	1,2,3,4,5,7

State Board of Technical Education
.Net Programming through C#
CS-502V Semester
Mid SEM -1 Model Paper

Time: 1 hour   Marks: 20

PART-A

Instructions: *4 X 1 =4 marks*
Answer all questions
Each question carries 1 mark
   1. Define CLR.
   2. Define MSIL.
   3. Define Methodoverriding.
   4. List any two .NET languages.

PART-B

NOTE: 1. Answer any one question from 5 and 6.   *2X3=6 marks*
      2. Each question carries three marks.
   5(a). Demonstrate the architecture of CLR.
                    or
   5(b). List the features of .net framework.

   6(a).Write about creation of method in c#?
                    or
   6(b). Discuss different access modifiers.

PART-C

NOTE: 1. Answer any one question from 7 and 8.   *2X5=10 marks*
      2. Each question carries three marks.

   7(a). Explain the features of Visual studio.
                    or
   7(b). Explain different windows in visual Studio.

   8(a). Write a C# program to implement multiple inheritance.
                    or
   8(b).Write a c# program to demonstrate the local variable.

Time: 1 hour   Marks: 20

PART-A

Instructions: *4X1 =4*
marks
Answer all questions
Each question carries 1 mark
   1. Write the syntax of multiple catch blocks with a single try block.
   2. What is the class used to define user defined exception.
   3. Write the syntax for lambda expression.
   4. What is the use of 'is' operator.

PART-B

NOTE: 1. Answer any one question from 5 and 6.   *2X3=6*
marks
        2. Each question carries three marks.
   5(a). Discuss the keyword related to exception handling.
                        or
   5(b). Write about thread life cycle.

   6(a). Write about Indexers and Properties in a class.
                        or
   6(b). Write the need of generic programming.

PART-C

NOTE: 1. Answer any one question from 7 and 8.   *2X5=10*
marks
        2. Each question carries three marks.

   7(a). Write a C# program to create multiple threads
                        or
   7(b). Write a C# program to illustrate that program is not terminated when exception
   occurs.

   8(a). Write a C# program with anonymous method that accepts arguments and return
   parameters
                        or
   8(b). Write a C# program to define a class with generic data members.

Time: 2 Hours   **Total Marks: 40**

PART – A

Instructions: *8X1 = 08 Marks*

     1. *Answer all the following questions:*
     2. *Each question carries 1 mark*

1. Write the syntax to define a constructor in a class.
2. Write the syntax to create lambda expression.
3. Define Cookie.
4. Define instance variable.
5. What is Windows Form?
6. What is the use of run at attribute in a server control?
7. Define data grid control.
8. List any three web based user controls

PART- B

NOTE: 1. Answer any one question from 9, 10, 11 and 12.   *4X3=12 Marks*
     2. Each question carries three marks.

9(a) Draw and Explain CLR architecture.
           or
9(b) Write any five properties of TextBox and List Box controls.

10(a) Discuss about the five methods in a Thread class.
           or
10(b) List the features and advantages of ADO.NET.

11(a) Discuss the steps for creating a web application.
           or
11(b) List various Data validation controls

12(a) Write about any two validation controls in ASP.NET
           or
12(b) Discuss Connection, Dataset and Data adaptor object.

PART-C

13(a)Write about the following windows (a) Object browser window (b) solution explorer window (c) server explorer window.

                 or

13(b)Develop a C# application to sort the items in the list box.

14(a)Write a C# program to pass parameters and return values from anonymous methods.

or

14(b)Write a C# program to insert rows in a table.

15(a)Write a C# program to create menus at runtime.

                 or

15(b)Write the asp.net code to create a student registration form.

16(a)Write a C# code to navigate all the records in the table.

                 or

16(b)Write a C# program to create an ASP page with all validation controls

CS-503 MOBILE APPLICATION DEVELOPMENT

Course Title:	**Mobile Application Development**	Course Code	**CS-503**
Semester	**V Semester**	Course Group	**Core**
Teaching Scheme in Periods (L:T:P)	**4:1:0**	Credits	**2.5**
Methodology	**Lecture+Tutorials**	Total Contact Periods	**75**
CIE	**60 Marks**	SEE	**40 Marks**

Pre requisites

Knowledge of OOPs, Java programming, and AWT event handling concepts.

Course Outcomes

Upon completion of the course, the student shall be able to

Course Outcome	
CO1	Outline the categories of mobile applications and know the internal components of smart phone
CO2	Interpret different types of mobile operating systems and Demonstrate the architecture of iOS and Android OS
CO3	Outline the procedure to install various IDEs, tools, and frameworks used to provide Android execution environment
CO4	Illustrate the components of Android to develop simple mobile applications running on emulator or physical device
CO5	Design Graphical User Interface(GUI) mobile applications and handle events generated by UI controls and also Develop applications using Fragments
CO6	Relateto Android services and Develop android applications to interact with SQLite database

Unit No	Unit Name	Periods	Questions to be set for SEE			
				R	U	A
I	Introduction to mobile application development and smart phone hardware architecture	12	Q4	Q1	Q9(a)	Q13(a)
II	Introduction to Mobile Operating Systems	12				
III	Android development environment setup using various IDEs, tools and frameworks	12		Q2	Q10(a)	Q14(a)
IV	Programming components of Android application development	12				
V	Android User Interface Designing Layouts, UI Controls/widgets, and Fragments	14	Q3	Q5,Q6	Q9(b),Q11(a), Q11(b)	Q13(b),Q15(a), Q15(b)
VI	Android Services and Storage using SQLite database	13		Q7,Q8	Q10(b),Q12(a), Q12(b)	Q14(b),Q16(a), Q16(b)
	Total	75	8		8	8

Course Contents

UNIT - 1: Introduction to Mobile Application Development and Smart Phone hardware architecture   Duration: 12 Periods(L: 10 – T:2)
Mobile device –History – Types of mobile phone generations - Types of mobile devices –Mobile ecosystem - Mobile application development – Importance - Types of mobile apps: native, web and hybrid - Smart phone - Evolution of smart phones - Features of smart phone - System on Chip (SoC) - Components of SoC - Advantages and disadvantages of SoC - Contemporary processors used in smart phones - Peripheral devices for smart phone - Future technology in smart phones.

UNIT - 2: Introduction to Mobile Operating Systems
                                                    Duration: 12 Periods(L: 10 – T:2)
Mobile operating system – Types of mobile operating systems - History of iOS –features of iOS - Versions of iOS - iOS Architecture - Layers in iOS architecture - Features of different layers of iOS architecture - History of Android OS –features of Android OS - Versions of Android OS- Android OS architecture - Layers in Android OS architecture- Features of different layers of Android OS architecture- iOS vs. Android OS.

UNIT - 3: Android development environment setupusing various IDEs, tools and frameworks

Duration: 12 Periods(L: 10 – T:2)

Programming languages used in Android applications – MVC Architecture – Security Aspects of Android – Android Environment Setup - Android Studio IDE – Eclipse IDE –Visual Studio IDE –Create Android Virtual Devices (AVDs) – Physical device setup –Categories of Android applications – Android development frameworks– Types of Android development tools.

UNIT - 4: Programming Components of Android application development

Duration: 12 Periods(L: 10 – T:2)

Programming Components of Android – Activities – Services– Content Providers – Broadcast Receivers – additional components - Create "Hello world!" application –Android Project structure: Main Activity File, Android Manifest file, R file, Strings file, Layout folder, Resources folder, Gradle–Toast message in android application to display notifications –Intent – Types of Intents –Intent to dial a number–Intent to send SMS –Intent to open webpage –Explicitly switching between activities–Passing data between activities – Lifecycle of Android Activities – Activity callback functions – Android application which shows activity lifecycle.

UNIT - 5: Android User InterfaceDesigning Layouts,UI Controls/widgets, and Fragments

Duration: 14 Periods(L: 10 – T:4)

Creating User Interfaces in Android - View versus ViewGroup - User Interface Designing Layouts - LinearLayout, RelativeLayout, FameLayout, ConstraintLayout, TableLayout–UI Views - List View, GridView, WebView, ScrollView, RecyclerView - User Interface(UI) Controls –TextView - Edit Text – Button – ImageButton – Checkbox – RadioButton – ToggleButton – Spinner - Date Picker – TimePicker –ProgressBar – SeekBar –RatingBar - Develop simple android applications using UI controls/widgets - Event handling of UI Controls/widgets (Button, Checkbox, Spinner, Date Picker and Seek Bar) with example programs – Fragments –Types – Life cycle of fragments - Develop android application using fragments.

UNIT - 6: Android Services and Storage using SQLite database

Duration: 13 Periods(L: 10 – T:3)

Android services introduction – Types of services - Life cycle of Android Services - Develop simple Android application using Android service - Serviceto play music –Android storage - Introduction to SQLite database - Creating and opening a database - Creating tables - Inserting data into tables - Retrieving data from tables - Updating and Deleting data from tables - Develop simple android application using SQLite database.

Text Books

1. Modern Computer Architecture and Organization: Learn x86, ARM, and RISC-V Architectures and the Design of Smartphones, PCs, and Cloud Servers by Jim Ledin (2017, Jones & Bartlett Learning)

2. Head First Android Development: A Learner's Guide to Building Android Apps with Kotlin, Third Edition (2021, O'Reilly Media)
3. Android App Development for Dummies, 3rd Edition (2019, John Wiley & Sons)
4. Android Programming for Beginners: Build in-depth, full-featured Android apps starting from zero programming experience, 3rd Edition (2021, John Wiley & Sons)
5. Android Programming: The Big Nerd Ranch Guide (2019, No Starch Press)
6. The Busy Coder's Guide to Advanced Android Development (2018, Pragmatic Bookshelf)

Reference Books

1. Clean Architecture for Android (2018) by Eran Boudjnah. (Pragmatic Bookshelf)
2. Android Programming: The Big Nerd Ranch Guide (3rd Edition, 2021) by Bill Phillips, Chris Stewart, Kristin Marsicano, and Brian Gardner. (Manning Publications Co.)
3. Hello, Android: Introducing Google's Mobile DevelopmentPlatform fourth edition by Ed Burnette - The pragmatic programmers.
4. Busy Coder's Guide to Android Development by Mark L Murphy.
5. Android Programming: The Big Nerd Ranch Guide by Bill Philips, Chris Stewart and Kristin.
6. Modern Android 13 Development Cookbook (2nd Edition, 2023) by Jeff Friesen. (O'Reilly Media).
7. Kickstart Modern Android Development with Jetpack and Kotlin (2nd Edition, 2023) by Paul Burke and Yigit Boyar. (O'Reilly Media).

Suggested e-Learning Links

1. https://onlinecourses.swayam2.ac.in/nou21_ge41/preview
2. https://onlinecourses.nptel.ac.in/noc20_cs52/preview
3. https://elearn.nptel.ac.in/shop/iit-workshops/completed/introduction-to-android-app-development/
4. https://www.tutorialspoint.com/android/index.htm
5. https://developer.android.com/
6. https://www.sanfoundry.com/java-android-programing-examples
7. https://sites.google.com/site/hkustcomp4521/home/lab-exercises
8. https://www.vidyarthiplus.com/vp/attachment.php?aid=47906
9. https://www.javatpoint.com/android-tutorial
10. https://www.studytonight.com/android/
11. https://www.splessons.com/lesson/android-tutorial/
12. https://developer.android.com/courses
13. https://www.udacity.com/course/android-kotlin-developer-nanodegree--nd940
14. https://www.pluralsight.com/courses/android-start-developing
15. https://www.coursera.org/specializations/android-app-development
16. https://www.youtube.com/@android

Suggested Learning Outcomes

For achieving the Course outcomes, the following learning outcomes must be achieved

CO1: Outline the categories of mobile applications and know the internal components of smart phone

1.1   Define mobile device
1.2   Outline the history of mobile devices
1.3   List the types of mobile phone generations
1.4   List different types of mobile devices
1.5   Define Mobile ecosystem
1.6   Illustrate Mobile ecosystem
1.7   Define mobile application development
1.8   Explain the significance of mobile application development
1.9   Classify mobile application development applications: native, web and hybrid
1.10   Define smart phone
1.11   Discuss the evolution of smart phones
1.12   Relate to the key features of smart phone
1.13   Define System on Chip (SoC)
1.14   Explain the components of SoC
1.15   List advantages and disadvantages of SoC
1.16   Outline the contemporary processors used in smart phones
1.17   List different peripheral devices for a smart phone
1.18   Relate to the future technology in smart phones.

CO2: Interpret different types of mobile operating systems and demonstrate the architecture of iOS and Android OS

2.1   Define mobile operating system
2.2   List different types of mobile operating systems
2.3   Outline the history of iOS
2.4   List various features of iOS
2.5   Explain different versions of iOS
2.6   Demonstrate the block diagram of iOS Architecture
2.7   List the layers in iOS architecture
2.8   Explain the features of different layers of iOS architecture
2.9   Outline the history of Android OS
2.10   List various features of Android OS
2.11   Explaindifferent versions of Android
2.12   Demonstratethe block diagram of Android OS Architecture
2.13   List the layers in Android OS architecture
2.14   Explainthe features of different layers of Android OS architecture
2.15   Compare and Contrast iOS and Android OS.

CO3: Outline the procedure to install various IDEs, tools, and frameworks used to provide Android execution environment

3.1   List the programming languages used for developing Android applications
3.2   Demonstrate MVC Architecture used for mobile application development
3.3   Illustrate theSecurity aspects of Android OS
3.4   Elaborate the stepsof Android environment setup using Android Studio IDE
3.5   Elaborate the stepsof Android environment setup using Eclipse IDE
3.6   Elaborate the steps of Android environment setup using Visual Studio IDE
3.7   Elaborate the stepsto create Android Virtual Device(AVD)/Emulator
3.8   List the steps of setting up a physical Android device for app development
3.9   Classify different categories of Android applications
3.10   Outline different Android development frameworks for mobile application development
3.11   Outline different Android development tools for mobile application development.

CO4: Illustrate the components of Android to develop simple mobile applications running on emulator or physical device

4.1   Explain the programming components of Android application development
      4.1.1 Activities
      4.1.2 Services
      4.1.3 Content Providers
      4.1.4 Broadcast Receivers
4.2   List the additional components required for android application development
4.3   Develop the procedure to create first "Hello world!" application and running application in emulator or physical device
4.4   Illustrate the android project structure:Main Activity File, Android Manifest file, R file, Layout file, Resources folder, Values folder, Gradle
4.5   Illustrate the usage of toast message in android application to display notifications
4.6   Explain Android activating component: Intent
      4.6.1   Define Intent
      4.6.2   List the types of Intents
      4.6.3   Develop an android application using implicit intent to dial a number
      4.6.4   Develop an android application using implicit intent to send SMS
      4.6.5   Develop an android application using implicit intent to open a webpage
      4.6.6   Develop an android application on explicitly switching between activities using explicit intent
      4.6.7   Develop an android application passing data between activities using explicit intent
4.7   Demonstrate the lifecycle of Android activities
      4.7.1   Draw the block diagram of Activity life cycle
      4.7.2   List the Activity call-back functions
      4.7.3   Develop an android application which shows the lifecycle of an Activity.

CO5: Design Graphical User Interface(GUI) mobile applications and handle events generated by UI controls and also Develop applications using Fragments

5.1   Define View and ViewGroup
5.2   Compare View and ViewGroup
5.3   Illustrate the User Interface (UI) designing Layouts with example programs
      5.3.1   Linear Layout
      5.3.2   Relative Layout
      5.3.3   Frame Layout
      5.3.4   Constraint Layout
      5.3.5   Table Layout
5.4   Illustrate various UI Viewswith example programs
      5.4.1List View
      5.4.2 GridView
      5.4.3   WebView
      5.4.4   ScrollView
      5.4.5   RecyclerView
5.5   Outline various User Interface (UI) controls/widgets along with their classes and attributes
      5.5.1   TextView
      5.5.2   Edit Text
      5.5.3   Button
      5.5.4   ImageButton
      5.5.5   Check Box
      5.5.6   RadioButton
      5.5.7   ToggleButton
      5.5.8   Spinner
      5.5.9   Date Picker
      5.5.10 TimePicker
      5.5.11 ProgressBar
      5.5.12 SeekBar
      5.5.13 RatingBar
5.6   Develop simple Android applications using each UI control/widget
5.7   Explain event handling of UI Controls (Button, Checkbox, Spinner, Date Picker and Seek Bar) with example programs
5.8   Explain Fragments
      5.8.1   Define fragment
      5.8.2   List the types of fragments
      5.8.3   Life cycle of fragments
      5.8.4   Develop simple android application using fragment

CO6: Relate to Android services and Develop android applications to interact with SQLite database

6.1   Define Android service
6.2   List the types of Android services
6.3   Explain the life cycle of Android Services with example program
6.4   List the call-back functions in Android Services
6.5   Develop an android application to create simple service
6.6   Develop an android application to create music service to play and stop any music file
6.7   Relate to SQLite database
6.8   Outline the steps to install SQLite database
6.9   Illustrate the process of creating and opening a database using SQLite database
6.10   Illustrate the process of creating tables using SQLite database
6.11   Illustrate the process of inserting data into the tables using SQLite database
6.12   Illustrate the process of retrieving data from tables using SQLite database
6.13   Illustrate the process of updating data in a table using SQLite database
6.14   Illustrate the process of deleting data from tables using SQLite database
6.15   Develop simple android application to perform all CRUD (Create, Read, Update, and Delete) operations using SQLite database.

Suggested Student Activities

Student activity like mini-project, surveys, quizzes, etc. should be done in group of 4-6 students.
- Each group should do any one of the following type of activity or any other similar activity related to the course with prior approval from the course coordinator and programme coordinator concerned.
- Each group should conduct different activity and no repetition should occur.

1. Study different Integrated Development Environments(IDEs) available for executing android programs and prepare a report.
2. Develop some simple GUI based applications like calculator etc. using android controls.
3. Visit Library to refer to standard Books on Advanced java concepts, collect related material and prepare notes.
4. Refer to online content and videos to get more knowledge on SQLite database concepts.
5. Interact with industry people who are working in android technologies and prepare a report.
6. Compare different types of Operating Systems used in mobiles and submit a report.
7. Write assignments given by course coordinator.
8. Read all the course contents and should be able to write slip tests and surprise tests.
9. Prepare a seminar on a specific topic that is related to latest technologies in the mobile application development and present a Power Point Presentation (PPT) to all the peers.
10. Study IEEE papers on android programming and submit a report.
11. Prepare quiz on android programming related questions and conduct.
12. Participate in state level or national level technical conferences.
13. Develop advanced android applications (apps) and upload to play store.
14. Learn advanced android frameworks like Flutter, Reactive Native etc.

CO-PO Mapping Matrix

CO	Basic and Discipline Specific Knowledge PO1	Problem Analysis PO2	Design/Development of Solutions PO3	Engineering Tools, Experimentation and Testing PO4	Engineering Practices for Society, Sustainability and Environment PO5	Project Management PO6	Lifelong Learning PO7	Linked PO
CO1	2							1
CO2	2							1
CO3	2	2	2	2			2	1,2,3,4,7
CO4	2	2	2	2		2	2	1,2,3,4,6,7
CO5	2	2	2	2		2	2	1,2,3,4,6,7
CO6	2	2	2	2		2	2	1,2,3,4,6,7

Course Code: CS-503   **Duration:1 hour**
Course Name: Mobile Application Development   **Max.Marks: 20 Marks**

PART-A

Answer **all** questions- Each Question carries **ONE** mark   **4x1 = 4 Marks**

1) Define Mobile ecosystem.
2) Define SoC.
3) Define mobile OS.
4) List the types of mobile OS.

PART-B

Answer **two** questions- Each Question carries **THREE** marks   **2x3 = 6 Marks**

5(a) Classify different types of mobile apps.

(OR)

5(b) List the advantages and disadvantages of SoC.

6(a) Compare iOS and Android OS.

(OR)

6(b) List any three features of iOS.

PART-C

Answer **two** questions- Each Question carries **FIVE** marks   **2x5 = 10 Marks**

7(a)Classify mobile application development applications.

(OR)

7(b) Explain the contemporary processors used in smart phones.

8(a) Explain different versions of iOS

(OR)

8(b) Demonstrate the layers of Android OS architecture.

Course Code: CS-503   **Duration:1 hour**
Course Name: Mobile Application Development   **Max.Marks: 20 Marks**

PART-A

<u>Answer **all** questions- Each Question carries **ONE** mark</u>   **4x1 = 4 Marks**

1) List the programming languages used for developing android applications.
2) List the categories of android applications.
3) Define Intent.
4) What is the use of Android manifest file?

PART-B

<u>Answer **two** questions- Each Question carries **THREE** marks</u>   **2x3 = 6 Marks**

5(a) Discuss the security aspects of Android.
          (OR)
5(b) List the steps of setting up a physical Android device for app development.

6(a) List different types of Intents with examples.
          (OR)
6(b) Outline the Activity call-back functions in Activity Life cycle.

PART-C

<u>Answer **two** questions- Each Question carries **FIVE** marks</u>   **2x5 = 10 Marks**

7(a) Elaborate the steps to install Android Studio IDE.
              (OR)
7(b) Demonstratethe concept of MVC architecture for mobile application development.

8(a) Develop an android application using Intent to dial a number.
              (OR)
8(b) Develop an android application to display "Hello World!" message on emulator or physical device.

Course Code: CS-503   **Duration:2 hour**
Course Name: Mobile Application Development   **Max.Marks: 40 Marks**

___

PART-A

Answer **all** questions- Each Question carries **ONE** mark   **8x1 = 8 Marks**

1) List the peripheral devices for a smart phone.
2) Define content provider.
3) What is Linear Layout?
4) What isstring.xml file?
5) List any three UI controls.
6) Define fragment.
7) Define Service.
8) What is SQLite database?

PART-B

Answer **Four** questions- Each Question carries **THREE** marks   **4x3 = 12 Marks**

9(a) Discuss the future technology in smartphones.
            (OR)
9(b) Write about event handling of Button UI control.

10(a) Discuss different categories of Android applications.
        (OR)
10(b) Outline the call-back methods in Android Services.

11a) Describe about Array Adapters in List View.
            (OR)
11(b) Write about Seek Bar widget.

12(a) List the types of services.
            (OR)
12(b) Discuss about creating database in SQLite database.

PART-C

13(a) Explain the layers of iOS architecture with a block diagram.
> (OR)

13(b) Develop simple android application to find sum of two numbers using TextView,EditText and Button UI controls.

14(a) Explain the steps of Android environment setup using Visual Studio IDE.
> (OR)

14(b) Develop simple android application using Android services.

15(a) Develop simple android application to display notifications using Toast message.
> (OR)

15(b) Develop an android application using Spinner widget.

16(a) Explain the process of inserting data into a table using SQLite database.
> (OR)

16(b) Explain the process of retrieving data from atable using SQLite database.

CS-504-SOFTWARE ENGINEERING

Course Title:	**Software Engineering**	Course Code	**CS-504**
Semester	**V Semester**	Course Group	**Core**
Teaching Scheme in Periods (L:T:P)	**4:1:0**	Credits	**2.5**
Methodology	**Lecture+Tutorials**	Total Contact Periods	**75**
CIE	**60 Marks**	SEE	**40 Marks**

Pre requisites

Basic knowledge in development of programs.

Course Outcomes

Upon completion of the course, the student shall be able to

CO1	Understand theevolution of Software engineering.
CO2	Identifying appropriate Software development life cycle for a project.
CO3	Understanding software project management activities.
CO4	Gathering and Analysing the Requirementsof aSoftware project.
CO5	Selecting appropriate Designing methodologies.
CO6	Understand the coding and testing.

Course Content and Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE				
			R			U	A
I	Introduction to software Engineering.	10	Q4	Q1		Q9(a)	Q13(a)
II	Software Life Cycle Models.	15					
III	Software Project Management.	15		Q2		Q10(a)	Q14(a)
IV	Requirements Analysis and Specification.	10					
V	Software Design.	10		Q3	Q5,Q6	Q9(b),Q11(a), Q11(b)	Q13(b),Q15(a), Q15(b)
VI	Coding and Testing.	15			Q7,Q8	Q10(b),Q12(a), Q12(b)	Q14(b),Q16(a), Q16(b)
	Total	75	8			8	8

Course Contents

UNIT- I   **Duration: 10Periods (L: 8– T: 2)**
Introduction: Evolution from an Art Form to an Engineering Discipline, Software Development Projects, Emergence of Software Engineering: Notable Changes in Software Development Practices, Computer Systems Engineering.

UNIT-II   **Duration: 15 Periods (L: 12– T: 3)**
Software Life Cycle Models: A Few Basic Concepts, Waterfall Model and its Extensions – (Iterative, V Model, Prototyping, Incremental, Evolutionary Model), Rapid Application Development (RAD), Agile Development Models. Spiral Mode, Comparison of Different Life Cycle Models and Selecting an Appropriate Life cycle Model for a Project.

UNIT-III   **Duration: 15 Periods (L: 12– T: 3)**
Software Project Management: Software Project Management Complexities. Responsibilities of a Software Project Manager, Project Planning, Metrics for Project Size Estimation; Project Estimation Techniques: Introduction to COCOMO - A Heuristic Estimation Technique. Introduction to Halstead's Software Science - Critical Path Method (CPM), PERT Charts, Gantt Charts, Risk Management, Software Configuration Management, Software Quality Management System, Explain ISO 9000, Demonstrate Capability Maturity Model Integration (CMMI

Unit – IV   **Duration: 10 Periods (L: 8 – T: 2)**
Requirements Analysis and Specification Requirements Analysis and Specification phase– Software Requirements Specification (SRS) Document, Functional requirements and Non-Functional Requirements, Organization of the SRS Document, Formal system specification.

Unit-V   **Duration: 10 Periods (L: 8 – T: 2)**
Software Design Overview of the Design Process, Cohesion and Coupling, Function-oriented Design- Data Flow Diagrams, Object-oriented Design using UML- Class Diagram, Object Diagram, Interaction Diagram, Sequence Diagram, Collaboration Diagram. Activity Diagram, State Chart Diagram.

UNIT - VI   **Duration: 15Periods (L: 12 – T: 3)**
Coding and Testing Code Review,Software Documentation, Debugging, Testing Phase - Design Test Cases, Black-box Testing, White Box Testing, Integration Testing, Smoke Testing, system testing, Software Reliability,Hardware versus Software Reliability

Text Books

1. Rajib Mall (2014), Fundamentals of Software Engineering, PHI Learning

Reference Books

1. Pressman, R. S., (2009), Software Engineering: A Practitioner's Approach, Tata McGrawHill
2. Head First Software Development, by Dan Pilone, Russ Miles, Publisher(s): O'Reilly Media, Inc.
3. Jalote, P., (2005), An Integrated Approach to Software Engineering, Narosa Publishing House
4. Ahmed, A., (2011), Software Project Management: A Process-Driven Approach, Auerbach Publications 6. Beck, K., (2002), Test Driven Development: By Example, Addison-Wesley Professional
5. Williams, L. & Kessler, R., (2002), Pair Programming Illuminated, AddisonWesley Professional
6. Olga Filipova, RuiVilao (2018) Software Development from A to Z_ A Deep Dive into All the Roles Involved in the Creation of Software

Suggested Learning Outcomes

CO1: Introduction to evolution of Software engineering.
1.0 Introduction.
1.1   Evolution—From an Art Form to an Engineering Discipline.
        1.1.1Evolution of an Art into an Engineering Discipline.
        1.1.2 Evolution Pattern for Engineering Disciplines.
        1.1. 3 Explain a Solution to the Software Crisis.
1.2   Software Development Projects.
        1.2.1 Explain Types of Software Development Projects.
        1.2.2Summaries Software Projects Being Undertaken by Indian Companies.
1.3   Emergence of Software Engineering.
        1.3.1 Understand Early Computer Programming.
        1.3.2Explain High-level Language Programming.
        1.3.3Define Control Flow-based Design.
        1.3.4 Define Structure-oriented Design.
        1.3.5Explain Data Flow-oriented Design.
        1.3.6Understand Object-oriented Design.
1.4   Explain Notable Changes in Software Development Practices.
1.5   Illustrate Computer Systems Engineering.

CO2: Identifying appropriate Software development life cycle for a project.
2.0 Software Life Cycle Models.
2.1   A Few Basic Concepts of Software life cycle models.
2.2   Explain Waterfall Model and its Extensions.
2.3   Illustrate Classical Waterfall Model.
2.4   Interpret Iterative Waterfall Model.
2.5   Illustrate V-Model.
2.6   Explain Prototyping Model.
2.7   Explain Incremental Development Model.
2.8   Explain Evolutionary Model.
2.9   Illustrate Rapid Application Development (RAD).
        2.9.1 Explain Working of RAD.
        2.9.2 List the applicability of RAD Model.
2.10   Interpret Agile Development Models.
        2.10.1 Essential Idea behind Agile Models.
2.12   Explain Spiral Model.
2.13   Comparison of Different Life Cycle Models.
2.14   Selecting an Appropriate Life cycle Model for a Project.

CO3: Understanding software project management activities.

3.0 Software Project Management.
3.1 Analyze Software Project Management Complexities.
3.2 Responsibilities of a Software Project Manager.
     3.2.1 Outline Job Responsibilities for Managing Software Projects.
     3.2.2 Outline Skills Necessary for Managing Software Projects.
3.3 Define Project Planning.
     3.3.1 Explain Sliding Window Planning.
     3.3.2 Outline the SPMP Document of Project Planning.
3.4 List Metrics for Project Size Estimation.
     3.4.1 Define Lines of Code (LOC).
     3.4.2 Define Function Point (FP) Metric.
3.5 Explain Project Estimation Techniques.
3.5.1 List Empirical Estimation Techniques.
3.5.2 List Heuristic Techniques.
3.6 COCOMO- A Heuristic Estimation Technique.
     3.6.1 Outline Basic COCOMO Model.
     3.6.2 Outline Intermediate COCOMO.
     3.6.3 Explain Complete COCOMO.
     3.6.4 Illustrate COCOMO 2.
3.7 Define Scheduling.
     3.7.1 Explain Critical Path Method (CPM).
     3.7.2 Explain PERT Charts.
     3.7.3 Explain Gantt Chart.
3.8 Define Risk Management.
     3.8.1 What is Risk Identification?
     3.8.2 Explain Risk Assessment.
     3.8.3 Understand Risk Mitigation.
3.9 Explain Software Configuration Management.
3.10 Outline Software Quality Management System.
3.11 Explain ISO 9000.
3.12 Demonstrate Capability Maturity Model Integration (CMMI).

CO4: Gathering and Analysing the Requirements of a Software project.

4.0 Requirements Analysis and Specification.
4.1 Outline Requirements Gathering and Analysis.
     4.1.1 Explain Requirements Gathering.
     4.1.2. Explain Requirements Analysis.
4.2. Illustrate Software Requirements Specification (SRS).
     4.2.1 Identify theUsers of SRS Document.
     4.2.2 Why Spend Time and Resource to Develop an SRSDocument?
     4.2.3 What are Characteristics of a Good SRS Document?
     4.2.4 Identify the Attributes of Bad SRS Documents.
     4.2.5 Explain Functional Requirements.
     4.2.6 How to Identify the Functional Requirements?
     4.2.7 How to Document the Functional Requirements?
4.3 Identify Non-Functional Requirements.
4.4 Organization of the SRS Document.
4.5 Outline Formal system specification.

CO5: Selecting appropriate Designing methodologies.
5.0 Software Design.
5.1   Overview of the Design Process.
        5.1.1Outcome of the Design Process.
        5.1.2Classification of Design Activities.
        5.1.3Classification of Design Methodologies.
5.2   Define Cohesion and Coupling.
5.3   Explain Function-oriented Design.
        5.3.1 Explain Data Flow Diagrams.
5.4   List and explain types of Object-oriented Design using UML.
        5.4.1Draw and explain Class Diagram.
        5.4.2 IllustrateObject Diagram.
        5.4.3 Draw and explain Interaction Diagram.
        5.4.4Draw and explain Sequence Diagram.
        5.4.5Illustrate Collaboration Diagram.
        5.4.6Draw and explain Activity Diagram.
        5.4.7Illustrate State Chart Diagram.
        5.4.8 Draw and explain Deployment Diagram

CO6: Understand the coding and testing.
6.0. Coding and Testing.
6.1   Define Coding.
        6.1.1Explain Coding Standards and Guidelines.
        6.1.2 Define Code Review.
        6.1.3 What is Code Walkthrough?
        6.1.4 Define Code Inspection.
6.2   Outline Software Documentation.
        6.2.1 Explain Internal Documentation.
        6.2.2 Explain External Documentation.
6.3   Define Testing.
        6.3.1 Understand basic Concepts and Terminologies.
        6.3.2 What are Testing Activities?
        6.3.3 Why to Design Test Cases?
6.4   Explain Unit Testing.
6.5   Illustrate Black-box Testing.
6.6   Explain White-Box Testing.
6.7   Illustrate Integration Testing.
6.8   Illustrate Interpret System Testing.
6.9   Explain Debugging.
        6.9.1 Outline Debugging Approaches.
        6.9.2 Understand Debugging Guidelines.
6.10 Explain Software Reliability.
6.11 Compare Hardware versus Software Reliability.

Student activity like mini-project, surveys, quizzes, etc. should be done in group of 5-10students. Each group should do any one of the following type of activity or any other similar activity related to the course with prior approval from the course coordinator and programming coordinator concerned.

1. Each group should conduct different activity and no repetition should occur.
2. Explore and analyze topics to improve the level of creativity and analytical skill by taking Quiz/ tests/ assignments. Documents have to be maintained as a record.
3. Create a power point presentation on the topic relevant to course or advanced topics an extension to the course to improve the communication skills. Documents have to be maintained as a record.
4. Visit different sites relevant to topics. Listen to the lectures and submit a handwritten report.
5. Attend Guest Lectures from experienced professors.
6. Participate in collaborative Research Projects.
7. Learn advanced topics of Software engineering.

Suggested e-Learning Links
1. https://www.geeksforgeeks.org/software-engineering-introduction-to-software-engineering/
2. https://www.coursera.org/articles/category/software-development
3. https://www.javatpoint.com/software-engineering
4. https://onlinecourses.nptel.ac.in/noc20_cs68/preview
5. https://www.mtu.edu/cs/undergraduate/software/what/#:~:text=Software%20engineering%20is%20the%20branch,software%20solutions%20for%20end%20users.

CO-PO Mapping Matrix

CO	Basic and Discipline Specific Knowledge PO1	Problem Analysis PO2	Design/Development of Solutions PO3	Engineering Tools, Experimentation and Testing PO4	Engineering Practices for Society, Sustainability and Environment PO5	Project Management PO6	Lifelong Learning PO 7	Linked PO
CO1	2							1
CO2	3	1	2				1	1,2,3,7
CO3	3	1	1			2	1	1,2,3,7
CO4	2		2			1		1,3,6
CO5	2	1	1				1	1,2,3,7
CO6	2	1	2				1	1,2,3,7

TIME: 1HOUR   **MAXIMUM MARKS: 20**

PART-A   *MARKS: 4 X 1=4*

NOTE: 1. Answer all questions.
*   2. Each question carries one mark.*
1. Define Software engineering?
2. List different types of development projects?
3. What is Software Development life cycle.
4. what is Prototype Model?

PART-B   *MARKS: 2 X 3=6*

NOTE: 1. Answer any one question from 5 and 6.
*   2. Each question carries three marks.*

5. a) What is Control flow-based Design?
                    (OR)
   b) List Notable Changes in Software development practice e.
6. a) State the need of Software development life cycle.
                    (OR)
   b) List different software development life cycle models.

PART-C   *MARKS: 2 X 5=10*

NOTE: 1. Answer any one question from 7 and 8.
*   2. Each question carries five marks.*
7. a) Illustrate Solution to the Software Crisis.
                    (OR)
   b) Explain Computer Systems Engineering.
8. a) Illustrate prototype model.
                    (OR)
   b) How to Select an Appropriate Life cycle Model for a Project.

TIME: 1HOUR   MAXIMUM MARKS: 20

PART-A   *MARKS: 4 X 1 =4*

NOTE: 1. Answer all questions.
*   2. Each question carries one mark.*

1. Define project planning?
2. Define PERT Charts?
3. What is Requirement gathering.
4. Define Non-Functional Requirements?

PART-B   *MARKS: 2 X 3=6*

NOTE: 1. Answer any one question from 5 and 6.
*   2. Each question carries three marks.*

5. a) What is Function Point Metrics.
             (OR)
   b) List Empirical Estimation Techniques?
6. a) What is SRS Document?
             (OR)
   b) List the users of SRS document.

PART-C   *MARKS: 2 X 5=10*

NOTE: 1. Answer any one question from 7 and 8.
*   2. Each question carries five marks.*

7. a) Explain the sliding Window Planning.
             (OR)
   b) Explain COCOMO2 model.
8. a) Explain Requirement gathering and Analysis.
             (OR)
   b) How to identify the Functional Requirements.

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, TELANGANA
MODEL QUESTION PAPER
BOARD DIPLOMA SEMESTER EXAMINATION (C-24)
CS-V-SEMESTER
CS-504 – Software Engineering

TIME: 1HOUR   **MAXIMUM MARKS: 20**

PART-A   *MARKS: 8 X 1=8*

NOTE: 1. Answer all questions.
*   2. Each question carries one mark.*

1. What is Structured Oriented Design?
2. Define Scheduling?
3. What is cohesion?
4. Define Coupling?
5. What is Data flow Diagram?
6. List design Activities?
7. Define Coding?
8. What is Software Reliability?

PART-B

NOTE: 1. Answer any one question from 9, 10, 11 and 12.   MARKS: 4 X 3=12
*   2. Each question carries three marks.*

9.   a) What are different types of software Development Projects?
           (OR)
     b) What are the Out Comes of Design Process.
10. a) List Project Estimation Techniques.
           (OR)
     b) What is code Review?
11. a) List the UML Diagrams.
           (OR)
     b) What is Function Oriented Design?
12. a) State the need Documentation.
           (OR)
     b) What are Testing Activities?

PART-C

NOTE: 1. Answer any one question from 13, 14, 15 and 16   MARKS: 4 X 5=20
*   2. Each question carries five marks.*

13. a) Explain Notable Changes in Software Development Practices.
           (OR)
     b) Explain the Usage of Activity Diagram with Neat Sketch.
14. a) Demonstrate Capability Maturity Model Integration (CMMI).
           (OR)
     b) Explain coding Standards and Guidelines.
15. a) Explain Data Flow Diagram.
           (OR)
     b) Explain State Chart Diagram with a neat sketch.
16. a) Explain Debugging Guidelines.
           (OR)
     b) Compare Hardware Reliability and Software Reliability.

CS-505A - INTERNET OF THINGS (IOT)

Course Title:	**Internet of Things (IoT)**	Course Code	**CS-505A**
Semester	**V Semester**	Course Group	**Elective**
Teaching Scheme in Periods (L:T:P)	**60:15:0**	Credits	**2.5**
Methodology	**Lecture+Tutorials**	Total Contact Periods	**75**
CIE	**60 Marks**	SEE	**40 Marks**

Pre-requisites

Knowledge of basic programming skills in python, networking concepts and basic electronic components.

Course Outcomes
Upon completion of the course, the student shall be able to

CO1	Familiarize with Internet of Things Physical and Logical Design and Levels.
CO2	Understand IoT System Management with NETCONF-YANG
CO3	Understand Internet of Things, its hardware & software components and applications.
CO4	Interpret IoT Application Development
CO5	Discuss Security, Privacy and Governance in IoT
CO6	Explain IIoT and Case studies for IoT Design

Course Content and Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE			
				R	U	A
I	**Introduction to Internet of Things**	12		Q1	Q9(a)	Q13(a)
II	**M2M, IoT System Management with NETCONF-YANG**	13	Q4			
III	**Elements of IoT**	12		Q2	Q10(a)	Q14(a)
IV	**IoT Application Development**	13				
V	**IoT Privacy, Security and Governance**	12	Q3	Q5,Q6	Q9(b),Q11(a), Q11(b)	Q13(b),Q15(a), Q15(b)
VI	**IIoT and Case Studies on IoT Design**	13		Q7,Q8	Q10(b),Q12(a), Q12(b)	Q14(b),Q16(a), Q16(b)
	Total	75		8	8	8

Course Contents

UNIT - 1: Introduction to Internet of Things   **Duration: 12 Periods (L: 10 – T: 2)**

IoT – Definition, characteristics, Physical design of IoT, Things in IoT, IoT Protocols, Logical Design of IoT, IoT functional blocks, IoT communication Models, IoT communication API's IoT enabling Technologies – Wireless sensor networks, Cloud Computing, Big Data Analytics, Communication protocols, embedded systems. IoT Levels and Deployment templates – IoT Level-1, IoT Level-2, IoT Level-3, IoT Level-4, IoT Level-5, IoT Level-6, Popular IoT platforms, Domain specific IoTs

UNIT - 2: M2M, IoT System Management with NETCONF-YANG
                                        Duration: 13 Periods (L: 11 – T: 2)

M2M, Difference between IoT and M2M, SDN and NFV for IoT, Need for IoT Systems Management, Simple Network Management Protocol, Network Operator requirements, NETCONF, YANG, IoT Systems Management with NETCONG-YANG

UNIT - 3: Elements of IoT   **Duration: 12 Periods (L: 10 – T: 2)**

Overview of IoT components-basic building blocks of IoT, Hardware Components- IoT Devices: Raspberry PI, Arduino; Sensors, Actuators, Smart objects and RFID, Software Components-Python Packages of interest for IoT, Networking Protocols

UNIT – 4: IoT Application Development   **Duration: 13 Periods (L: 10– T: 3)**

IoT Design Methodology, Linux on Raspberry PI, Raspberry PI interfaces, Programming Raspberry PI with Python, Data storage on cloud/local server

UNIT - 5: IoT Privacy, Security and Governance

Duration: 12 Periods (L: 10– T:2)

Overview of Governance, Security and Privacy issues, Security, Privacy and Trust in IoT, IoT security life cycle, use of Blockchain in IoT security

UNIT - 6: IIoT and Case Studies on IoT Design   **Duration: 13 Periods (L: 10 – T:3)**

Industrial Internet of Things (IIoT), Differentiate IoT and IIoT, Case Studies-Home Automation, Urban Cities, Environment, Agriculture, Health Care, Transportation.

Reference Books

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

3. Dr. SRN Reddy, RachitThukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs

4. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill

Suggested E-learning references

1. https://internetofthingsagenda.techtarget.com/
2. https://dzone.com/iot-developer-tutorials-tools-news-reviews
3. https://blog.bosch-si.com/
4. https://www.hackster.io/
5. https://www.libelium.com/
6. https://www.ibm.com/blogs/internet-of-things/
7. https://azure.microsoft.com/en-us/blog/topics/internet-of-things/
8. https://blog.arduino.cc/
9. https://www.raspberrypi.org/blog/
10. www.lemalabs.com/iot

Suggested Learning Outcomes

For achieving the Course outcomes, the following learning outcomes must be achieved.

CO1: Familiarize with Internet of Things Physical and Logical Design and Levels

1.1   Define IoT and
1.2   Illustrate characteristics of IoT
1.3   Explain Physical Design of IoT
1.4   Explain Logical Design of IoT
1.5   Understand IoT Enabling Technologies
        1.5.1   Wireless Sensor Networks
        1.5.2   Cloud Computing
        1.5.3   Big Data Analytics
        1.5.4   Communication Protocols
        1.5.5   Embedded Systems
1.6   Categorize IoT Levels and Deployment templates
        1.6.1   IoT Level-1
        1.6.2   IoT Level-2
        1.6.3   IoT Level-3
        1.6.4   IoT Level-4
        1.6.5   IoT Level-5
        1.6.6   IoT Level-6
1.7   List the various domain areas for application of IoT

CO2: Understand IoT System Management with NETCONF-YANG

    2.1   Interpret M2M

    2.2   Distinguish between IoT and M2M

    2.3   Explain Software Defined Networking (SDN) for IoT

    2.4   Explain Network Function Virtualization (NFV) for IoT

    2.5   Interpret the need for IoT Systems Management

    2.6   Explain Simple Network Management Protocol

    2.7   Summarize Network Operator requirements

    2.8   Define NETCONF

    2.9   Define YANG

    2.10 Explain NETCONG-YANG for IoT Systems Management

CO3: Understand Internet of Things, its hardware & software components and Applications.

    3.1   Recall the fundamental components of the Internet of Things (IoT)

    3.2   Explain the basic building blocks that constitute IoT systems

    3.3   Summarize the purpose and significance of Raspberry PI

    3.4   Explain the role of Arduino in IoT applications

    3.5   Identify various sensors employed in IoT applications

    3.6   Classify Actuators

    3.7   What are smart objects and explain their role in IoT

    3.8   Summarize the use of Radio-Frequency Identification (RFID) in IoT

    3.9   Recall Python packages relevant to IoT development

          3.9.1   JSON

          3.9.2   XML

          3.9.3   HTTPLib & URLLib

          3.9.4   SMTPLib

    3.10 Identify networking protocols commonly used in IoT

CO4: Interpret IoT Application Development

    4.1   What are the key steps of IoT Design Methodology

    4.2   Summarize the process of installing and configuring Linux on Raspberry PI

    4.3   Identify and explain various interfaces available on Raspberry PI

          4.3.1 Serial

          4.3.2 SPI

          4.3.3 I2C

    4.4   Explain steps to interface Raspberry PI components with Python programming.

    4.5   Summarize an IoT System using Python for Controlling LED with Raspberry PI

    4.6   Explain an IoT System using Python for Interfacing an LED and Switch with Raspberry PI

    4.7   Illustrate an IoT System using Python for Interfacing a Light sensor(LDR) with Raspberry PI

    4.8   Explain the steps involved in storing data on local and cloud for IoT

    4.9   Describe the advantages and challenges of using cloud-based data storage for IoT

CO5: Discuss Security, Privacy and Governance in IoT

    5.1 What is the need for Governance in the field of IoT

    5.2 What are the key components of governance in the context of IoT

    5.3 Illustrate the key aspects of the security, privacy, and trust in IoT environments

    5.4 Explain the Privacy issues in IoT

    5.5 Explain the Security related issues in IoT

    5.6 Differentiate between security and privacy concerns in the context of IoT

    5.7 Summarize the ways to build trust in IoT

    5.8 Explain the stages of the IoT security life cycle

    5.9 Explain the significance of incorporating block chain technology in IoT security

CO6: Explain IIoT and IoT Design Case studies

    6.1 Define Industrial Internet of Things (IIoT)

    6.2 What are the key characteristics of the Industrial Internet of Things (IIoT)

    6.3 Distinguish between the concepts of IoT and IIoT

    6.4 Demonstrate a Case Study on Home Automation

    6.5 Demonstrate a Case Study on IoT for Urban Cities

    6.6 Demonstrate a Case Study on IoT for Environment

    6.7 Demonstrate a Case Study on IoT for Agriculture

    6.8 Demonstrate a Case Study on IoT for Health Care

    6.9 Demonstrate a Case Study on IoT for Transportation.

Suggested Student Activities

Student activity like mini-project, surveys, quizzes, etc. should be done in group of 3-5 students.

●   Each group should do any one of the following type activity or any other similar activity related to the course and before conduction, get it approved from concerned course coordinator and programme co-coordinator.

●   Each group should conduct different activity and no repeating should occur.

   1. Study different IoT's programs and prepare a report.

   2. Develop some simple IoT based applications

   3. Visit Library to refer to standard Books on IoT concepts, collect related material and prepare notes.

   4. Refer to online content and videos to get more knowledge on IoT concepts.

   5. Interact with industry people who are working in IoT technologies and prepare a report.

   6. Analyze different types of IoT Software's used and submit a report.

   7. Write assignments given by course coordinator.

   8. Read all the course contents and should be able to write slip tests and surprise tests.

   9. Prepare a seminar on a specific topic that is related to latest technologies in the IoT application development and present a Power Point Presentation (PPT) to all the peers.

CO-PO Mapping Matrix

CO	Basic and Discipline Specific Knowledge PO1	Problem Analysis PO2	Design/Development of Solutions PO3	Engineering Tools, Experimentation and Testing PO4	Engineering Practices for Society, Sustainability and Environment PO5	Project Management PO6	Lifelong Learning PO 7	Linked PO
CO1	2						1	1,7
CO2	2		1	1			1	1,3,4,7
CO3	2	1	1	1			2	1,2,3,4,7
CO4	2	1	1	1			2	1,2,3,4,7
CO5	3	1			1		2	1,2,5,7
CO6	3	3	2	2	2	1	1	1,2,3,4,5,6,7

Time: 1 hour   **Max. Marks: 20**

PART-A
Answer <u>All</u> questions. Each carries 1 mark.   4X1=04 Marks

1. Define IoT.
2. List IoT Levels.
3. Define YANG.
4. What is M2M?

PART-B

Answer any <u>TWO</u> questions. Each carries 3marks.   2X3=06Marks

5a) List characteristics of IoT.

OR

5b) Why Cloud computing is used in IoT.

6a) Distinguish between IoT and M2M.

OR

6b) List Network Operator requirements in IoT.

PART-C

Answer <u>TWO</u> questions. Each carries 5marks.   2X5=10Marks

7a) Explain Physical Design of IoT.

OR

7b) Explain Level-1 and Level-2 of IoT.

8a) Explain Software Defined Networking (SDN) for IoT.

OR

8b) Explain Simple Network Management Protocol.

Time: 1 hour   **Max. Marks:20**

PART-A

Answer All questions. Each carries 1 mark.   4X1=04 Marks

1. List fundamental components of the Internet of Things (IoT).
2. What is Actuator?
3. List the steps of IoT Design Methodology.
4. List interfaces available on Raspberry PI.

PART-B
Answer any TWO questions out of Three questions. Each carries 5marks.   2X5=10Marks

5a) List the networking protocols commonly used in IoT.

OR

5b) what is the use of Radio-Frequency Identification (RFID) in IoT.
6a) Write the key steps of IoT Design Methodology.

OR

6b) write the advantages of using cloud-based data storage for IoT.

PART-C

Answer any TWO questions. Each carries 5 marks.   2X5=10Marks

7a) Explain the basic building blocks that constitute IoT systems.

OR

7b) Explain the role of Arduino in IoT applications.

8a) Explain steps to interface Raspberry PI with Python programming.

OR

8b) Explain the steps involved in storing data on local and cloud for IoT.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING:TS:HYDERABD

SEMESTER END EXAMINATION <u>MODEL</u> QUESTION PAPER

24CS-505EA- Internet of Things

Time: 2 hours   **Max. Marks:40**

PART-A

Answer <u>All</u> questions. Each carries 2 marks.   **1X8=08 Marks**

1. List IoT levels
2. What is meant by smart object?
3. List stages of the IoT security life cycle
4. List Python packages relevant to IoT
5. List key components of governance in IoT
6. List Privacy issues in IoT
7. Define Industrial Internet of Things(IIoT)
8. List key characteristics of IIoT.

PART-B

Answer <u>all</u> questions. Each questions carry 3 marks   3X4=12Marks

9.   a) Distinguish between IoT and M2M.
                                OR
        b) What is the need for Governance in IoT?

10.   a) Write the challenges of using cloud-based data storage for IoT.
                                        OR
        b) Distinguish between IoT and IIoT.

11   a) How to build trust in IoT.
                                OR
        b) Distinguish between security and privacy in IoT.

12   a) Name three cases where we can use IoT in Cities.
                                        OR
        b) Name three cases where we can use IoT in Transportation.

PART-C

ANSWER ALL THE QUESTIONS. EACH QUESTION CARRIES 5 MARKS.
5x4 = 20 M

13a. Explain Logical Design of IoT.

OR

13b. Explain the Security related issues in IoT.

14a. Explain the basic building blocks of IoT.

OR

14b.   Analyse the applicaiton of IoT in Environment.

15a. Explain the stages of the IoT security life cycle.

OR

15b. Explain the role of blockchain technology in IoT security.

16a.   Analyse the applicaiton of IoT in Ariculture.

OR

16b.   Analyse the applicaiton of IoT in Home Automation

CS-505B CLOUD COMPUTING AND BIG DATA

Course Title:	**Cloud Computing and Big Data**	Course Code	**CS-505B**
Semester	**V Semester**	Course Group	**Elective**
Teaching Scheme in Periods (L:T:P)	**4:1:0**	Credits	**2.5**
Methodology	**Lecture+Tutorials**	Total Contact Periods	**75**
CIE	**60 Marks**	SEE	**40 Marks**

Pre requisites

Students should have basic computer skills, programming knowledge (e.g., Python, Java), and understanding of networking and databases, with familiarity with Linux command line and mathematics/statistics concepts being beneficial for the Cloud Computing and Big Data course.

Course Outcomes

Upon completion of the course, the student shall be able to

CO1	Interpret fundamental concepts, historical evolution, and significance of cloud computing and big data.
CO2	Analyze and compare cloud architecture, deployment models, and service models for diverse business requirements.
CO3	Classify big data characteristics, key technologies, and storage/processing approaches for large-scale datasets.
CO4	Design and implement scalable, secure cloud-based data storage solutions adhering to data lifecycle and compliance requirements.
CO5	Apply data pre-processing, transformation, and analytics techniques for extracting insights from large datasets using batch and real-time processing.
CO6	Evaluate advanced concepts, emerging trends, and ethical considerations shaping cloud computing and big data.

Unit No	Unit Name	Periods	Questions to be set for SEE				
				R		U	A
I	Introduction to Cloud Computing and Big Data	13	Q4	Q1		Q9(a)	Q13(a)
II	Fundamentals of Cloud Computing	12					
III	BigData Foundations	13		Q2		Q10(a)	Q14(a)
IV	Data Storage and Management in the Cloud	12					
V	BigData Analytics and Processing	12		Q3	Q5,Q6	Q9(b),Q11(a), Q11(b)	Q13(b),Q15(a), Q15(b)
VI	Advanced Topics and Emerging Trends	13			Q7,Q8	Q10(b),Q12(a), Q12(b)	Q14(b),Q16(a), Q16(b)
	Total	75		8		8	8

Course Contents

UNIT - 1: Introduction to Cloud Computing and Big Data

Duration: 13 Periods (L: 10 – T:3)

Overview of cloud computing and big data concepts, Historical background and evolution, Importance and relevance in modern IT infrastructure, Key challenges and opportunities

UNIT - 2: Fundamentals of Cloud Computing

Duration: 12 Periods (L:10 – T:2)

Understanding cloud architecture and deployment models (public, private, hybrid), Virtualization technologies and cloud service models (IaaS, PaaS, SaaS), Cloud storage, networking, and security principles, Case studies and real-world examples of cloud computing implementation

UNIT - 3: Big Data Foundations

Duration: 13 Periods (L:10 – T:3)

Introduction to big data: definition, characteristics, and challenges, Overview of big data technologies and ecosystems (Hadoop, Spark, NoSQL databases), Data acquisition, storage, processing, and analysis techniques, Big data analytics: batch processing vs. real-time processing

UNIT – 4: Data Storage and Management in the Cloud

Duration: 12 Periods (L:10– T:2)

Cloud-based storage solutions (object storage, file storage, databases), Data lifecycle management and governance in the cloud, Scalability, availability, and durability considerations, Data security and compliance in cloud environments

UNIT - 5: Big Data Analytics and Processing

Duration: 12 Periods (L:10– T:2)

Data preprocessing and transformation techniques, Batch processing with MapReduce and Hadoop ecosystem, Stream processing with Apache Kafka and Spark Streaming, Machine learning and predictive analytics on big data

UNIT - 6: Advanced Topics and Emerging Trends

Duration: 13 Periods (L:10 – T:3)

Edge computing and its impact on cloud and big data, Serverless computing and functions-as-a-service (FaaS), Containerization and orchestration with Docker and Kubernetes, Ethical considerations, privacy issues, and future directions

Reference Books

1. "Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl, Zaigham Mahmood, and Ricardo Puttini.
2. "Big Data: Principles and best practices of scalable realtime data systems" by Nathan Marz and James Warren.
3. "Hadoop: The Definitive Guide" by Tom White.
4. "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost and Tom Fawcett.
5. "The Cloud Adoption Playbook: Proven Strategies for Transforming Your Organization with the Cloud" by Moe Abdula and Ingo Averdunk.

Website References:
1. [Cloud Academy](https://cloudacademy.com/)
2. [edX - Big Data and Cloud Computing Courses](https://www.edx.org/learn/big-data)
3. [Apache Hadoop](https://hadoop.apache.org/)
4. [Apache Spark](https://spark.apache.org/)
5.[Coursera]CloudComputingSpecialization](https://www.coursera.org/specializations/cloud-Computing)

Upon completion of the course, the student shall be able to

1. **Introduction to Cloud Computing and Big Data**

   1.1 Recall significant milestones in the historical development of cloud computing and big data.

   1.2 Explain the core concepts of cloud computing and big data, including their definitions and underlying principles.

   1.3 Apply cloud computing and big data principles to solve practical problems in various industries.

   1.4 Analyze the impact of cloud computing and big data on modern IT infrastructure and business operations.

   1.5 Evaluate the effectiveness of different cloud computing and big data solutions in meeting organizational needs.

   1.6 Develop innovative strategies for integrating cloud computing and big data technologies to enhance business processes.

   1.7 Recall key terminology associated with cloud computing and big data.

   1.8 Understand the differences between traditional IT infrastructure and cloud-based solutions.

   1.9 Apply best practices for deploying and managing cloud computing and big data systems.

   1.10 Analyze case studies to identify successful implementations of cloud computing and big data solutions.

   1.11 Evaluate the scalability and performance of cloud computing and big data platforms.

   1.12 Design data architecture plans that leverage cloud computing and big data technologies effectively.

   1.13 Analyze potential risks and challenges associated with migrating to cloud-based Infrastructure and implementing big data solutions. Define sound and Acoustic

2. **Fundamentals of Cloud Computing.**

   2.1 Define the architecture and deployment models of cloud computing, including public, private, and hybrid clouds.

   2.2 Describe virtualization technologies and their role in cloud computing.

   2.3 Differentiate between various cloud service models, such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).

   2.4 Explain the principles of cloud storage, networking, and security.

   2.5 Analyze case studies and real-world examples to understand the practical implementation of cloud computing across different industries.

   2.6 Classify the characteristics and advantages of public, private, and hybrid cloud deployments.

2.7 Evaluate the scalability and flexibility of virtualization technologies in cloud environments.

2.8 Compare and contrast the features and benefits of different cloud service models.

2.9 Assess the impact of cloud storage, networking, and security principles on data management and protection.

2.10 Synthesize lessons learned from case studies to propose effective strategies for cloud adoption and migration.

2.11 Formulate recommendations for optimizing cloud infrastructure based on industry best practices and emerging trends.

2.12 Critically analyze the challenges and opportunities associated with integrating cloud computing into existing IT ecosystems.

3. Big Data Foundations

3.1 Define big data, elucidating its key characteristics and challenges.

3.2 Explore the technologies and ecosystems associated with big data, including Hadoop, Spark, and NoSQL databases.

3.3 Examine techniques for data acquisition, storage, processing, and analysis in big data environments.

3.4 Compare and contrast batch processing and real-time processing in the context of big data analytics.

3.5 Analyze case studies and real-world examples to understand the application of big data technologies across various domains.

3.6 Identify the role of Hadoop in distributed storage and processing of large datasets.

3.7 Evaluate the capabilities of Spark for in-memory processing and iterative algorithms in big data analytics.

3.8 Investigate the characteristics and use cases of different types of NoSQL databases in handling diverse data types and structures.

3.9 Assess strategies for efficient data storage and retrieval in big data ecosystems.

3.10 Implement data processing pipelines using tools and frameworks such as Apache Kafka and Apache Flink.

3.11 Design data analysis workflows to derive actionable insights from big data sources.

3.12 Develop proficiency in utilizing big data visualization tools to communicate insights effectively.

3.13 Critically evaluate ethical and privacy considerations associated with big data collection, analysis, and utilization.

4. **Data Storage and Management in the Cloud**

   4.1 Explore cloud-based storage solutions, including object storage, file storage, and databases.

   4.2 Discuss data lifecycle management and governance practices tailored for cloud environments.

   4.3 Evaluate scalability, availability, and durability considerations when selecting cloud storage solutions.

   4.4 Assess data security mechanisms and compliance requirements in cloud environments.

   4.5 Compare and contrast different types of cloud-based storage solutions in terms of performance and cost-effectiveness.

   4.6 Develop strategies for optimizing data storage and retrieval processes in cloud-based systems.

   4.7 Analyze case studies to understand best practices for data storage and management in cloud environments.

   4.8 Implement data governance frameworks to ensure data integrity and regulatory compliance in the cloud.

   4.9 Design disaster recovery and backup solutions for cloud-based data storage systems.

   4.10 Investigate the role of data encryption and access controls in ensuring data security in the cloud.

   4.11 Develop proficiency in utilizing cloud-native databases and storage services for various use cases.

   4.12 Critically evaluate emerging trends and challenges in cloud-based data storage and management.

5. **Big Data Analytics and Processing**

   5.1 Implement data preprocessing and transformation techniques to prepare raw data for analysis.

   5.2 Understand the principles and workflow of batch processing using MapReduce and the Hadoop ecosystem.

   5.3 Explore stream processing methodologies with Apache Kafka and Spark Streaming for real-time data analysis.

   5.4 Apply machine learning algorithms and predictive analytics techniques to extract insights from big data.

   5.5 Evaluate the suitability of different data preprocessing techniques based on data characteristics and analysis goals.

   5.6 Design and implement MapReduce jobs to process large-scale datasets efficiently.

   5.7 Configure and deploy Apache Kafka for building real-time data pipelines in big data applications.

   5.8 Utilize Spark streaming to perform continuous processing and analysis of streaming

data.

5.9 Develop machine learning models using big data platforms to solve classification, regression, and clustering problems.

5.10 Assess the performance and scalability of batch and stream processing frameworks for big data analytics.

5.11 Analyze case studies and practical examples to understand the application of big data analytics in various domains.

5.12 Critically evaluate the ethical and social implications of using machine learning on big data for decision-making.

6. **Advanced Topics and Emerging Trends**

6.1 Examine the concept of edge computing and its implications for cloud and big data architectures.

6.2 Evaluate the advantages and challenges of serverless computing and Functions-as-a-Service (FaaS) in cloud environments.

6.3 Explore containerization technologies such as Docker and orchestration tools like Kubernetes for deploying and managing cloud-native applications.

6.4 Analyze ethical considerations and privacy issues related to the collection and processing of data in cloud and big data environments.

6.5 Investigate emerging trends and future directions in cloud computing and big data analytics.

6.6 Understand the architectural principles and deployment models of edge computing in distributed systems.

6.7 Implement serverless functions and deploy them using cloud platforms like AWS Lambda or Azure Functions.

6.8 Design containerized applications and manage them at scale using Docker and Kubernetes.

6.9 Evaluate the trade-offs between edge computing and centralized cloud architectures in terms of latency, reliability, and scalability.

6.10 Critically assess the impact of emerging technologies on data privacy, security, and regulatory compliance.

6.11 Explore the potential of edge computing and serverless architectures in enabling real-time analytics and IoT applications.

6.12 Investigate the role of containerization in enhancing the portability and efficiency of cloud-native applications.

6.13 Propose strategies for addressing ethical dilemmas and safeguarding user privacy in the era of ubiquitous computing and big data analytics.

Suggested Student Activities

1. Compare how companies use different types of cloud setups (public, private, or mixed) and what works best for them.
2. Look at a real example of a company moving its operations to the cloud. What were the problems, and how did they solve them?
3. Plan out how you'd handle a big bunch of data using tools like Hadoop and Spark. Think about how you'd get the data, analyze it, and use it.
4. Test out different ways to store data in the cloud and see which one is the most flexible and fast.
5. Talk about the fairness of using big data. Should companies be allowed to collect so much information about us? What about when they make decisions based on that data?

CO-PO Mapping Matrix

CO	Basic and Discipline Specific Knowledge	Problem Analysis	Design/Development of Solutions	Engineering Tools, Experimentation and Testing	Engineering Practices for Society, Sustainability and Environment	Project Management	Lifelong Learning	Linked PO
	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	
CO1	3							1
CO2		2						2
CO3	3							1
CO4				3				4
CO5		2						2
CO6							3	7

CS-505(B)- Cloud Computing and Big Data
V SEMESTER MID-I SEMESTER – I MODEL PAPER

Time: 1 hour   Max. Marks:20

PART-A
Answer All questions. Each carries 1 mark.   4X1=04 Marks

1. List the key components of cloud computing and big data.

2. What are challenges in cloud computing and big data adoption?

3. What are the three main cloud service models?

4. Identify the essential components of cloud storage solutions.

PART-B

Answer any TWO questions. Each carries 3marks.   2X3=06Marks

5a) Explain the significance of cloud computing and big data in modern IT infrastructure

OR

5b) Write the key differences between cloud computing and traditional IT infrastructure?

6a) Explain the concept of virtualization and its significance in cloud computing.

OR

6b) How do cloud service models differ from traditional software deployment models?

PART-C

Answer TWO questions. Each carries 5marks.   2X5=10Marks

7a) Develop a plan for a small business to migrate its IT infrastructure to the cloud, considering scalability and security aspects.

OR

7b) Propose strategies to overcome the challenges mentioned in cloud computing and big data adoption.

8a) Develop a cloud-based file storage solution for a hypothetical organization, ensuring data security and access controls.

OR

8b) Develop a proposal for a company interested in adopting cloud services, outlining the most appropriate deployment model and service model.

Time: 1 hour   Max. Marks:20

PART-A

Answer <u>All</u> questions. Each carries 1 mark.   **4X1=04 Marks**

1. List the characteristics of big data.
2. What are the primary challenges associated with big data processing?.
3. What are the key components of data lifecycle management in the cloud?..
4. Name three types of cloud-based storage solutions.

PART-B
Answer any <u>TWO</u> questions out of Three questions. Each carries 5marks.
2X5=10Marks

5a) .Explain the concept of big data and its significance in modern data environments
OR
5b) How does real-time processing differ from batch processing in big data analytics?.

6a) Explain the concept of data lifecycle management and its importance in cloud environments.
OR
6b) How do cloud-based databases differ from traditional on-premises databases in terms of management and governance?

.PART-C

Answer any <u>TWO</u> questions. Each carries 5 marks.   **2X5=10Marks**

7a) Develop a data acquisition strategy for a retail company interested in analyzing customer purchase data.
OR
7b) Implement a batch processing workflow using Hadoop MapReduce to analyze a large dataset.

8a) Develop a data lifecycle management plan for a cloud-based project, including data ingestion, storage, processing, and archival.

OR

8b) Design a scalable and reliable cloud storage solution for a growing startup company, considering data availability and redundancy.

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SEMESTER END EXAMINATION <u>MODEL</u> QUESTION PAPER

CS-505(B)- Cloud Computing and Big Data

Time: 2 hours   Max. Marks:40

PART-A

Answer <u>All</u> questions. Each carries 2 marks.   1X8=08 Marks

1. Name two virtualization technologies commonly used in cloud computing.
2. What are the key components of data lifecycle management in the cloud?

3. What are some techniques used for data preprocessing and transformation in big data analytics?

4. What are examples of challenges in cloud computing and big data adoption
5. Name two technologies commonly used for batch processing in big data ecosystems.
6. Identify a machine learning algorithm commonly used for predictive analytics on big data
7. Name two technologies commonly associated with edge computing
8. What are key characteristics of serverless computing?
   .

PART-B

Answer any <u>all</u> questions. All questions carry 3 marks

                                                      2X5=10Marks

9. a) Explain the significance of cloud computing and big data in modern IT infrastructure.
                    OR
   b) Describe the workflow of batch processing using MapReduce and Hadoop ecosystem.

10. a) How does real-time processing differ from batch processing in big data analytics?
                    OR
    b) Describe the principles of serverless computing and its benefits for application development

11 a) Explain the importance of data preprocessing and transformation in preparing data for analysis.

                    OR
  b) How does stream processing enable real-time analysis of data streams?

12 a) How do containerization and orchestration technologies enhance scalability and portability in cloud environments?

                    OR

b) Write about the ethical considerations and privacy issues associated with cloud computing and big data.

.

PART-C

Answer all the questions. Each question carries 5 marks.   **5x4 = 20 Marks**

13 a) Develop a plan for a small business to migrate its IT infrastructure to the cloud, considering scalability and security aspects.

OR

13 b) Design a stream processing pipeline using Apache Kafka and Spark Streaming to analyze real-time data streams.

14a) Design a scalable and reliable cloud storage solution for a growing startup company, considering data availability and redundancy

OR

14b) Design an edge computing solution for a smart city project, considering data processing at the network edge.

15a) Preprocess and transform a dataset using Apache Spark to prepare it for analysis.

OR

15b) Implement a batch processing job using Hadoop MapReduce to analyze a large dataset.

16a) Implement containerization and orchestration using Docker and Kubernetes for a micro services-based architecture.

OR

16b) Evaluate the ethical implications of using AI and machine learning in cloud computing and big data applications.

CS-506A- ARTIFICIAL INTELLIGENCE

Course Title	Artificial Intelligence	Course Code	CS-506A
Semester	V	Course Group	Elective
Teaching Scheme in Hrs (L:T:P)	4:1:0	Credits	2.5
Methodology	Lecture + Tutorials	Total Contact Hours	75
CIE	60 Marks	SEE	40 Marks

Prerequisites: This course requires the basic knowledge of Mathematical and Logical skills and concepts of Python programming.

Course Outcomes: After completion of this course the student should be able to

CO	Course Outcome
CO1:	Explain the basic concepts of Artificial Intelligence and Natural Language Processing
CO2:	Apply the Probability and Distribution concepts for solving AI Problems.
CO3:	Explore the Agent, Environment and Search strategies in AI
CO4:	Apply various Gaming Techniques in AI
CO5:	Illustrate various Knowledge representation techniques.
CO6:	Explore Machine learning, Deep Learning and Neural Networks

Unit No	Unit Name	Period	Questions to be set for SEE		
			R	**U**	**A**
I	Explain the basic concepts of Artificial Intelligence and Natural Language Processing	7	Q1	Q9(a)	Q13(a)
II	Apply the Probability and Distribution concepts for solving AI Problems.	16			
III	Explore the Agent, Environment and Search strategies in AI	17	Q2	Q10(a)	Q14(a)
IV	Apply various Gaming Techniques in AI	10			
V	Illustrate various Knowledge representation techniques.	10	Q5,Q6	Q9(b), Q11(a) Q11(b)	Q13(b), Q15(a) Q15(b)
VI	Explore Machine learning, Deep Learning and Neural Networks	15	Q7,Q8	Q10(b), Q12(a) Q12(b)	Q14(b), Q16(a) Q16(b)
	Total	75	8	8	8

(Q4 spans units I–IV in the R column; Q3 spans units V–VI in the R column.)

Course content:

UNIT –1 Explain the basic concepts of Artificial Intelligence and Natural Language Processing
Duration: 7 Periods (L:5-P: 2)

Introduction- Artificial Intelligence- Stages of AI- Domains of Learning-Application of AI- Work with Google Teachable Machine - Ethical Challenges.

UNIT – 2: Apply the Probability and Distribution concepts for solving AI Problems
Duration: 16 Periods (L:14-P: 2)

Introduction to Probability - State the Importance of Probability to AI - Conditional Probability - Multiplication Theorem - Bayes' Theorem - Probability Distribution - Random Variables - Bernoulli Trials and Binomial Distribution. Introduction to Bayesian networks

UNIT– 3: Explore the Agent, Environment and Search strategies in AI
Duration: 17Periods (L: 14-P: 3)

Percept and Rationality - Agents and types of Agents - Environment and types of Environment - Problems as a state space search - Problem Characteristics - Production system - Searching problems, solutions - Uninformed Searching strategy - Informed Searching strategy - Breadth First method - Depth-first search Method-Hill climbing.

UNIT – 4: Apply various Gaming Techniques in AI

Importance of AI for Games- Game theory - Types of Games - Game Tree Minimax algorithm – Alpha_Beta Pruning Algorithm - Evaluation function - Algorithm for a Tic Tac Toe game - history of Deep Blue game - Monte Carlo Search tree.

. **UNIT – 5: Illustrate various Knowledge representation techniques**

Duration: 10 Periods (L:8-P: 2)

Knowledge representation - Types of Knowledge representations - Knowledge representation issues - Predicate logic. Introduction to Large Language Model (LLM)

UNIT – 6: Explore Machine learning, Deep Learning and Neural Networks

Duration: 15 Periods (L:12-P: 3)

Machine Learning - Forms of Learning - List types of problems in supervised learning - Algorithms for Supervised Learning - Define optimization- Artificial Neural Networks - Unsupervised Learning - Examples for clustering.Introduction to Deep Learning and Generative AI.

Reference Books

1. Artificial Intelligence, 3rdEdn, E.Richand K. Knight(TMH)

2. Artificial Intelligence, 3rdEdn., Patrick Henny Winston, Pearson Education

3. Artificial Intelligence, ShivaniGoel,Pearson Education.

4. Probabilistic Graphical Models: Principles and Techniques" by Daphne Koller and Nir Friedman

5. Deep Learning by Ian Good fellow, Yoshua Bengio, and Aaron Courville

Suggested e-learning resources

1. https://teachablemachine.withgoogle.com/

2. https://www.youtube.com/watch?v=I9FOswjTSGg

3. https://www.youtube.com/watch?v=_eaJd3muf2E

4. https://www.image-net.org/

5. https://en.wikipedia.org/wiki/Ethics_of_artificial_intelligence

6. https://drive.google.com/file/d/1MyorSLV8RrPJWSimuCJ89uApW3vf69D7/view

7. https://ocw.mit.edu/resources/res-6-012-introduction-to-probability-spring-2018/part-i-the-fundamentals/

8. https://stanford.edu/~cpiech/cs221/apps/deepBlue.html

9. https://www.youtube.com/watch?v=Yskkx7dEo2k

10. https://www.youtube.com/watch?v=nXZvdG4DrDw

11. https://www.geeksforgeeks.org/minimax-algorithm-in-game-theory-set-3-tic-tac-toe-ai-finding-optimal-move/

12. https://www.javatpoint.com/artificial-intelligence-tutorial

13. https://towardsdatascience.com/monte-carlo-tree-search-158a917a8baa#:~:text=What%20is%20Monte%20Carlo%20Tree,the%20policy%20of%20the%20game.

14. https://www.javatpoint.com/types-of-artificial-intelligence

15. https://www.deeplearning.ai/

16. https://www.techtarget.com/searchenterpriseai/definition/generative-AI

Suggested Student Activities:

1. Each group should do any one of the following type of activity or any other similar activity related to the course with prior approval from the course coordinator and program coordinator concerned.
2. Each group should conduct different activity and no repetition should occur.
3. Explore and analyze topics to improve the level of creativity and analytical skill by taking Quiz/ tests/ assignments. Documents have to be maintained as a record.
4. Create a power point presentation on the topic relevant to course or advanced topic as an extension to the course to improve the communication skills. Documents have to be maintained as a record.
5. Visit different sites relevant to topics. Listen to the lectures and submit a handwritten report
6. Coding competitions.
7. Prepare a report on the case study on working of chatGPT and BharatGPT with respect to:
   a) Large Language Model

CO-PO Mapping Matrix

CO	Basic and Discipline Specific Knowledge	Problem Analysis	Design/Development of Solutions	Engineering Tools, Experimentation and Testing	Engineering Practices for Society, Sustainability Environment	Project Management	Lifelong Learning	Linked PO
	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	
CO	3							1
CO	3							1
CO	3		2					1,2
CO	3			2				1,4
CO	3		2			3		1,3,(
CO	2		2	2			1	1,3,4

CO 1.0: Explain the basic concepts of Artificial Intelligence and Natural Language Processing

1.0 Define Artificial Intelligence

1.1 History of Artificial Intelligence

     1.1.1 Turing test

     1.1.2 Define IBM Deep Blue for game Chess

     1.1.3 Define IBM Watson for game Jeopardy

     1.1.4 History about the Term AI

     1.1.5 Introduce Sophia the humanoid robot

     1.1.6 Define Game Alpha Go for game Go

1.2 Stages of AI

     1.2.1 Define Artificial Narrow Intelligence

     1.2.2 Define Artificial General Intelligence

     1.2.3 Define Artificial Super Intelligence

1.3 Domains of Learning

     1.3.1 Define Machine Learning

     1.3.2 Define Deep Learning

     1.3.3 Define Neural Networks

     1.3.4 Compare Artificial Intelligence and Data Science

     1.3.5 Define Robotics

     1.3.6 Introduction to Fuzzy Logic

1.4 Application of AI

     1.4.1 Define Natural Language Processing

     1.4.2 Define Computer Vision

     1.4.3 Define Virtual Reality

     1.4.4 Define Augmented Reality

     1.4.5 Define Expert Systems

     1.4.6 Examples of Expert System

1.5 Work with Google Teachable Machine

1.6 Ethical Challenges

     1.6.1 Explore Biases problem

     1.6.2 Explore Control Problem like Trolley Problem

1.6.3   Explore Privacy and Power Balance due to AI

1.6.4   Explore Intellectual Property like Music, Textbooks, and Fake News, Fake Tweets

1.6.5   Explore Environment impact of AI

CO: 2.0 Apply the Probability and Distribution concepts for solving AI Problems

2.0 Introduction to Probability

  2.0.1 Define Sample Space

  2.0.2 Define Event

2.1 State the Importance of Probability to AI

2.2 Conditional Probability and Simple Problems

2.3 Multiplication theorem on probability and Simple Problems

2.4 Independent Events, Total Probability and Simple Problems

2.5 Bayes' Theorem and Simple Problems

2.6 Define Probability Distribution

2.7 Random Variables and its Probability Distribution and Simple Problems

2.8 Bernoulli Trials and Binomial Distribution and Simple Problems

2.9 Define terms

  2.9.1   Discrete Probability Distribution

  2.9.2   Continuous Distribution

  2.9.3   Joint Distribution

  2.9.4   Multivariate Distribution

2.10 Introduction to Bayesian networks

CO: 3.0 Explore the Agent, Environment and Search strategies in AI

3.1 Define Percept and Rationality

3.2 Explain Agents and type of Agents

3.3 Explain Environment and types of Environment

3.4 Define the problems as a state space search

3.5 List the Problem Characteristics

3.6 Define the production system

3.7 Explain the Production systems

3.8 List the Features of Production system

3.9 Explain about Searching problems, solutions

3.10   Define Uninformed Searching strategy

3.11   Define Informed Searching strategy

3.12   Explain Breadth First method

3.13   Explain Breadth First method

3.14   Explain Depth First method

3.15   Explain Hill climbing

CO: 4.0 Apply various Gaming Techniques in AI

4.1 State the importance of AI for Games

4.2 Define Game theory

4.3 Define Types of Games according to Game theory

4.4 Define Game Tree

4.5 Explain Minimax algorithm

4.6 Explain Alpha-Beta Pruning Algorithm

4.7 Explain Evaluation function in Board Games

4.8 Apply Minimax Algorithm for a Tic Tac Toe game

4.9 Explore history of Deep Blue game

4.10   Explain Monte Carlo Search tree

4.11   List Some Games that employed Artificial Intelligence

CO: 5.0 Illustrate various Knowledge representation techniques

5.1 Define Knowledge representation

5.2 List and explain the types of Knowledge

5.3 Knowledge representation issues

   5.3.1   List and Explain issues in knowledge representation

   5.3.2   Explain representation mappings

   5.3.3   List the approaches to knowledge representation

5.4 Predicate logic

   5.4.1   Define predicate logic

   5.4.2   Illustrate simple facts in logic

   5.4.3   Illustrate instance and ISA relationships

   5.4.4   Describe Computable functions and predicates

   5.4.5   Quote Resolutions

5.5 Introduction to Large Language Model (LLM)

C0:6.0 Explore Machine learning, Deep Learning and Neural Networks

6.1 Define Machine Learning

6.2 Forms of Learning

      6.2.1   Explain Supervised Learning

      6.2.2   Explain Unsupervised Learning

      6.2.3   Explain Reinforcement Learning

6.3 List types of problems in supervised learning

      6.3.1   Define Regression

      6.3.2   Examples of regression problem

      6.3.3   Define classification problem

      6.3.4   Examples of classification problem

6.4 Algorithms for Supervised Learning

      6.4.1   How Supervised learning works

      6.4.2   Define Linear Regression

      6.4.3   Define Decision Tree

6.5 Define optimization

      6.5.1   Explain Gradient Descent Algorithm

6.6 Artificial Neural Networks

      6.6.1   Define neuron

      6.6.2   Define activation function

      6.6.3   List various activation functions

      6.6.4   Explain Architecture of Neural Network

      6.6.5   Define Deep Learning

      6.6.6   Establish relation between Artificial Intelligence, Machine Learning, and Deep Learning

6.7 Unsupervised Learning

      6.7.1   How unsupervised learning works

      6.7.2   Types of problems in Unsupervised Learning

      6.7.3   Define clustering

      6.7.4   Give Examples for clustering

6.8 Introduction to Deep Learning

6.9 Introduction to Generative AI

MODEL PAPER MID- SEM I

TIME: 1HOUR   **MAX. MARKS: 20**
PART-A

Answer ALL questions   **4 x 1= 4M**
1.   Define Artificial Intelligence
2.   List any two applications of AI
3.   Define Probability
4.   Define Bayesian Network

PART – B

Answer ALL questions   **2 x 3 = 6M**

5(a). Explain evolution of Artificial Intelligence
                                OR
5(b). Explain Different Stages of AI
6(a). Explain Conditional Probability with an Example.
                                OR
6(b). Explain Independent Events with an Example
PART – C
Answer ALL questions   **2 x 5 = 10M**
7(a). Explain any five challenges due to use of Artificial Intelligence

OR

7(b). Write the Steps to use Google teachable machine.

8(a). In a school, there are 1000 students, out of which 430 are girls. It is known that out of 430, 10% of the girls study in class XII. What is the probability that a student chosen randomly studies in Class XII given that the chosen student is a girl?

OR

8(b). An urn contains 10 black and 5 white balls. Two balls are drawn from the urn one after the other without replacement. What is the probability that both drawn balls are black?

MODEL PAPER MID- SEM II

TIME: 1HOUR   **MAX. MARKS: 20**
PART-A
Answer ALL questions   **4 x 1= 4M**
1. Define Agent
2. List any two types of Environments.
3. Define Game Tree
4. Define Tic Tac Toe Game

PART – B

Answer ALL questions   **2 x 3 = 6M**
5a. Explain any two types of Environments
OR
5b. Explain BFS algorithm
6a. Explain the history of Deep Blue Game.
OR
6b. Explain Depth First Search Algorithm.

PART – C

Answer ALL questions   **2 x 5 = 10M**
7a. Explain types of Agents
OR
7b. Explain Hill Climbing Algorithm

8a. Explain different Types of Games
OR
8b. Explain Minimax algorithm

STATE BOARD OF TECHNICAL EDUCATION & TRAINING: TS: HYDERABAD
SEMESTER END EXAMINATION MODEL QUESTION PAPER
CS-V-SEMESTER EXAMINATION
CS-506A-ARTIFICIAL INTELLIGENCE

Time: 2 hours Max. Marks: 40

Answer all questions. Each carries 1 mark. 8X1=8 Marks

1. What is IBM Deep Blue?
2. Define discrete probability distribution.
3. Define Deep Learning
4. Define uninformed search strategy
5. Define Predicate Logic
6. Define knowledge representation.
7. List any two forms of Learning
8. Define Decision Tree

PART-B

Answer ALL questions. Each carries 3 Marks. 4X3=12 Marks

9.(a) Explain Trolley Problem

OR

9(b) Explain about Large Language Model(LLM)

10(a) List the conditions to be satisfied by Bernoulli trials.

OR

10(b) Define Clustering. Give Example for Clustering

11 (a) Write about instance and ISA relationship.

OR

11 (b) How to represent simple fact in logic?

12 (a) Define Classification and give examples.

OR

12 (b) Explain about Deep Learning

Answer ALL questions. Each carries 5 Marks.   **4X5=20 Marks**

13a Explain how to use Google teachable machine

OR

13b Explain Issues in Knowledge Representation

14a. Ten eggs are drawn successively with replacement from a lot containing 10% defective eggs. Find the probability that there is at least one defective egg.

OR

14b. Explain Architecture of Neural Network

15a. Explain various approaches for knowledge representation.

OR

15b. Explain types of Knowledge.

16a. Explain forms of learning

OR

16b. Explain Gradient Descent Algorithm

CS 506B- MACHINE LEARNING

Course Title	**Machine Learning**	Course Code	**CS 506B**
Semester	**V Semester**	Course Group	**Elective**
Teaching Scheme in Periods (L:T:P)	**4:1:0**	Credits	**2.5**
Methodology	**Lecture +Tutorials**	Total Contact Periods	**75**
CIE	**60 Marks**	SEE	**40 Marks**

Prerequisites

Basic knowledge of Linear algebra, Calculus, Probability and statistics and programming in python.

Course Outcomes

Upon completion of the course the student shall be able to

CO1	Explain the fundamental principles of data and machine learning.
CO2	Comprehend the linear models in both regression and classification.
CO3	Explain the principles underlying non-linear models for classification.
CO4	Interpret the fundamental principles, Architecture, and working of Neural Networks.
CO5	Interpret the concepts of clustering, dimensionality reduction including their underlying principles and mechanisms.
CO6	Understand the concept of Deep Learning and its Algorithms, Machine Learning Applications.

Course Content and Blue Print of Marks for SEE

Unit No.	Unit Name	Periods	Questions to be set for SEE			
			R		U	A
I	Introduction of Machine Learning	9	Q4	Q1	Q9(a)	Q13(a)
II	Linear Models for Supervised Learning	16				
III	Decision Trees and Ensemble Methods	11		Q2	Q10(a)	Q14(a)
IV	Artificial Neural Networks	14				
V	Clustering, Dimensionality reduction	14		Q5, Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
VI	Deep Learning, Machine Learning Applications	11	Q3	Q7,Q8	Q10(b), Q12(a), Q12(b)	Q14(b), Q16(a), Q16(b)
	Total	75	8		8	8

Course Contents

UNIT -1: Introduction of Machine Learning: **Duration: 9 Periods (L:7 - T:2)**

Data- types of data, data preprocessing. Introduction of machine learning: Definition-Applications - Types of machine learning algorithms, Supervised learning: Issues of supervised learning - Working of supervised learning algorithm, Approaches and Algorithms of supervised learning, Application for supervised learning.

UNIT -2: Linear Models for Supervised Learning   **Duration: 16 Periods (L:13 –T:3)**

Linear models for Regression: Linear Regression - Multivariate Linear Regression, Metrics: Mean Absolute Error, Mean Squared Error, R^2 (R-Squared) - **Linear Models for Classification:** Logistic Regression, Naïve Bayes classifier, Metrics: Accuracy, Confusion Matrix, Precision – Recall – F1- Score.

UNIT -3: Decision Trees and Ensemble Methods

                                       Duration: 11 Periods (L:9 –T:2)

Difference between Linear and non-linear models. Decision Trees: Introduction - Decision tree Induction – advantages and disadvantages –Overfitting – Pruning - Ensemble methods-Rationale for ensemble methods - Bagging.

UNIT – 4: Artificial Neural Networks: **Duration: 14 Periods (L:12 –T:2)**

Perceptron algorithm, Limitations, Neural Network: Introduction, Activation functions, Cost functions, Architecture, Training (learning), Optimization.

UNIT -5 : Clustering, Dimensionality reduction

                                      Duration: 14 Periods (L:12 – T:2)

Clustering- Definition-Advantages-Applications-Clustering- metrics- types- K-Mean clustering–Elbow curve - K-Nearest Neighbor (KNN) - Apriori Algorithm - Curse of dimensionality - Dimensionality reduction techniques

UNIT -6: Deep Learning, Machine Learning Applications Duration: 11 Periods (L:9 – T:2)

Deep Learning: Definition, working of deep learning, Working principle of Various Neural Networks - CNN (Convolutional Neural Networks), LSTM (Long Short term Memory Networks), GAN (Generative Adversarial Nets), Recurrent Neural Networks. Machine Learning Applications: List various machine learning applications, ML in Computer Vision, ML in Natural Language Processing.

Reference Books

1. Pattern Recognition and Machine Learning by Christopher Bishop
2. Introduction to machine Learning by Ethem Alpaydim
3. Introduction to Machine Learning (The Wikipedia Guide)
4. Machine Learning by saikat Dutt and Subramanian ChandraMouli
5. Machine learning, Tom Mitchell, McGrawHill.
6. Data mining by pang Ning Tan, Vipin Kumar, Michael Steinbach
7. Fundamentals of Neural networks --- Laurene Fausett
8. Neural Networks and Deep learning- CharuC.Aggarwal - Springer International Publishing, 2018
9. Neural Networks, A Classroom Approach , Tata McGraw -Hill, 2007 - Satish Kumar
10. Neural Networks, A Comprehensive Foundation, 2nd Edition, Addison Wesley Longman, 2001- Simon Haykin.

Suggested E-learning references

1. http://github.com
2. https://towardsdatascience.com/
3. https://softai.io
4. Part I: The Fundamentals | Introduction to Probability | Supplemental Resources | MIT OpenCourseWare.
5. Statistics and Probability | Khan Academy.
6. www.nptel.com
7. www.swayam.gov.in

Specific Learning Outcomes

For achieving the Course outcomes, the following learning outcomes must be achieved

CO1 : Explain the fundamental principles of data and machine learning

1.1 Define Data
    1.1.1 List the type of data
    1.1.2 Define continuous and Discrete Data
    1.1.3 List Data preprocessing techniques (handling missing values, binning, scaling, transformations).
1.2 Define Machine Learning (ML).
1.3 List the applications of Machine Learning.
1.4 Types of Machine Learning algorithms
    1.4.1 List various Machine Learning algorithms
    1.4.2 Define Supervised Learning.
    1.4.3 List the applications of supervised Learning
    1.4.4 Define Unsupervised Learning.
    1.4.5 List the applications of Unsupervised Learning
    1.4.6 Define Reinforcement Learning
    1.4.7 List the applications of reinforcement Learning.
1.5 Supervised learning
    1.5.1 List the issues of supervised learning
    1.5.2 Working principle of supervised learning algorithm
    1.5.3 List the various approaches and algorithms of supervised learning

CO2 : Comprehend the linear models in both regression and classification

2.1 Linear Regression
    2.1.1 Define Linear Regression
    2.1.2 List applications of simple Linear regression
    2.1.3 List advantages and disadvantages of Linear Regression.
    2.1.4 What is a variable (or Feature)
    2.1.5 Describe the various types of variables (Dependent and Independent variables)
    2.1.6 Explain formula of Linear Regression
    2.1.7 Describe the steps in building the Linear Regression.
    2.1.8 List the assumptions and Diagnostic of Linear Regression.

2.2 Multivariate Linear Regression:
    2.2.1 What is the Multivariate Linear Regression?
    2.2.2 Explain the formula of Multivariate Linear Regression.
    2.2.3 Explain the point to consider in Multivariate Linear Regression.
2.3 Compare Simple Linear Regression with Multivariate Linear regression.
2.4 Explain Metrics: Mean Absolute Error, Mean Squared Error, R^2 (R-Squared)
2.5 Linear Models for Classification
    2.5.1 Define Classification
    2.5.2 List the types of classification
    2.5.3 List the applications of Classifications
    2.5.4 List the Algorithms used for Classification
    2.5.5 Logistic Regressions.
        2.5.5.1 Explain the formula for Logistic Regression.
        2.5.5.2 Explain the steps in building the Logistic Regression.
        2.5.5.3 List and explain the metrics for Classification algorithms (Confusion Matrix, Accuracy, Precision and Recall, F1-Score)
2.6 Naive Bayes Classifier:
    2.6.1 Define Conditional Probability
    2.6.2 Illustrate conditional probability with an example
    2.6.3 What is Bayes Theorem?
    2.6.4 Explain how Bayes Theorem is used for classification
    2.6.5 Illustrate Naive Bayes classifier

CO3 : Explain the principles underlying non-linear models for classification
    3.1 Define Decision Tree.
    3.2 List different type of Nodes in Decision tree (Decision Node, Leaf Node).
    3.3 Define Decision node and Leaf node.
    3.4 How a Decision Tree works?
    3.5 List the steps to build a Decision Tree.
    3.6 Outline design Issues of Decision tree Induction.
    3.7 Explain different methods for expressing attribute test conditions.
    3.8 What is Entropy and Information Gain?
    3.9 Illustrate finding the best attribute using Entropy and Information Gain.
    3.10 Explain how to calculate Information Gain of a node.
    3.11 List Advantages and Disadvantages of Decision Tree.
    3.12 Define overfitting.
    3.13 Define pruning.
    3.14 How to prune decision tree using Pre-pruning (Early stopping rule)?
    3.15 How to prune decision tree using Post-pruning (Tree Pruning)?
    3.16 Explain ID3 algorithm with an example.
    3.17 List advantages and disadvantages of ensemble methods.
    3.18 Define Bagging.
    3.19 List advantages and Disadvantages of Bagging.
    3.20 How Bagging works?

CO4: Interpret the fundamental principles, Architecture, and working of Neural Networks.
    4.1 Interpretation of the biological neuron
    4.2 Define Perceptron
    4.3 Explain Steps in perceptron algorithm.
    4.4 List the limitations of perceptron algorithm
    4.5 Define Neural Network
    4.6 Define Activation function
    4.7 List activation functions
    4.8 Define Cost functions
    4.9 List Cost functions.
    4.10 Define Artificial Neural Network.
    4.11 Explain Architecture of Artificial Neural Network.
    4.12 Define Input Layer
    4.13 What is Hidden Layer?
    4.14 Define Output Layer
    4.15 List the components of Neural Network
    4.16 Explain Single layer perceptron
    4.17 Explain Multi layer perceptron
    4.18 Define Learning
    4.19 Define forward propagation
    4.20 Explain forward propagation
    4.21 Define backward propagation
    4.22 Explain backward propagation
    4.23 Define Epochs. What is hyper parameter tuning?
    4.24 Define Optimization
    4.25 List the types of Optimization
    4.26 Explain Gradient Descent Optimization
    4.27 Explain stochastic Gradient Descent Optimization.

CO5: Interpret the concepts of clustering, dimensionality reduction including their underlying principles and mechanisms.

    5.1   Define unsupervised learning.
    5.2   Illustrate the working of unsupervised learning.
    5.3   Differentiate supervised learning with unsupervised learning.
    5.4   List the types of unsupervised learning.
    5.5   Outline various unsupervised learning algorithms.
    5.6   What is Cluster?
    5.7   List Cluster methods.
    5.8   List the Applications of Clustering.
    5.9   Explain Distance based and Similarity based metrics used in clustering tasks
    5.10 Explain K-Means clustering
    5.11 Explain Elbow curve
    5.12 Illustrate K-Nearest Neighbor (KNN) Clustering algorithm with an example.
    5.13 Illustrate Apriori Algorithm with an example.
    5.14 Define dimensions. What is curse of dimensionality problem?
    5.15 Outline the key problems with curse of dimensionality.
    5.16 List the solutions for curse of dimensionality problem.
    5.17 Define Dimensionality Reduction.
    5.18 List the approaches to Dimensionality Reduction (Feature Selection and Feature Extraction)
    5.19 List the commonly used Dimensionality Reduction Techniques.

CO6: Understand the concept of Deep Learning and its Algorithms, Machine Learning Applications.

    6.1 Define Deep Learning
    6.2 Illustrate how deep learning algorithms work
    6.3 List types of algorithms/Networks used in Deep Learning
    6.4 Define CNN
    6.5 Illustrate working of CNN
    6.6 List out the applications of CNN
    6.7 Define LSTM
    6.8 Illustrate working of LSTM
    6.9 List out the applications of LSTM
    6.10 Define GAN
    6.11 Illustrate working of GAN
    6.12 List out the applications of GAN
    6.13 Define RNN
    6.14 Illustrate working of RNN
    6.15 List out the application of RNN
    6.16 List out various application areas of Machine Learning
    6.17 Define Computer Vision
    6.18 Demonstrate how Machine Learning is used in Computer Vision
    6.19 Define Natural Language Processing
    6.20 Demonstrate how Machine Learning is used in NLP

Suggested Student Activities

Student activity like mini-project, surveys, quizzes, etc. should be done in group of 3-5 students.

- Each group should do any one of the following type activity or any other similar activity related to the course and before conduction, get it approved from concerned course coordinator and programme co-coordinator.
- Each group should conduct different activity and no repeating should occur.

1. Discuss on Kaggle projects
2. Have group Discussion on research paper on machine learning applications
3. Visit Library to refer for standard Books on machine learning and prepare notes.
4. Refer to online content and videos to get more knowledge on concepts.
5. Write assignments given by course coordinator.
6. Read all the course contents and should be able to write slip tests and surprise tests.
7. Prepare a seminar on a specific topic that is related to latest technologies in the machine learning and present a Power Point Presentation (PPT) to all the peers.
8. Prepare quiz on machine learning course related questions and conduct.
9. Participate in Kaggle competitions
10. Develop some projects using machine learning algorithms.

CO-PO Mapping Matrix

CO	Basic and Discipline Specific Knowledge PO1	Problem Analysis PO2	Design/Development of Solutions PO3	Engineering Tools, Experimentation and Testing PO4	Engineering Practices for Society, Sustainability and Environment PO5	Project Management PO6	Lifelong Learning PO 7	Linked PO
CO1	2	1					1	1,2,7
CO2	3	2	1				2	1,2,3,7
CO3	2	2	2				2	1,2,3,7
CO4	3	1					2	1,2,7
CO5	2	2	1				2	1,2,3,7
CO6	2	2	1				1	1,2,3,7

Course Code: CS-506E(B)   **Duration : 1 Hour**
Course Name: Machine Learning   **Maximum Marks: 20**

PART-A

Answer **all** questions- Each Question carries **ONE** mark   **4x1 = 4 Marks**

1) Define supervised learning.
2) Define reinforcement learning.
3) Define Linear regression.
4) Define Feature.

PART-B

Mark Answer **TWO** questions- Each question carries **THREE** marks   **2x3 = 6 Marks**

5(a) Define data and list types of data
                              (OR)
5(b) List data pre-processing techniques.

6(a) List the assumption of Linear Regression.
                              (OR)
6(b) List the various classification algorithms.

PART-C

Answer **TWO** questions- Each question carries **FIVE** marks   **2x5= 10 Marks**

7(a) Explain various machine learning algorithms.
                              (OR)
7(b) Explain working principle of supervised learning.

8(a) Explain the points to consider in multi variant Regression.
                              (OR)
8(b) Explain how naïve bayes classifier works.

Course Code: CS-506E(B)	**Duration : 1 Hour**
Course Name: Machine Learning	**Maximum Marks: 20**

PART-A

<u>Answer **all** questions- Each Question carries **ONE** mark</u>   **4x1 = 4 Marks**

   1) List the measures used in selecting the best split in decision tree.
   2) Define Bagging
   3) Define perceptron
   4) List activation functions.

PART-B

<u>Answer **TWO** questions- Each question carries **THREE** marks</u>   **2x3 = 6 Marks**

5(a) Explain design Issues of Decision tree Induction.
                (OR)
5(b) List advantages of ensemble methods

6(a) List the various cost functions
                    (OR)
6(b) List the various layers in architecture of neural networks

PART-C

<u>Answer **TWO** questions- Each question carries **FIVE** marks</u>   **2x5= 10 Marks**

7(a) Explain how to build a decision tree.
                (OR)
7(b) Explain Bagging.

8(a) Explain the ANN architecture
                (OR)
8(b) Explain perceptron algorithm.

Course Code: CS-506E(B)   **Duration:2 hour**
Course Name: Machine Learning   **Max.Marks:40 Marks**

PART-A

Answer ALL questions- Each Question carries ONE mark   8x1 = 8 Marks

1) Define supervised learning
2) Define input layer.
3) Define unstructured data..
4) List various machine learning algorithms.
5) Define clustering
6) Define unsupervised learning.
7) Define Deep Learning.
8) List any Two applications of Machine Learning.

PART-B

Answer **FOUR** questions. Each question carries **three** marks.   **4 x 3 = 12 Marks**

9(a) List applications of machine learning.
                          (OR)
9(b) List cluster methods.

10(a) List disadvantages of ensemble methods.
                          (OR)
10(b) Describe any two applications of Machine learning.

11a) Write the differences between supervised and unsupervised learning.
                          (OR)
11(b) Briefly explain curse of dimensionality.

12(a) Illustrate the working of CNN.
                          (OR)
12(b) Illustrate the working of LSTM.

PART-C

13(a) Explain various issues in supervised learning.

(OR)

13(b) Explain K-means clustering.

14(a) Explain how to select the best split of decision tree.

(OR)

14(b) Illustrate the working of RNN.

15(a) Explain Elbow method in K-means clustering.

(OR)

15(b) Explain applications of clustering.

16(a) Explain How Machine Learning used in Computer Vision.

(OR)

16(b) Explain the working principle of NLP.

CS-507-.NET PROGRAMMING THROUGH C# LAB

Course Title:	**.NET PROGRAMMING THROUGH C# LAB**	Course Code	:	**CS-507**
Semester:	**V Semester**	Course Group	:	**Practical**
Teaching Scheme in Periods(L:T:P):	**1:0:2**	Credits	:	**1.25**
Methodology :	**Lecture+ Practical**	Total Contact Periods	:	**45 Periods**
CIE :	**60 Marks**	SEE	:	**40 Marks**

Pre requisites

This course requires the basic skills of programming and hardware

Course Outcomes

On completion of the course, the student should be able to;

CO1	Familiarize with Basics of .NET Framework and Visual Studio
CO2	Introduction to C#.net and oops concepts
CO3	Demonstration of Exception Handling and Multithreading
CO4	Develop programs windows based applications
CO5	Demonstrate the connection with database
CO6	Develop Web Based Applications

Course Content and Blue Print of Marks for SEE

Unit No	Unit name	Hours/ Periods	Marks for SEE			Marks weightage	%Weightage
			Coding	Execution	Viva		
1	.NET THROUGH C# LAB	45	20	10	10	40	100
	Total	45	40			40	100

Unit Number	UnitName	Periods
1	**Basics of .NET Framework and Visual Studio**	**2**
2	**Introduction to C#.net**	**6**
3	**Exception Handling and Multithreading**	**8**
4	**Advanced concepts of C#**	**4**
5	**Windows Applications development**	**12**
6	**Web Based Applications and Database access**	**13**
	Total	**45**

Reference Books

1. ProfessionalC#   5.0and   .NET4.5.1(WROX)   -Christian   Nagel   (Author),
   JayGlynn(Author), Morgan SkinnerC#4.0 –The Complete Reference-Herbert childt

2. C#5.0INA NUTSHELLFifthEdition-JosephAlbahari and Ben Albahari

List of Experiments

1. Exercise on basic C# programs

2. Demonstrate with C#ProgramtoIllustratetheUseofAccessSpecifiers

3. Develop programs on inheritance

4. Develop C#ProgramstoDemonstrateBuilt-in Exceptions

5. Develop C#ProgramtoDemonstrateUser defined Exceptions

6. Create the C# Programs to Demonstrate Multiple Exceptions

7. Develop C# Program with multiple threads.

8. Develop C# Program with anonymous Methods

9. Create C# Programs with Lambda Expressions.

10. Create C# Programs using Generic Classes.

11. Create WINDOWS BASED application using various controls.

12. Creation of Menus at design time.

13. Develop an application to control menus at run time.

14. Create an ASP WEB page with various controls.

15. Create an ASP WEB page with all validation controls.

Suggested Student Activities

Student activity like mini-project, quizzes, etc. should be done in group of 3-5 students.

- Each group should do any one of the following type activity or any other similar activity related to the course and before conduction, get it approved from concerned course coordinator and program co-coordinator.
- Each group should conduct different activity and no repeating should occur.
- Develop programs
- Establishing the connection with the database

CO-PO Mapping Matrix

CO	Basic and Discipline Specific Knowledge	Problem Analysis	Design/Development of Solutions	Engineering Tools, Experimentation and Testing	Engineering Practices for Society, Sustainability and Environment	Project Management	Lifelong Learning	Linked PO
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	
CO1	1	2	2				1	1,2,3,7
CO2	3	1	1	2	2		3	1,2,3,4,5,7
CO3	2	1	1	2	1		3	1,2,3,4,5,7
CO4	3	2	2	2	2		3	1,2,3,4,5,7
C05	3	2	2	2	2	1	3	1,2,3,4,5,6,7
C06	3	2	2	1	1	1	3	1,2,3,4,5,6,7

CS-508-MOBILE APPLICATION DEVELOPMENT LAB

Course Title :	**Mobile Application Development Lab**	Course Code	**CS-508**
Semester	**V**	Course Group	**Practical**
Teaching Scheme in Periods(L:T:P)	**1:0:2**	Credits	**1.25**
Methodology	**Lecture + Practical**	Total Contact Periods:	**45 Periods**
CIE	**60 Marks**	SEE	**40 Marks**

Pre requisites:

Knowledge of OOPs, Java programming, and AWT event handling concepts.

Course Content and Blue Print of Marks for SEE

Unit No	Unit name	Hours/ Periods	Marks for SEE			Marks weightage	%Weightage
			Coding	Execution	Viva		
1	Mobile Application Development Lab	45	20	10	10	40	100
	Total	45	40			40	100

Course Outcomes

On successful completion of the course, the students will be able to attain below Course Outcomes (CO):

Course Outcome	
CO1	Setup Android environment to develop mobile applications and creating Android Virtual Device(AVD)/emulator to execute apps
CO2	Illustrate the components of Android for developing mobile applications and usage of intents and develop mobile applications using implicit and explicit intents
CO3	Design Graphical User Interface (GUI)applications using User Interface (UI)controls/widgets, Layouts and handle events generated by android widgets
CO4	Develop android applications using Android Services and to use SQLite database for android storage

Course Contents

Unit Number	Unit Name	Periods
III	Android development environment setup using various IDEs, tools and frameworks	10
IV	Programming components of Android application development	10
V	Android User Interface Designing Layouts, UI Controls/widgets, and Fragments	12
VI	Android Services and Storage using SQLite database	13
	Total	45

Recommended Books

1. Modern Computer Architecture and Organization: Learn x86, ARM, and RISC-V Architectures and the Design of Smartphones, PCs, and Cloud Servers by Jim Ledin (2017, Jones & Bartlett Learning)
2. Head First Android Development: A Learner's Guide to Building Android Apps with Kotlin, Third Edition (2021, O'Reilly Media)
3. Android App Development for Dummies, 3rd Edition (2019, John Wiley & Sons)
4. Android Programming for Beginners: Build in-depth, full-featured Android apps starting from zero programming experience, 3rd Edition (2021, John Wiley & Sons)
5. Android Programming: The Big Nerd Ranch Guide (2019, No Starch Press)
6. The Busy Coder's Guide to Advanced Android Development (2018, Pragmatic Bookshelf)
7. Clean Architecture for Android (2018) by Eran Boudjnah. (Pragmatic Bookshelf)
8. Android Programming: The Big Nerd Ranch Guide (3rd Edition, 2021) by Bill Phillips, Chris Stewart, Kristin Marsicano, and Brian Gardner. (Manning Publications Co.)
9. Hello, Android: Introducing Google's Mobile Development Platform fourth edition by Ed Burnette - The pragmatic programmers.
10. Busy Coder's Guide to Android Development by Mark L Murphy.
11. Android Programming: The Big Nerd Ranch Guide by Bill Philips, Chris Stewart and Kristin.
12. Modern Android 13 Development Cookbook (2nd Edition, 2023) by Jeff Friesen. (O'Reilly Media).
13. Kickstart Modern Android Development with Jetpack and Kotlin (2nd Edition, 2023) by Paul Burke and Yigit Boyar. (O'Reilly Media).

Suggested E-learning references

1. https://onlinecourses.swayam2.ac.in/nou21_ge41/preview
2. https://onlinecourses.nptel.ac.in/noc20_cs52/preview
3. https://elearn.nptel.ac.in/shop/iit-workshops/completed/introduction-to-android-app-development/
4. https://www.tutorialspoint.com/android/index.htm
5. https://developer.android.com/
6. https://www.sanfoundry.com/java-android-programing-examples
7. https://sites.google.com/site/hkustcomp4521/home/lab-exercises
8. https://www.vidyarthiplus.com/vp/attachment.php?aid=47906
9. https://www.javatpoint.com/android-tutorial
10. https://www.studytonight.com/android/
11. https://www.splessons.com/lesson/android-tutorial/
12. https://developer.android.com/courses
13. https://www.udacity.com/course/android-kotlin-developer-nanodegree--nd940
14. https://www.pluralsight.com/courses/android-start-developing
15. https://www.coursera.org/specializations/android-app-development
16. https://www.youtube.com/@android

CO-PO Mapping Matrix

CO	Basic and Discipline Specific Knowledge	Problem Analysis	Design/Development of Solutions	Engineering Tools, Experimentation and Testing	Engineering Practices for Society, Sustainability and Environment	Project Management	Lifelong Learning	Linked PO
	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	
CO1	2	2	2	2			2	1,2,3,4,7
CO2	2	2	2	2		2	2	1,2,3,4,6,7
CO3	2	2	2	2		2	2	1,2,3,4,6,7
CO4	2	3	2	2		2	2	1,2,3,4,6,7

Upon completion of the course, the student shall be able to

List of Exercises

1. Elaborate the steps to setup Android development environment using
   (a) Android Studio IDE
   (b) Eclipse IDE
   (c) Visual Studio IDE
   (d) Create Android Virtual Device(AVD)/Emulator
2. Develop your First android application to display a message like "Hello World" using Text View UI control in Android Virtual Device or physical device.
3. Develop android applications using following UI Layouts
   (a) Linear Layout
   (b) Relative Layout
   (c) Frame Layout
   (d) Constraint Layout
   (e) Table Layout
4. Develop android applications using following UI Views
   (a) List View
   (b) GridView
   (c) WebView
   (d) ScrollView
   (e) RecyclerView
5. Create an Android app to accept two numbers in two EditText(textfields) and display the sum of them in a toast message on clicking a button
6. Create an Android app to accept a number in EditText and display the factorial of it in a Toast message on clicking a button.
7. Design a simple calculator application to perform addition, subtraction, multiplication and division using different buttons.
8. Design a simple android application to convert various country currencies to Indian rupees.
9. Develop an android application to illustrate the use of
   (a) Text View to display various text views
   (b) Edit Text to take different types of input data (text, password, mobile number, email address etc.)

10. Develop an android application to illustrate the use of
    (c) Button
    (d) ToggleButton
    (e) ImageButton
11. Develop an android application to illustrate the use of
    (f) CheckBox
    (g) RadioButton
12. Develop an android application to illustrate the use of Spinner(ComboBox) widget.
13. Develop an android application to illustrate the use of Date Picker widget.
14. Develop an android application to illustrate the use of Time Picker widget.
15. Develop an android application to illustrate the use ofProgress Bar widget.
16. Develop an android application to illustrate the use ofSeek Bar widget.
17. Develop an android application to illustrate the use ofRating Bar widget.
18. Develop an android application that uses multiple UI controls to create student registration form.
19. Develop an android application to handle events generated by User Interface (UI) controls(Button, Checkbox, Spinner, Date Picker and Seek Bar).
20. Develop an android application to dial a number using implicit intent.
21. Develop an android application to send SMS using implicit intent.
22. Develop an android application to open a web page using implicit intent.
23. Develop an android application on explicitly switching between activities using explicit intent.
24. Develop an android application passing data between activities using explicit intent.
25. Develop an android application which shows the lifecycle of an Activity.
26. Develop an android application which shows the lifecycle of Fragment.
27. Develop simple android application using fragments to display two fragments with different background color in a single activity.
28. Develop an android application to create a simple service.
29. Develop an android application to create music service to play and stop music file.
30. Develop an android application to create and open database using SQLite database.
31. Develop an android application to create tableusing SQLite database.
32. Develop an android application to insert data into the tables using SQLite database.
33. Develop an android application to retrieve data from table using SQLite database.
34. Develop an android application to update data in a table using SQLite database.
35. Develop an android application to delete data from a table using SQLite database.
36. Develop simple android application to perform all CRUD (Create, Read, Update, and Delete) operations using SQLite database on a student table (SID, Name, PINNo, CGPA).

Student activity like mini-project, surveys, quizzes, etc. should be done in group of 3-5 students.

- Each group should do any one of the following type activity or any other similar activity related to the course and before conduction, get it approved from concerned course coordinator and programme co-coordinator.
- Each group should conduct different activity and no repeating should occur.

1. Study different Integrated Development Environments (IDEs) available for executing android programs and prepare a report.
2. Develop some simple GUI based applications like calculator etc using android controls.
3. Visit Library to refer to standard Books on Advanced java concepts, collect related material and prepare notes.
4. Refer to online content and videos to get more knowledge on database concepts.
5. Interact with industry people who are working in android technologies and prepare a report.
6. Compare different types of Operating Systems used in mobiles and submit a report.
7. Write assignments given by course coordinator.

8. Read all the course contents and should be able to write slip tests and surprise tests.
9. Prepare a seminar on a specific topic that is related to latest technologies in the mobile application development and present a Power Point Presentation (PPT) to all the peers.
10. Study IEEE papers on android programming and submit a report.
11. Prepare quiz on android programming related questions and conduct.
12. Participate in state level or national level technical conferences.
13. Develop Simple android applications (apps).

CS-509 WEB PROGRAMMING USING PHP LAB

Course Title:	**Web Programming using PHP Lab**	Course Code	:	**CS-509**
Semester:	**V Semester**	Course Group	:	**Practical**
Teaching Scheme in Periods(L:T:P):	**1:0:2**	Credits	:	**1.25**
Methodology :	**Lecture+ Practical**	Total Contact Periods	:	**45 Periods**
CIE :	**60 Marks**	SEE	:	**40 Marks**

Pre requisites

This course requires the basic knowledge of programming.

Course Content and Blue Print of Marks for SEE

Unit No	Unit name	Hours/ Periods	Marks for SEE			Marks weightage	%Weightage
			Coding	**Compilation**	**Execution**		
1	Web Programming using PHP	45	20	10	10	40	100
	Total	45	40			40	100

Course Outcomes

On completion of the course, the student should be able to

Course Outcome	
CO1	Develop and execute programs using PHP Conditional statements
CO2	Develop and execute programs using PHP Iterative statements.
CO3	Develop and execute programs using PHP Functions
CO4	Develop and execute programs using PHP Arrays.
CO5	Develop and execute Programs using PHP Sessions, Cookies
CO6	Develop and execute Programs using PHP Database Management.

Suggested Reference Book
1. Robert W Sebesta, Programming with World Wide Web , 7th ed., Pearson Education, New Delhi, 2009

Suggested E-learning references

1. http://w3schools.com
2. www.javatpoint.com
3. https://www.php.net
4. http://www.mysql.com

Suggested Learning Outcomes

Upon completion of the course, the student shall be able to

CO1: Develop and execute programs using PHP Conditional statements
1. Develop a PHP program to demonstrate Arithmetic operators.
2. Develop a PHP program to demonstrate Increment/Decrement operators.
3. Develop a PHP program to demonstrate Relational operators, Logical Operators.

CO2: Develop and execute programs using PHP Iterative statements.
4. Develop PHP programs to demonstrate conditional statements and Iterative Statements

CO3: Develop and execute programs using PHP Functions
5. Develop a PHP program on functions.
6. Develop a PHP Program to demonstrate Recursion.

CO4: Develop and execute programs using PHP Arrays.
7. Develop a PHP program to demonstrate Indexed Arrays.
8. Develop a PHP program to demonstrate Associative Arrays.
9. Develop a PHP program to demonstrate 2D Arrays.

CO5: Develop and execute Programs using PHP Sessions, Cookies

10. Develop a PHP program to create a Session, Access the values from the session and Destroying the Session.
11. Develop a PHP program to Create a Cookie, Retrieve the Cookie and Delete the cookie
.
CO6: Develop and execute Programs using PHP Database Management.
12. Develop a PHP program to Create a Database.
13. Develop a PHP program to Create a Table.
14. Develop a PHP program to Insert values into the Table.
15. Develop a PHP program to Delete a Value from a Table.
16. Develop a PHP program to Update a Value from a Table.
17. Develop a PHP program to Select Data from a Table.
18. Develop a PHP program for Form Validation.

Suggested Student Activities

Student activity like mini-project, quizzes, etc. should be done in group of 5-10 students.

- ➢ Codingcompetitions
- ➢ Quiz Competitions
- ➢ Advanced Topics Seminars
- ➢ Writing Reports
- ➢ Mini Projects
  - Students Attendance Management System
  - Banking Application
  - Blood Bank Management
  - Library Management System
  - Online Examination System
  - Restaurant Management System
  - College Management System

CO-PO Mapping Matrix

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CO1	1	1	1	1			1	1,2,3,4,7
CO2	2	1	1	2			2	1,2,3,4,7
CO3	2	1	2	2			1	1,2,3,4,7
CO4	2	2	2	2			2	1,2,3,4,7
CO5	2	2	2	2			2	1,2,3,4,7
CO6	2	2	2	2			2	1,2,3,4,7

CS-510-PROJECT WORK

Course Title :	Project Work	Course Code	CS-510
Semester	V	Course Group	Practical
Teaching Scheme in Periods(L:T:P)	1:0:2	Credits	1.25
Methodology	Lecture + Practical	Total Contact Periods	45
CIE	60 Marks	SEE	40 Marks

Prerequisites: Students should have the knowledge of various programming languages and practices in addition to basic engineering skills. Course Outcomes:

Course Outcome	
CO1	Analyze the realistic problem
CO2	Design the solution using various modules.
CO3	Coding using engineering tool.
CO4	Implementing and updating.

Should be in following Areas

1. Implement Image Processing Algorithms
2. Implement Cryptographic Algorithms.
3. Implement Algorithms in any computer application domain.
4. Implement solutions given in recent papers published in journals.
5. Design Micro Controller based application
6. Design Robot based applications
7. Use boards like Raspberry PI, Arduino Uno to design computer controlled application
8. Design Application using Sensors
9. Design Application using IOT
10. Data Science based project
11. Configure Cisco route
12. Mobile Applications
13. Establishing a computer network with required permission to resources like files and printers
14. rs for packet filtering, Packet routing, firewall configuration, bandwidth allocations.
15. Troubleshoot Computer Peripherals.
16. Develop Games
17. Design Web Portal with database to any organization

18. Learning Management Systems like Learning from videos, assignment submission, quizzes.
19. Online Examination with data persistence on Servers.
20. Examination Seating Plan particularly for Diploma Examinations
21. Student data base management System Consisting of modules Admission, Marks, Attendance, No Due certificate.
22. Library management System
23. Hostel Management System
24. Stores management System
25. Banking Software
26. Hospital Management System
27. Railway Reservations
28. Healthcare Management System.
29. Income tax calculator application.
30. Online Shopping Portal

CO / PO - MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapped POs
CO1	3	3		1	2	1	1	1,2,4,5,6,7
CO2	3	3		1	2	1	1	1,2,4,5,6,7
CO3	3	3	2	1	2	1	1	1,2,3,4,5,6,7
CO4	3	3	2	1	2	1	1	1,2,3,4,5,6,7