

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)**Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)**
Semester-IV**Course Title: Modern Practical Tools**
(Course Code: 4340705)

Diploma programme in which this course is offered	Semester in which offered
Computer Engineering	Forth

1. RATIONALE

Today's modern industry uses many frameworks for a front-end web design and Angular is one of them for developing dynamic web applications. It covers all the basics of frontend web application development using the Angular framework in order to provide developers insights into real-world challenges and scenarios they face throughout their day-to-day development process, as well as provides tips and best practices for becoming a web application developer.

Self-learning tips on exploring Angular topics are provided to equip the student better to continuously keep upgrading their knowledge and skills even after landing a career in Angular. All the key theories and concepts related to the Angular framework and front-end web development are explained with the help of real-world day-to-day problems. The learners will be asked to complete projects and challenges based on the concepts which they learned in lab sessions to help them to get a real-world glimpse into practical Angular front-end programming. Below are major reasons for considering learning Angular over other platforms.

- Optimal code
- Easy to Integrate
- Support for Single Page Applications
- Declarative User Interface
- Modularity
- Cross-platform compatibility

This course will give basic knowledge and skills for front-end design for web application development using Angular framework.

2. COMPETENCY

The purpose of this course is to help the student to attain the following industry identified competency through Angular Framework experiences:

- **Use Angular Framework to build appealing dynamic web application for all platforms.**

3. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge and the relevant soft skills associated with the identified competency are to be developed in the student for the achievement of the following COs:

- Prepare environment for angular project using Node.js, npm and visual code editor.
- Apply angular directives, components and pipes in different web page development.
- Utilize angular template driven and reactive forms in different problem solutions.
- Design pages to make HTTP GET/POST calls to perform CRUD operations using different server-side APIs.
- Develop single page dynamic applications using Angular framework and APIs.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				
L	T	P		Theory Marks		Practical Marks		Total Marks
			C	CA	ESE	CA	ESE	
0	0	2	1	0	0	25	25	50

(*): For this practical only course, 25 marks under the practical CA has two components i.e. the assessment of micro-project, which will be done out of 10 marks and the remaining 15 marks are for the assessment of practical. This is designed to facilitate attainment of COs holistically, as there is no theory ESE.

Legends: L-Lecture; T- Tutorial/Teacher Guided Theory Practice; P-Practical; C- Credit, CA - Continuous Assessment; ESE -End Semester Examination.

5. SUGGESTED PRACTICAL EXERCISES

The following practical outcomes (PrOs) are the sub-components of the COs. Some of the PrOs marked “*” are compulsory, as they are crucial for that particular CO at the ‘Precision Level’ of Dave’s Taxonomy related to ‘Psychomotor Domain’.

S. No	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Setup environment for Angular framework by Installing Node.js, npm package manager using editor like Visual Code.	I	01*
2	Create first application to print Hello World message using angular framework.	I	01*
3	Design a web page to utilize property binding and event binding concepts using button and textbox controls.	I	01*
4	Create various components of web page using Attribute Directives.	II	01*
5	Design a web page to display student grading system in tabular format with alternate color style using ngSwitch, ngStyle Directives.	II	01*

S. No	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
6	Design component to perform following tasks A) To Add or Remove number of students using textbox and button controls and display it in tabular structure format. B) Give row level remove button option to student table and record should be deleted when click on it..	II	02*
7	Create a component to display a products list from array. the product component should display a product Id, name, purchase date, price, and image for the product and search using various pipes.	II	02*
8	Design a student registration page using template driven form approach and utilize different form and controls level ng validation classes.	III	01*
9	Design component to enter faculty details like Code, Name, Email, Type, Faculty Status (Active, Inactive), Subjects Teaching (with option to add multiple subjects dynamically) using reactive form with various types of validation of form and controls.	III	02*
10	Design a page to implement Add to Cart functionality using decorators, custom properties, custom events of component communication.	III	01*
11	Develop page to demonstrate different methods of angular component lifecycle.	III	01*
12	Design an e-commerce product page and product details page that displays product details when clicking on any particular product.	III	02*
13	Design a page to display student information using dependency Injection.	IV	02*
14	Develop a page for product listing and search-as-you-type using observables and web APIs from database.	IV	02*
15	Design web page to display student data in table using HTTP GET/POST Calls from web APIs.	IV	02*
16	Design web page to insert product data in table using web APIs.	IV	01*
17	Design a page to implement Multiview component with login, logout functionalities using different routing options.	V	02*
18	Develop a page to demonstrate page navigation of product list using routing concepts.	V	01*
19	Design a page to load customer and Sales order data using lazy loading technique in angular.	V	01*
20	Design a page to implement CORS concept.	V	01*

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
	Total 20 Practical Exercises		28 Hrs.

Note

- i. More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list.
- ii. The following are some **sample** 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above listed **Practical Exercises** of this course required which are embedded in the COs and ultimately the competency.

S.No.	Sample Performance Indicators for the PrOs	Weightage in %
1	Use of creative and innovative approach.	20
2	Readability	15
3	Code Efficiency	30
4	Verify practical implementation for desired output.	25
5	Readability and documentation of the program/Quality of input and output displayed (messaging and formatting).	10
	Total	100

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

These major equipment with broad specifications for the PrOs is a guide to procure them by the administrators to usher in uniformity of practicals in all institutions across the state.

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	Computer system with operating system and browser that supports JavaScript.	All
2	HTML IDEs and Code Editors Open-source tools like Visual Studio Code, Notepad++	All
3	Open-source jQuery, Node.js, Node Package Manager (npm)	All

7. AFFECTIVE DOMAIN OUTCOMES

The following **sample** Affective Domain Outcomes (ADOs) are embedded in many of the above-mentioned COs and PrOs. More could be added to fulfil the development of this course competency.

- a) Work as a leader/a team member.
- b) Follow ethical programming practices.
- c) Practice environmentally friendly methods and processes.
- d) Follow safety precautions.

The ADOs are best developed through the laboratory/field-based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- i. 'Valuing Level' in 1st year
- ii. 'Organization Level' in 2nd year.
- iii. 'Characterization Level' in 3rd year.

8. UNDERPINNING THEORY

The major underpinning theory is given below based on the higher level UOs of Revised Bloom's taxonomy that are formulated for development of the COs and competency. If required, more such UOs could be included by the course teacher to focus on attainment of COs and competency.

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different levels)	Topics and Sub-topics
Unit – I: Introduction to Angular Framework	1a Setup Angular Development Environment 1b Getting Started first Angular Project 1c Identify the various pieces that the Angular skeleton application generates and their needs and uses. 1d Relate basic Angular data binding mechanism.	1.1 Why Angular 1.2 Development Environment: Node JS, Type script, Angular CLI 1.3 Starting Your First Angular Project 1.4 Understanding the Angular CLI 1.5 Running first Application for Hello World 1.6 Basics of an Angular Application Root HTML--index.html The Entry Point--main.ts Main Module--app.module.ts Root Component-AppComponent 1.7 Creating a Component 1.8 Understanding Data Binding 1.9 Understanding Property Binding 1.10 Understanding Event Binding 1.11 Using Models for Cleaner Code
Unit– II: Angular Directives, Components and Pipes	2a. Classify various type of Directives used in angular 2b. Apply various attributes, decorator, and styles to components. 2c. Use various states of component life cycle. 2d. Utilize various types of pipes in template expression for display data in Angular.	2.1 Introduction Directives 2.2 Built-In Attribute Directives: NgClass, NgStyle 2.3 Alternative Class and Style Binding Syntax 2.4 Built-In Structural Directives Ngif , NgFor, NgSwitch, Multiple Sibling Structural Directives 2.5 Defining a Component 2.6 Selector, Template, Styles, Style Encapsulation, Others Components and Modules 2.7 Input, Output and Change Detection 2.8 Component Lifecycle, Interfaces and Functions, View Projection 2.9 Introduction to Pipes 2.10 Built-In Pipes, Angular Custom Pipes, Pure and Impure Pipes 2.11 Pipe Transform Interface &

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different levels)	Topics and Sub-topics
		Transform Function
Unit– III: Angular Template Driven Forms and Reactive Forms	3a. Show usage of template driven Forms. 3b. Perform page design with Reactive Forms. 3c. Apply Form Array in various components. 3d. Differentiate Template driven and reactive Forms.	3.1 Introduction to Template-Driven Forms 3.2 Setting Up Forms 3.3 Alternative to NgModel-Event and Property Binding 3.4 NgModel 3.5 A Complete Form, Control State and Validity 3.6 Working with Form Groups 3.7 Introduction to Reactive Forms 3.8 Using Reactive Forms: Form Controls, Form Groups, Form Builders 3.9 Form Data, Control State, Validity, and Error Messages 3.10 Form Arrays
Unit–IV: Angular Services and HTTP calls	4a. Correlate the concepts of Angular services and Dependency Injection 4b. Develop customize APIs for different CRUD operations. 4c. Apply Various HTTP calls in application development. 4d. Utilize Observables feature in customized application.	4.1 Introduction to Angular Services. 4.2 Creating Our Own Angular Service and Dependency Injection 4.3 Introducing HttpClient, Server Setup, Using HttpClientModule, HTTP GET/POST Calls 4.4 Design Server-side APIs using PHP and MYSQL 4.5 Advanced HTTP: Options-Headers/Params, Observe/Response Type, Interceptors 4.6 RxJS, Observables and Advanced Observables
Unit–V: Angular Routing and Application Development	5a. setup the Angular router for any Angular application. 5b. Apply different routing concept for navigation. 5c. Use Route Guard for authenticated page navigation. 5d. Utilize concepts of CORS and Lazy loading to design web pages.	5.1 Server Setup, Importing the Router Module, Displaying the Route Contents, Navigating Within the Application, Wildcards and Defaults 5.2 Common Routing Requirements, Required Route Params, Optional Route Params 5.3 Route Guards: Authenticated-Only Routes, Preventing Unload, Preloading Data Using Resolve 5.4 API/Server Calls and CORS 5.5 Lazy Loading

9. SUGGESTED SPECIFICATION TABLE FOR QUESTIONPAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction to Angular Framework	3				
II	Angular Directives, Components and Pipes	6				
III	Angular Template Driven Forms and Reactive Forms	7				
IV	Angular Services and HTTP calls	7				
V	Angular Routing and Application Development	5				
Total		28				

Legends: R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)

Note: This specification table provides general guidelines to assist students for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions to assess the attainment of the UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may slightly vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

Other than the laboratory 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 perform following activities in group and prepare reports of about 5 pages for each activity. They should also collect/record physical evidences for their (student's) portfolio which may be useful for their placement interviews:

- Identify tools used for web page development and present its features.
- Undertake course "Angular - The Complete Guide (2023 Edition)" available on Udemy online platform. (<https://www.udemy.com/course/the-complete-guide-to-angular-2/>).
- Undertake course "Angular Course" available on internshala online platform. ([Angular Course - Learn Angular JS Online with Certificate \(internshala.com\)](https://www.internshala.com/angular-course-learn-angular-js-online-with-certificate/)) or any other such site.
- Undertake course "Routing and Navigation Concepts in Angular" available on coursera online platform. ([Routing and Navigation Concepts in Angular \(coursera.org\)](https://www.coursera.org/course/routing-and-navigation-concepts-in-angular)) or any other such site.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- Guide student(s) in undertaking micro-projects.
- 'P' in section No. 4** means different types of instructions that are to be employed by teachers to develop the outcomes.
- About **20% of the topics/sub-topics** which are relatively simpler or descriptive in nature is to be given to the students for **self-learning**, but to be assessed using different assessment methods.
- With respect to **section No.10**, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.
- Guide students for open-source Angular framework and other resources.

- g) Motivate students to visit as many websites as they can to increase the design knowledge and creativity.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based (group of 3 to 5). However, **in the fifth and sixth semesters**, the number of students in the group should **not exceed three**.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The duration of the microproject should be about **12-14 (twelve to fourteen) student engagement hours** during the course. The students ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. This has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:

- Develop a Notepad application with functionality of digital Notebook.
- Develop currency converter application using angular framework.
- Develop Angular Bare Bones project showcases Angular routing
- Develop a dynamic single page application for awareness towards blood donation, organ donation, follow healthy life style and quit smoking in society.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Angular in Action	Jeremy Wilken	Manning Publications. ISBN-10: 1617293318 ISBN-13: 978-1617293313
2	Angular: Up and Running: Learning Angular, Step by Step	Shyam Seshadri	O'Reilly Media, Inc. ISBN-10: 9352137426 ISBN-13: 978-9352137428
3	ng-book: The Complete Guide to Angular	Felipe Coury, Ari Lerner, Carlos Taborda	Createspace Independent Publishing Platform. ISBN-10: 1985170280 ISBN-13: 978-1985170285
4	Angular Projects	Aristeidis Bampakos, Mark Thompson	Packt Publishing Ltd. ISBN-10: 1800205260 ISBN-13: 978-1800205260
5	Angular Development with TypeScript	Yakov Fain, Anton Moiseev	Manning; 2nd edition ISBN-10: 1617295345 ISBN-13: 978-1617295348
6	Angular Cookbook	Muhammad Ahsan Ayaz, Najla Obaid	Packt Publishing Limited, ISBN-10: 1838989439 ISBN-13: 978-1838989439

14. SOFTWARE/LEARNING WEBSITES

- <https://www.geeksforgeeks.org/angular-8-introduction/>
- [Angular7 Tutorial \(tutorialspoint.com\)](https://www.tutorialspoint.com/angular7/tutorial/angular7-tutorial.html)
- <https://docs.angularjs.org/guide/concepts>
- [https://www.w3schools.com/angular-8-tutorial](https://www.w3schools.com/angular/angular-tutorial.asp)
- <https://www.simplilearn.com/tutorials/angular-tutorial>
- <https://www.javatpoint.com/angular-7-tutorial>

15. PO-COMPETENCY-CO MAPPING

Semester IV	Modern Practical Tools (Course Code: 4340705)						
	POs						
Competency & Course Outcomes	PO 1 Basic & Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/development of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO 5 Engineering practices for society, sustainability & environment	PO 6 Project Management	PO 7 Life-long learning
Competency	Use Angular Framework to build appealing dynamic web application for all platforms.						
Course Outcomes							
CO a) Prepare environment for angular project using Node.js, npm and visual code editor.	2	-	1	1	-	-	-
CO b) Apply angular directives, components and pipes in different web page development.	2	1	1	1	-	-	1
CO c) Utilize angular template driven and reactive forms in different problem solutions.	2	2	2	2	-	-	-
CO d) Design pages to make HTTP GET/POST calls to perform CRUD operations using different server-side APIs.	2	2	2	2	-	-	1
CO e) Develop single page dynamic applications using Angular framework and APIs.	2	2	2	2	1	1	1

Legend: '3' for high, '2' for medium, '1' for low and '-' for no correlation of each CO with PO.

16. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU Resource Persons

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