



**APJ ABDUL KALAM TECHNOLOGICAL
UNIVERSITY**

(A State Government University)

B. Tech, 2024

Minor Degree in

Computer Science and Engineering

Offered By : Computer Science and Engineering

CURRICULUM

Minor (Computer Science and Engineering)											
Sl. No:	Semester	Course Code	Course Title (Course Name)	Credit Structure			SS	Total Marks		Credits	Hrs./ Week
				L	T	P		CIA	ESE		
1	3	MNCST309	PYTHON FOR APPLICATION DEVELOPMENT	3	1	0	5	40	60	4	4
2	4	MNCST409	DATABASE MANAGEMENT SYSTEMS	3	1	0	5	40	60	4	4
3	5	MNCST509	WEB APPLICATION DEVELOPMENT	3	1	0	5	40	60	4	4
4	6	MNCST609	SOFTWARE ARCHITECTURE	3	0	0	4.5	40	60	3	3
Total							20			15	15

*Students must register for theory courses listed in the 3rd and 4th semesters of the Minor curriculum. #Students who fail a theory course listed in the Minor curriculum are permitted to register for an alternate MOOC course specified in the Minor curriculum.

&The courses offered in the third and fourth semesters can be structured as either theory-based courses **or** a combination of theory and lab-based courses.

SYLLABUS

SEMESTER 3

SEMESTER 3

PYTHON FOR APPLICATION DEVELOPMENT

Course Code	MNCST309	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:1:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	-	Course Type	Theory

Course Objectives:

- To provide learners an insight into Python programming in a scientific computation context and develop programming skills to solve engineering problems
- To give insights in developing AI & web based applications
- To familiarize Data Visualization tools & its application .

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Basic coding skills Working with data types, Keywords, Variables and Operators, working with numeric data, Type conversions, Input, Processing, and Output, Formatting output. Data Types - String, Numeric(int, float, complex), Bool, List, Tuple, Dict, Set and Frozen Set Control statements - Selection structure (if-else), Iteration structure (for, while)	11
2	Functions and Files Functions - Definitions, Arguments Parameters, Recursion, Callbacks, Decorators, Function overloading and Lambda Functions Files and the Operating System: files and modes, file methods and attributes, Binary files, the os module. (if needed can be add the shutil like modules also)	11
3	Object Oriented Programming Classes and objects - Objects and Classes, Methods, Instance Variables, Constructor, Accessors and Mutators. Special methods / Magic methods Structuring classes with Inheritance and Polymorphism. Abstract Classes. Exceptions - Handle a single exception, handle multiple exceptions.	11

4	Data Handling Regular Expressions - Re Module and Creating regular expressions NumPy - ndarrays, array indexing, array arithmetics, transpose,, Pseudorandom Number, and Linear algebra	11
---	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> 2 Questions from each module. Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24marks)</p>	<ol style="list-style-type: none"> Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Write, test and debug Python programs using conditional and iterative statements	K3
CO2	Develop programs by utilizing the modules Lists, Tuples, Sets and Dictionaries in Python and functions	K3
CO3	Implement Object Oriented programs with exception handling	K3
CO4	Write programs in Python to process data stored in files for searching patterns and predicting the outcomes.	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		3		3							3
CO2	3		3		3							3
CO3	3	3	3		3							3
CO4	3	3	3		3							3

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Fundamentals of Python : First Programs	Kenneth A Lambert	Cengage Publishing	2/e, 2016
2	Python for Data Analysis,	Wes McKinney	Shroff / O'Reilly Publishers	2/e, 2017
3	Introduction to Python for Science and Engineering,	David J. Pine,	CRC Press	1/e, 2021
4	The Complete Reference Python	Martin C. Brown	Mc Graw Hill	1/e, 2018

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Think Python: How to Think Like a Computer Scientist,	Allen B. Downey	Schroff	2/e, 2016
2	Python Programming, Shroff/Murach	Michael Urban and Joel Murac	Shroff/Murach, 2016	2016
3	Python Essential Reference.	David M.Baezly	Addison-Wesley Professional	4/e, 2009.
4	Python for Informatics: Exploring Information,	Charles Severance	Addison-Wesley Professional	2009

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://onlinecourses.nptel.ac.in/noc20_cs83/preview The Joy of Computing using Python - Course By Prof. Sudarshan Iyengar, Prof. Yayati Gupta IIT Ropar
2	https://onlinecourses.swayam2.ac.in/cec25_ma18/preview , Programming in Python - Course By Dr. Rizwan Rehman Dibrugarh University
3	https://onlinecourses.swayam2.ac.in/cec25_ma02/preview Problem solving Aspects and Python Programming - Course by Dr. S. Malliga, Dr. R. Thangarajan, Dr. S. V. Kogilavani

MODEL QUESTION PAPER				
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY				
THIRD SEMESTER B. TECH MINOR DEGREE EXAMINATION, MONTH AND YEAR				
Course Code: MNCST309				
Course Name: Python for Application Development				
Max. Marks: 60			Duration: 2 Hours 30 Minutes	
PART A				
		Answer all questions. Each question carries 3 marks	CO	Marks
1		Write a Python program that takes two integer inputs from the user and prints the larger of the two numbers. If the numbers are equal, it should print "Numbers are equal".	1	(3)
2		Explain the difference between a list and a tuple in Python. Provide a short code example demonstrating one key difference in their behavior.	1	(3)
3		Explain the purpose of a decorator in Python. Provide a simple example of a decorator that adds a greeting message before executing a function.	2	(3)
4		Write a Python function that takes a filename as input and checks if the file exists in the current directory. The function should return True if the file exists and False otherwise. Use the os module for this task.	2	(3)
5		Explain the concept of inheritance in object-oriented programming. Provide a simple Python example demonstrating a parent class and a child class inheriting from it.	3	(3)
6		Design a Python class Counter with the following methods: increment() (increases the counter by 1), decrement() (decreases the counter by 1), and get_value() (returns the current counter value). Ensure the counter cannot go below zero.	3	(3)
7		Create a NumPy array of the first 10 even numbers (2, 4, 6,... 20).	4	(3)
8		Given a NumPy array, write Python code to find the indices of all the even numbers within that array. For example, if the array is [1, 2, 3, 4, 5, 6], the output should be [1, 3, 5].	4	(3)
PART B				
Answer any one full question from each module. Each question carries 9 marks				
Module 1				
9	a)	A mobile app records daily temperatures (as float values) entered by a user. Write a code snippet that stores these in a list, converts each to an integer for quick preview, and prints them in a tabular format with proper alignment..	1	3
	b)	A health tracker needs to categorize user activity based on number of steps walked in a day. Using selection and iteration, write a program fragment to classify each day’s data as “Sedentary”, “Active”, or “Highly Active” from a given dictionary of daily step counts.	1	4
10	a)	Describe how Python supports arithmetic and comparison operations. Your team is developing a console-based student mark	1	7

		<p>analyzer. The input is taken as a string of comma-separated marks. Demonstrate how to:</p> <ol style="list-style-type: none"> 1. Parse and convert the input into numeric form. 2. Classify each mark as "Fail", "Pass", or "Distinction" based on thresholds using appropriate control structures. 3. Format and print the output with aligned columns. 		
Module 2				
11	a)	Create a function <code>log_event(event_type, message)</code> that writes logs into a text file in the format: <code>[EVENT_TYPE]: message</code> . The function should append logs to the same file each time.	2	3
	b)	Using the <code>os</code> module, write a function that checks if a backup directory exists. If not, it creates one. Then it copies a specified file to that directory. Explain how the code ensures portability.	2	4
12	a)	Write a Python function using recursion that prints the names of all <code>.py</code> files in a given directory and its subdirectories.	2	3
	b)	Enhance the above function to count the number of <code>.py</code> files and write their paths to a log file. Use the <code>os</code> module and demonstrate how exceptions (e.g., permission errors) are handled gracefully.	2	4
Module 3				
13	a)	Design a class <code>Vehicle</code> with attributes like <code>speed</code> and <code>engine_on</code> . Add a method <code>start()</code> to turn on the engine and print a message.	3	3
	b)	Create a derived class <code>ElectricCar</code> from <code>Vehicle</code> that overrides the <code>start()</code> method and includes a method <code>charge()</code> . Demonstrate how polymorphism works by calling <code>start()</code> from both classes. Also include exception handling for invalid charging input.	3	4
14	a)	Write a class <code>BankAccount</code> with methods <code>deposit()</code> and <code>withdraw()</code> . Raise an exception if withdrawal exceeds balance.	3	3
	b)	Extend the class to support a subclass <code>SavingsAccount</code> that applies interest during deposit. Demonstrate method overriding and show how exceptions are handled during deposit if the amount is negative.	3	4
Module 4				
15	a)	Write a function using <code>regex</code> to check if a password meets the following rules: minimum 8 characters, includes at least one uppercase letter, one number, and one special character.	4	3
	b)	Given a 2D NumPy array representing stock prices over days, write a function to: <ol style="list-style-type: none"> 1. Calculate daily differences, 2. Identify days with maximum gain/loss, 3. Return a new array with these differences. 	4	4
16	a)	From a multiline string containing log entries like "User: John, ID: 001", extract all user names using regular expressions. Convert the extracted names into a NumPy array. Assume you now want to sort them alphabetically and count how many start with each letter. Write code to do this and return the results.	4	7

SEMESTER 4

SEMESTER 4

DATABASE MANAGEMENT SYSTEMS

Course Code	MNCST409	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:1:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)		Course Type	Theory

Course Objectives:

- To give a comprehensive understanding of fundamental DBMS concepts as well as the principles and applications of NoSQL databases
- To enable the learners to design, implement, and manage both relational and NoSQL databases

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Introduction to Databases :- Database System Concepts and Architecture-Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, Centralized and Client/Server Architectures for DBMSs. Conceptual Data Modelling and Database Design:- Data Modelling Using the Entity, Relationship (ER) Model - Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types. Refining the ER Design for the COMPANY Database.	11
2	The Relational Data Model and SQL - The Relational Data Model and Relational Database Constraints-Relational Algebra and Relational Calculus - Structured Query Language (SQL)-Data Definition Language, Data Manipulation Language, Assertions, Triggers, views, Relational Database Design Using ER-to-Relational Mapping.	11
3	Database Design Theory & Normalization - Functional Dependencies - Basic definition; Normalization- First, Second, and Third normal forms. Transaction Management - Transaction Processing : Introduction, problems and failures in transaction, Desirable properties of transaction, Characterizing schedules based on recoverability and serializability; Concurrency Control with Two-Phase Locking Techniques- Database Recovery management: Deferred update-immediate update- shadow paging.	11
4	Introduction To NoSQL Concepts - types of NoSQL databases- CAP Theorem- BASE properties- Use Cases and limitations of NoSQL. SQL architectural Patterns - Key value Stores, Graph Stores, Column Family stores and Document Stores.	11

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> 2 Questions from each module. Total of 8 Questions, each carrying 3 marks (8x3 =24 marks) 	4. Each question carries 9 marks. 5. Two questions will be given from each module, out of which 1 question should be answered. 6. Each question can have a maximum of 3 subdivisions. (4x9 = 36 marks)	60

Course Outcomes (COs)

At the end of the course, students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Summarize and exemplify the fundamental nature and characteristics of database systems	K2
CO2	Model and design solutions for efficiently representing data using the relational model or non-relational model	K3
CO3	Discuss and compare the aspects of Concurrency Control and Recovery in Database systems	K3
CO4	Construct advanced SQL queries to effectively retrieve, filter, and manipulate data from relational databases.	K3
CO5	Experiment with NoSQL databases in real world applications	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3									3
CO2	3	3	3	3						2	2	3
CO3	3	3	3	3								3
CO4	3	3	3	3								3
CO5	3	3	3	3								3

Note: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Fundamentals of Database Systems [Module 1,2,3,4]	Elmasri, Navathe	Pearson	7/e, 2017
2	Making Sense of NoSQL: A guide for managers and the rest of us [Module 4]	Dan McCreary and Ann Kelly	Manning	1/e, 2014

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Database System Concepts	Sliberschatz A., H. F. Korth and S. Sudarshan,	McGraw Hill,	7/e, 2011
2	Beginning Database Design Solutions	Rod Stephens	Wiley	2/e, 2023
2	NoSQL Distilled	Pramod J. Sadalage, Martin Fowler	Addison-Wesley	1/e, 2012
3	NoSQL Data Models: Trends and Challenges (Computer Engineering: Databases and Big Data), - Vol 1	Olivier Pivert	Wiley	1/e, 2018

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://onlinecourses.nptel.ac.in/noc21_cs04/preview
2	https://onlinecourses.nptel.ac.in/noc21_cs04/preview
3	https://onlinecourses.nptel.ac.in/noc21_cs04/preview
4	https://archive.nptel.ac.in/courses/106/104/106104135/

MODEL QUESTION PAPER				
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY				
FOURTH SEMESTER B. TECH MINOR DEGREE EXAMINATION, MONTH & YEAR				
Course Code: MNCST409				
Course Name: DATABASE MANAGEMENT SYSTEMS				
Max. Marks: 60			Duration: 2 hours 30 minutes	
PART A				
		Answer all questions. Each question carries 3 marks	CO	Marks
1		List out any three salient features of database systems, which distinguish it from a file system.	1	(3)
2		When is multi-valued composite attribute used in ER modelling?	1	(3)
3		With the help of an example database, explain the usage of the set operations Union, Intersection, and set difference in Relational Algebra.	2	(3)
4		Differentiate between DELETE and DROP commands in SQL. Illustrate their usage.	4	(3)
5		List Armstrong Axiom rules	3	(3)
6		Why concurrency control is needed in transaction processing.	3	(3)
7		Explain CAP Theorem.	5	(3)
8		What is a key-value database? List its major properties.	5	(3)
PART B				
Answer any one full question from each module. Each question carries 9 marks				
Module 1				
9	a)	Draw neat labelled diagram of three schema architecture and briefly describe each level.	1	(5)
	b)	What is the concept of a weak entity used in data modelling? Define the terms owner entity type, Identifying relationship type.	1	(4)
10	a)	Design an ER diagram for a typical college library database and then map it into a relational database schema. List your assumptions and indicate the cardinality mappings.	1	(5)
	b)	Distinguish between physical data independence and logical data independence with suitable examples.	1	(4)
Module 2				
11	a)	Consider the following schema, Suppliers (<u>sid</u> , sname, address) Parts (<u>pid</u> , pname, color) Catalog (<u>sid</u> , <u>pid</u> , cost)	2	(6)

		<p>The primary key fields are underlined.</p> <p>Write relational algebra expressions for the following queries:</p> <p>b) Find the name of parts supplied by supplier with sid=105</p> <p>ii) Find the names of suppliers supplying some green part for less than Rs 1000</p> <p>iii) Find the IDs of suppliers who supply some red or green part</p> <p>iv) Find the names of suppliers who supply some red part</p>		
	b)	Distinguish between Super key, Candidate key, and Primary key using an example.	2	(3)
12	a)	<p>Consider a company database having the following schema and frame Relational Algebra queries for the following problems. Primary keys are underlined.</p> <p>EMPLOYEE (<u>SSN</u>, Name, SupervisorSSN, Dnum)</p> <p>DEPARTMENT (<u>Dnumber</u>, Dname, MgrSSN)</p> <p>PROJECT (<u>Pnumber</u>, Plocation, ControlDeptNum)</p> <p>EMPLOYEE (Dnum) References DEPARTMENT (Dnumber) and PROJECT (ControlDeptNum) References DEPARTMENT (Dnumber)</p> <p>(1) Find the names of all employees who are supervised by the supervisor of the employee named 'Smith'</p> <p>(2) List the numbers of the projects (Pnumbers) controlled by Smith's department</p>	4	(5)
	b)	Illustrate the concept of trigger in SQL with an example	4	(4)
Module 3				
13	a)	Write briefly on the different types of anomalies in designing a database.	2	(4)
	b)	Explain Two-Phase locking protocol and any three variants of it	3	(5)
14	a)	Illustrate 2NF and 3NF with suitable examples.	2	(5)
	b)	<p>Check whether the given schedules are conflict serializable or not</p> <p>i) S1 : R1(X) , R2(X) , R1(Y) , R2(Y) , R3(Y) , W1(X) , W2(Y)</p> <p>ii) S2 : R1(X) , R2(X) , R2(Y) , W2(Y) , R1(Y) , W1(X)</p>	3	(4)
Module 4				
15	a)	Explain briefly the characteristics of Column family database.	5	(5)
	b)	Explain the limitations of NoSQL.	5	(4)
16	a)	What are the main characteristics of NOSQL systems in the areas related to data models and query languages?	5	(5)
	b)	Explain the characteristics of Graph databases.	5	(4)

SEMESTER 5

SEMESTER 5

WEB APPLICATION DEVELOPMENT

Course Code	MNCST509	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:1:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	MNCST409	Course Type	Theory

Course Objectives:

1. To equip students with foundational skills in building structured and styled web pages using HTML5 and CSS.
2. To develop interactive and dynamic web functionalities using JavaScript, jQuery, and client-side scripting techniques.
3. To introduce server-side development with Node.js and integrate full-stack applications using React, including deployment and version control practices.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	<p>Module 1: Introduction To HTML and CSS</p> <p>Introduction to HTML5: Structuring & editing an HTML5 document, Fundamentals of HTML - Headings-Hyper Links- Images - Special Characters & Horizontal Rules-Lists- Tables -Forms - Internal Linking- Meta Elements-HTML5 Form input types -Input and Data List Elements and auto complete attribute- Page Structure Elements.</p> <p>Introduction to Style sheets : Introduction to CSS-Basic syntax and structure-Inline Styles, Embedded Style Sheets, Conflict Resolution, Linking External Style Sheets-Exploring CSS</p> <p>Selectors-Properties, values, Positioning Elements: Absolute Positioning, Relative Positioning-Backgrounds-List Styles-Element Dimensions-Table Layouts - Box Model and Text Flow - div and span - Basics of Responsive CSS, Media port & Media Queries.</p>	11
2	<p>Module 2: Java Script and JQuery</p> <p>Introduction to JavaScript : Introduction to Scripting- Programming fundamentals of JavaScript -Obtaining User Input with prompt</p>	11

	<p>Dialogues - Arithmetic-Decision Making -Control Statements - Functions -Arrays -Objects -Document Object Model (DOM) -Form processing.</p> <p>Introduction to JQuery : A basic JQuery example, finding elements, JQuery selection, getting element content, updating elements, changing content, inserting elements, adding new content, getting and setting attributes, getting and setting CSS properties, using.each(), events, event object, effects, animating CSS properties, using animation, traversing the DOM, working with forms, JavaScript libraries.</p>	
3	<p>Module 3 : Server-Side Development with Node.js</p> <p>Introduction to Node.js: Features and advantages of Node.js, Installing Node.js and npm, Running a simple Node.js script.</p> <p>Working with Node.js Core Modules: File System - Reading and writing files, HTTP: Creating a basic web server, Working with file and directory paths.</p> <p>Building a Simple Web Server: Using the http module to create a web server, Handling basic routing, Serving static files (HTML, CSS, JS).</p> <p>Introduction to Express.js: Installing Express.js, Setting up a basic Express server, Handling GET and POST requests.</p>	11
4	<p>Module 4: Full Stack Integration using React and Deployment</p> <p>Introduction to component-based architecture using React, Creating forms and managing state using useState and useEffect.</p> <p>Connecting React Frontend with Backend (Node.js and MongoDB): Creating form components and handling input, Submitting form data using fetch() or Axios, Receiving and displaying data from REST API (GET and POST), Conditional rendering and basic loading/error handling. Hosting frontend React app , Deploying backend (Express + MongoDB) , Connecting frontend to deployed backend.</p> <p>Version Control and Deployment - Introduction to Git: commit, push, pull, branching.</p>	11

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> 2 Questions from each module. Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24marks)</p>	<ul style="list-style-type: none"> Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Explain the basic structure and features of HTML5 and CSS	K2
CO2	Describe the role of JavaScript and jQuery in creating interactive web pages.	K2
CO3	Build responsive web pages using HTML, CSS, and JavaScript.	K3
CO4	Design a full-stack web application using React, Node.js and MongoDB.	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											2
CO2	2		2									2
CO3	3	2	3	2	3					2		3
CO4	3	2	3	3	3				2	2	2	3

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	HTML and CSS: Design and Build Websites	Jon Duckett	Wiley	1/e, 2011
2	JavaScript and jQuery: Interactive Front-End Web Development	Jon Duckett, Gilles Ruppert, Jack Moore	Wiley	1/e, /2014
3	Web Development with Node and Express: Leveraging the JavaScript Stack	O'Reilly Media	Ethan Brown	2/e, 2014
4	Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node	Vasan Subramanian	Apress	2/e, 2019
5	Version Control with Git	Jon Loeliger and Matthew McCullough	O'Reilly	2/e, 2012

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	HTML5 and CSS3 All-in-One For Dummies (3rd Edition)	Andy Harris	Wiley	3/e,2014
2	Pro Express.js: Master Express.js—The Node.js Framework for Your Web Development	Azat Mardan	Apress	2/e,2014
3	Beginning MERN Stack: Build and Deploy a Full Stack MongoDB, Express, React, Node.js App	Greg Lim	Packt Publishing Ltd	2/e,2021
4	Pro Git – Every thing you need to know about Git	Scott Chacon and Ben Straub	Apress	2/e,2014
5	Version Control with Git: Powerful Tools and Techniques for Collaborative Software Development	Prem Kumar Ponuthurai, Jon Loeliger	O'Reilly	3/e,2022

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1,2	https://archive.nptel.ac.in/courses/106/106/106106156/
3,4	https://archive.org/details/react-node-js-express-mongo-db-the-mern-fullstack-guide

MODEL QUESTION PAPER				
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY				
FIFTH SEMESTER B. TECH MINOR DEGREE EXAMINATION, MONTH AND YEAR				
Course Code: MNCST309				
Course Name: Web Application Development				
Max. Marks: 60			Duration: 2 hours 30 minutes	
PART A				
		Answer all questions. Each question carries 3 marks	CO	Marks
1		Explain the difference between internal and external style sheets in CSS with examples.	K2	(3)
2		Given a scenario where a webpage displays conflicting styles, how would you resolve the conflict using CSS principles?	K3	(3)
3		What is the difference between prompt() and alert() in JavaScript? Give an example of using prompt() to get user input.	K2	(3)
4		Write a jQuery code snippet to hide a paragraph when a button is clicked.	K3	(3)
5		What is the purpose of the npm (Node Package Manager)? How is it used in Node.js projects?	K2	(3)
6		Write a small code snippet using the http module in Node.js to create a server that responds with "Hello, World!".	K3	(3)
7		What is useEffect in React? How is it different from useState? Provide an example of how useEffect is used to fetch data from an API.	K2	(3)
8		Write a simple React component that conditionally renders content based on whether data has been successfully fetched from an API or not. Include basic error handling.	K3	(3)
PART B				
Answer any one full question from each module. Each question carries 9 marks				
Module 1				
9	a)	Explain the structure of an HTML5 form. Write a sample form using at least three different input types. Also, explain the use of the autocomplete and datalist attributes.	K2	(6)
	b)	Using CSS, create a basic webpage layout with a header at the top and two sections side by side. Mention how you used CSS positioning or layout techniques to achieve this.	K3	(3)
10	a)	Explain the box model in CSS. Describe the role of content, padding, border, and margin with the help of a diagram or example.	K2	(5)
	b)	Write an HTML and CSS code snippet to display an image in the center of the page with a border and some padding around it.	K3	(4)
Module 2				
11	a)	Explain how JavaScript handles form validation. Write a simple example to check if a text field is empty when a form is submitted.	K2	(6)
	b)	Using jQuery, write a code to change the background color of a <div>	K3	(3)

		when the mouse is moved over it, and change it back when the mouse is moved away.		
12	a)	Explain the use of functions and arrays in JavaScript with examples. How do they help in organizing code?	K2	(5)
	b)	Write a jQuery script to select all paragraphs on a webpage and change their font color to blue when a button is clicked.	K3	(4)
Module 3				
13	a)	What are the key features and advantages of Node.js? How does it differ from traditional server-side technologies?	K2	(5)
	b)	Write a simple Node.js script using the <code>fs</code> module to read a file and display its content in the console.	K3	(4)
14	a)	Explain how a basic web server is created using the <code>http</code> module in Node.js. Mention how routing is handled.	K2	(5)
	b)	Write an Express.js program to handle a GET request at the route <code>/welcome</code> and send a "Welcome to Express" message as a response.	K3	(4)
Module 4				
15	a)	Explain the concept of component-based architecture in React. How does it help in building scalable and maintainable applications?	K2	(5)
	b)	Create a simple React component that manages a form using <code>useState</code> . The form should accept user input and display it on submission.	K3	(4)
16	a)	Describe how React communicates with a backend using REST APIs. How would you handle form submission and data fetching in React?	K2	(5)
	b)	Write a code snippet using <code>Axios</code> to send a POST request to a backend API and handle the response to display a success message in the UI.	K3	(4)

SEMESTER 6

SEMESTER 6

SOFTWARE ARCHITECTURE

Course Code	MNCST609	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:0	ESE Marks	60
Credits	3	Exam Hours	2Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

- To develop a comprehensive understanding of software architecture principles and patterns.
- To provide the ability to design and analyze software architectures.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Introduction to Software Architecture: Architectural Structures and Views, Importance of software architecture, Contexts of Software Architecture. Types of Software Development Project, Metrics for Project Size Estimation, Project Estimation Techniques	8
2	Quality Attributes and Modelling Runtime Entities: Quality attributes –Availability, Interoperability, Modifiability, Performance, Security. Component-and-Connector Views- Overview, Elements, Relations, and Properties of C&C View.	9
3	Tactics, Pattern and Quality: Architecture Tactics and Patterns- Architectural Patterns, Component-and-Connector Patterns, Allocation Patterns, Relationships between Tactics and Patterns, Using Tactics Together Quality Attribute Modeling and Analysis: Modeling Architectures to Enable Quality Attribute Analysis, Quality Attribute Checklists, Thought Experiments and Back-of-the-Envelope Analysis.	9
4	Architecture in Agile Projects and Cloud: Architecture in Agile Projects- Attribute Driven Design Method- Architecture and Implementation, Architecture and Testing Architecture in the Cloud- Basic Cloud Definitions, Cloud Service Models, Deployment Models, Economic Justification, Base Mechanisms, Sample Technologies, Architecting in a Cloud Environment.	10

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> 2 Questions from each module. Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24 marks)</p>	<p>4. Each question carries 9 marks.</p> <p>5. Two questions will be given from each module, out of which 1 question should be answered.</p> <p>6. Each question can have a maximum of 3 subdivisions.</p> <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students will be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand the significance of software architecture and apply appropriate architectural views, project classification, and estimation techniques to analyze and plan software development projects effectively.	K3
CO2	Analyze key software quality attributes and apply component - and - connector views to model and evaluate architectural design decisions.	K3
CO3	Apply architectural tactics and patterns to address quality attributes, and evaluate software architectures using modeling techniques such as checklists, thought experiments, and back-of-the-envelope analysis.	K3
CO4	Implement systems considering economic justification, service models and deployment options for the cloud.	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										2
CO2	3	2	3	3								2
CO3	3	3	3	3	3							2
CO4	3	3	3	3	3							2

Note: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Software Architecture in Practice,.	L.Bass, P. Clements, R. Kazman.	Addison-Wesley	4/e, 2024
2	Documenting Software Architectures: Views and Beyond	P.Clements, F. Bachmann, L. Bass, D. Garlan, J. Ivers, R. Little, P. Merson, R. Nord, and J. Stafford.,	Addison-Wesley	2/e, 2010
3	Fundamentals of Software Engineering	Rajib Mall	PHI Learning	2/e, 2014

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Software Architecture: Foundations, Theory, and Practice	R.N. Taylor, N. Medvidovic, and E. M. Dashofy	John Wiley & Sons	1/e, 2009
2	Software architecture - perspectives on an emerging discipline	Mary Shaw, David Garlan	Prentice Hall	1/e, 2015
3	Head First Software Architecture: A Learner's Guide to Architectural Thinking	by Raju Gandhi, Mark Richards, Neal Ford	Oreilly	1/e, 2024

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	
2	

MODEL QUESTION PAPER				
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY				
SIXTH SEMESTER B. TECH MINOR DEGREE EXAMINATION, MONTH AND YEAR				
Course Code: MNCST609				
Course Name: SOFTWARE ARCHITECTURE				
Max. Marks: 60			Duration: 2 hours 30 minutes	
		PART A		
		Answer all questions. Each question carries 3 marks	CO	Marks
1		Differentiate between module structures and allocation structures in software architecture.	CO1	(3)
2		What is the purpose of cost estimation in software project planning?	CO1	(3)
3		Define interoperability and explain its significance in software architecture.	CO2	(3)
4		What are component-and-connector views? Describe any two elements of a C&C view.	CO2	(3)
5		What is an architectural pattern? Give examples of any two commonly used patterns.	CO3	(3)
6		Explain the relationship between architectural tactics and quality attributes with a simple example.	CO3	(3)
7		What is Attribute-Driven Design (ADD) and why is it used in agile projects?	CO4	(3)
8		List and briefly explain any two cloud service models.	CO4	(3)
PART B				
Answer any one full question from each module. Each question carries 9 marks				
Module 1				
9	a)	Explain any two types of software development projects.	CO1	(3)
	b)	Explain the importance of architecture in the context of project life cycle.	CO1	(6)
10	a)	Explain function point and LOC metric detailing the advantages and disadvantages of each.	CO1	(6)
	b)	Compare and contrast the decisions addressed by module structure and component and connector structure.	CO1	(3)
Module 2				

11	a)	Explain the concept of achieving quality attributes through tactics.	CO2	(3)
	b)	Explain in detail the tactics for modifiability.	CO2	(6)
12	a)	A manufacturing system has a Mean Time Between Failures (MTBF) of 6,000 hours and a Mean Time To Repair (MTTR) of 10 hours. What is the system's steady-state availability?	CO2	(6)
	b)	Explain the tactics for security in detail.	CO2	(3)
Module 3				
13	a)	What are the important aspects of the layered pattern?	CO3	(4)
	b)	Explain the map reduce pattern providing the pseudocode for map and reduce.	CO3	(5)
14	a)	You are developing a web-based student management system using the MVC architecture. The application should allow users to view a list of students, add new student records, and update existing ones. When a user clicks the “Edit” button next to a student’s name, they should be taken to a form where they can modify the student's details. In the context of this student management system, describe how the Model, View, and Controller components would interact when a user wants to update a student's information. Identify what each component is responsible for in this scenario.	CO3	(6)
	b)	Discuss about forms of analysis and their life-cycle stage with respect to cost, and confidence in their outputs.	CO3	(3)
Module 4				
15	a)	Explain the Attribute Driven Design method in detail. Why is it considered iterative?	CO4	(3)
	b)	Explain security, performance, and availability aspects while architecting a cloud environment. When architecting a cloud-based application, how can you design the system to ensure security, high performance, and availability simultaneously?	CO4	(6)
16	a)	Big Bang Integration in integration testing is risky because it makes it hard to isolate and debug issues. What is the general approach to overcome this issue?	CO4	(6)
	b)	Explain in detail about the cloud Platform as a Service and Databases in detail.	CO4	(3)
