REST FUL WEB DESIGNING AND INTERNET DATA EXCHANGE **Course Code : 316375**

Programme Name/s	**: Artificial Intelligence/ Artificial Intelligence and Machine Learning/ Cloud Computing and Big Data/ Computer Technology/ Computer Engineering/ Computer Software Technology/ Computer Science & Engineering/ Data Sciences/ Computer Hardware & Maintenance/ Information Technology/ Computer Science & Information Technology/ Computer Science/**
Programme Code	**: AI/ AN/ BD/ CM/ CO/ CST/ CW/ DS/ HA/ IF/ IH/ SE**
Semester	**: Sixth**
Course Title	**: REST FUL WEB DESIGNING AND INTERNET DATA EXCHANGE**
Course Code	**: 316375**

I. RATIONALE

In the rapidly evolving web landscape, dynamic, platform-independent RESTful Web Services and efficient Internet Data Exchange have become essential for developing modern web-based applications. Knowledge of RESTful Web Services Development and Internet Data Exchange using Python is increasingly important for Computer Engineering diploma graduates. Technologies such as JSON, XML, Flask/FastAPI, Java with Spring Boot, Node.js, and MySQL are widely used in contemporary web development and provide a strong foundation for building scalable, dynamic, and platform-independent applications.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Develop platform independent web based applications using RESTful Web Services, Internet data exchange, JSON, database and modern web development framework.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Identify REST architecture, web services and HTTP methods.
- CO2 - Develop and test basic REST APIs.
- CO3 - Design REST resources using JSON and XML.
- CO4 - Use AJAX to consume and process REST APIs.
- CO5 - Describe API platform, data access and API management.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
316375	REST FUL WEB DESIGNING AND INTERNET DATA EXCHANGE	RWD	DSE	3	-	2	1	6	3	3	30	70	100	40	25	10	25#	10	25	10	175

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Total IKS Hrs for Sem. : 0 Hrs
Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination
Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Explain REST architecture and Web Services. TLO 1.2 Apply HTTP methods, URI and RESTful resources. TLO 1.3 Exchange data using JSON/XML and REST API clients.	**Unit - I Introduction to REST Fundamentals** 1.1 Programmable Web, Web Services and REST Architecture – Programmable Web, Web Services, client-server architecture, REST architecture, REST principles, REST constraints, REST vs SOAP, advantages and applications of REST 1.2 HTTP Methods, Request–Response Cycle, RESTful Resources and URI – HTTP, request and response messages, HTTP methods (GET, POST, PUT, PATCH, DELETE), status codes, headers, RESTful resources, URI, URL, path parameters and query parameters 1.3 Data Exchange, REST API Clients and HTTP Libraries – Data exchange concepts, JSON, XML, JSON/XML structure and parsing, REST API clients, Postman, cURL, HTTP libraries, Fetch API and consuming REST APIs	Demonstration Hands-on Lecture Using Chalk-Board
2	TLO 2.1 Develop and test basic REST APIs. TLO 2.2 Explain resource-oriented architecture and resources. TLO 2.3 Apply URI, addressability and statelessness.	**Unit - II RESTful Services** 2.1 REST API Request–Response Handling, Description and Testing – Basic REST API request/response handling, API endpoints, request body, response body, error handling, status codes, API description, OpenAPI/Swagger, API testing using Postman 2.2 Resource-Oriented Architecture and Resources – Resource-oriented architecture, resources, data sets and resource identification 2.3 URI, Addressability and Statelessness – URI, resource naming, addressability and stateless communication	Presentations Hands-on Demonstration Flipped Classroom

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Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Explain resource representations using JSON and XML. TLO 3.2 Describe links, connectedness and uniform interface in REST. TLO 3.3 Design read-only and read/write REST resources. TLO 3.4 Interpret HTTP responses and represent user accounts as resources.	**Unit - III RESTful Services and HTTP Methods Status Codes** 3.1 Resource Representations – Meaning of resource representation, JSON and XML formats, conversion of resources into representations, and selecting suitable representations for clients 3.2 Links, Connectedness and Uniform Interface – Hypermedia links, linking related resources, navigation between resources, connectedness, resource-based URLs, and standard HTTP methods such as GET, POST, PUT and DELETE 3.3 Resource Design and Read/Write Services – Identifying resources, designing resource URIs, defining resource attributes and relationships, designing read-only resources using GET, and read/write resources using POST, PUT and DELETE 3.4 HTTP Responses and User Accounts as Resources – HTTP status codes, response headers and body, success and error responses, handling client/server errors, and representing user accounts as REST resources	Hands-on Presentations Demonstration
4	TLO 4.1 Explain Ajax architecture and its benefits. TLO 4.2 Use Ajax as a REST client. TLO 4.3 Handle REST API responses using Ajax TLO 4.4 Process JSON data using Ajax.	**Unit - IV Applications as REST Clients** 4.1 AJAX and Ajax Architecture – Introduction, Ajax architecture, evolution from AJAX to Ajax, advantages and limitations 4.2 Ajax as a REST Client – REST integration, making REST requests and client-server communication 4.3 Handling REST Responses – Receiving, processing and handling REST API responses 4.4 JSON Data Exchange – JSON format, receiving and processing JSON data in Ajax applications	Presentations Demonstration Hands-on
5	TLO 5.1 Explain API platform architecture and its capabilities. TLO 5.2 Describe data handlers and Data Access Objects. TLO 5.3 Describe API management, life cycle, retirement and monetization.	**Unit - V API Platform, Data Handler and API Management** 5.1 API Platform Architecture – Need and role of an API platform, its capabilities, organization, architecture, and integration with enterprise technical architecture 5.2 Data Handler and Data Access – Data handler concepts, Data Access Object (DAO), data access operations, and separation of data access responsibilities 5.3 API Management and Life Cycle – API management, API life cycle, API retirement, API client interaction, and API monetization	Demonstration Presentations Hands-on Flipped Classroom

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Perform REST operations using HTTP methods and RESTful URIs.	1	*Create and test GET, POST, PUT and DELETE requests using Postman/cURL and observe URI, headers, request and response.	2	CO1
LLO 2.1 Create and parse JSON/XML data for REST API data exchange.	2	* Create, read and parse JSON and XML data containing student information.	2	CO1
LLO 3.1 Consume and display REST API data using Fetch API.	3	Consume a REST API using Fetch API and display the response data on a web page.	2	CO1

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 4.1 Test REST API requests and responses using Postman and status codes.	4	*Create/test REST API endpoints using Postman, including request/response body, status codes and basic error handling.	2	CO2
LLO 5.1 Identify and design resources for a RESTful application.	5	* Design REST resources for a simple application such as Student Management System and identify datasets and resources.	2	CO2
LLO 6.1 Design addressable resources using appropriate URIs and stateless communication.	6	Design suitable URIs for REST resources and demonstrate stateless communication using HTTP requests.	2	CO2
LLO 7.1 Create and process REST resource representations using JSON/XML.	7	* Create student/customer resource data in JSON and XML, convert resources into representations, and display the data.	2	CO3
LLO 8.1 Implement read-only and read/write REST services using appropriate HTTP methods.	8	* Design RESTful URIs and implement GET, POST, PUT and DELETE operations for a simple application such as Student Management.	2	CO3
LLO 9.1 Demonstrate connected REST resources using links and resource-based URLs.	9	Create related resources such as Student–Course and use hyperlinks/URIs to navigate between them.	2	CO3
LLO 10.1 Send REST requests using AJAX for client-server communication.	10	* Create a simple AJAX application to send GET/POST requests to a REST API without reloading the web page.	2	CO4
LLO 11.1 Receive and process REST API responses using AJAX.	11	Receive REST API responses using AJAX and display the response data dynamically on a web page.	2	CO4
LLO 12.1 Parse and display JSON data received from a REST API.	12	Fetch JSON data from a REST API using AJAX, parse it, and display selected data in HTML.	2	CO4
LLO 13.1 Demonstrate the basic architecture and components of an API platform.	13	* Design a basic API platform architecture showing client, API, server, database and their interactions.	2	CO5
LLO 14.1 Implement database operations using the DAO pattern	14	Create a simple application using the Data Access Object (DAO) pattern to perform database operations such as insert, update, retrieve and delete.	2	CO5
LLO 15.1 Demonstrate basic API management and life-cycle operations.	15	Create and document a simple REST API and demonstrate API creation, testing, versioning and retirement using an API management/testing tool.	2	CO5
LLO 16.1 Identify the requirements of an AI-based RESTful API Assistant.	16	* Develop a RESTful API-based AI Assistant that accepts user queries and provides suitable responses.	2	CO5

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Assignment

- Solve assignment covering all COs given by course teacher.

Micro project

- Online Examination REST API: Develop a REST API for an online examination system. The API can provide questions, accept student answers and return examination results. JSON can be used for exchanging questions, answers and result data between the client and server.
- Library Book Management REST API: Create a REST API to manage library books. The system should maintain book ID, title, author, category and availability status. Students can implement APIs to *add books, search books, update availability and delete book records.
- Hospital Appointment REST API: Develop a RESTful web service for managing doctor appointments. The system can maintain patient name, doctor name, appointment date, time and status. APIs can be created to book, view, update and cancel appointments* using JSON data.
- Student Management REST API: Develop a REST API to manage student information such as student ID, name, branch, semester and marks. The API should provide operations to *add, view, update and delete* student records using HTTP methods such as GET, POST, PUT and DELETE.
- Online Restaurant Menu REST API: Develop a RESTful API for managing restaurant menu items. The API can store item name, category, price and availability. Users can retrieve menu details, add new items, update prices and remove unavailable items using REST API operations.

Other

- Complete any course of RESTFUL WEB DESIGNING AND INTERNET DATA EXCHANGE on Infosys Springboard/Spoken Tutorial/NPTEL 2. Develop APIs using RESTful architecture, HTTP methods, JSON/XML, and AJAX for data exchange.

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Hardware Requirements: Computer systems with minimum Intel Core i3/equivalent processor, 8 GB RAM, 256 GB SSD, standard peripherals and LAN/Internet connectivity. A local or dedicated application server may be configured as required.	All
2	Software Requirements: Windows 10/11 or Linux operating system; Visual Studio Code or equivalent code editor; Google Chrome or any modern web browser; Node.js with Express.js; SQLite or MySQL database; JavaScript, JSON and basic HTML support; and internet access. Git/GitHub or equivalent version control: Postman or cURL for API testing	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction to REST Fundamentals	CO1	8	4	4	6	14
2	II	RESTful Services	CO2	8	4	4	4	12

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Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
3	III	RESTful Services and HTTP Methods Status Codes	CO3	12	4	4	8	16
4	IV	Applications as REST Clients	CO4	8	4	4	6	14
5	V	API Platform, Data Handler and API Management	CO5	9	2	6	6	14
Grand Total				**45**	**18**	**22**	**30**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Continuous assessment based on process and product related performance indicators. Each practical will be assessed considering 1) 60% weightage is to process 2) 40% weightage to product

Summative Assessment (Assessment of Learning)

- End Semester Examination, Lab Performance, Viva-voce

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	2	1	1	-	2	1			
CO2	3	3	3	3	-	2	1			
CO3	3	3	3	3	-	2	1			
CO4	3	3	3	3	-	2	1			
CO5	3	2	2	3	-	2	2			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Leonard Richardson and Sam Ruby	RESTful Web Services	Publisher: O'Reilly Media, 2013 Print ISBN-13: 978-1-4493-5806-8
2	Mike Amundsen	RESTful Web API Patterns and Practices Cookbook	O'Reilly Media Indian edition ISBN: 9789355421845
3	Sanjay Patni	Pro RESTful APIs with Micronaut: Build Java-Based Microservices with REST, JSON, and XML	Publisher: Apress Latest Edition: 3rd Edition, 2025 ISBN: 979-8-8688-1243-9

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description

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Sr.No	Link / Portal	Description
1	https://www.w3schools.com/nodejs/nodejs_rest_api.asp	Restful webservice Designing
2	https://www.geeksforgeeks.org/node-js/rest-api-introduction/	REST API Introduction
3	https://www.tutorialspoint.com/restful/index.htm	RESTful Web Services Tutorial

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

MSBTE Approval Dt. 04/09/2025 **Semester - 6, K Scheme**