Full Stack Development

Government of Karnataka

DEPARTMENT OF COLLEGIATE and TECHNICAL EDUCATION

Program	**Computer Science & Engineering**	**Semester**	**5**
Course Code	**20CS52I**	**Type of Course**	**L:T:P (104:52:312)**
Course Name	**Full Stack Development**	**Credits**	**24**
CIE Marks	**240**	**SEE Marks**	**160**

Introduction:

Welcome to the curriculum for the Full Stack Development Specialisation. This specialisation course is taught in Bootcamp mode. Bootcamps are 12 weeks, intense learning sessions designed to prepare you for the practical world – ready for either industry or becoming an entrepreneur. You will be assisted through the course, with development-based assessments to enable progressive learning. In this course, you'll learn a complete suite of software development skills to build application like front-end, middleware, and back-end Java web developer technologies, test and deploy code, store data using MongoDB, and much more.

This course will teach you Fundamentals of business process automation, React, Spring, MongoDB, REST API, DevOps practices, cloud deployment and more. Details of the curriculum is presented in the sections below.

Pre-requisite

Before the start of this specialisation course, you would have completed the following courses;

In the 1st year of study, you would have studied Engineering Mathematics, Communication Skills, Computer Aided Engineering Graphics, Statistics & Analysis, Basic IT Skills, Fundamentals of Computer, Fundamentals of Electrical and Electronics Engineering, Project Management skills and Multimedia & Animation.

In the 2nd year of study, you would have studied Python Programming, Computer Hardware, Maintenance and Administration, Computer Networks, Database System Concepts and PL/SQL,

Data Structures with Python, Operating System and Administration, Object oriented programming and Design with Java, Software Engineering principles and practices.

In this year of study, you shall be applying your previous years learning along with specialised field of study into projects and real-world applications.

Course Cohort Owner

A Course Cohort Owner is a faculty from the core discipline, who is fully responsible for one specialised field of study and the cohort of students who have chosen to study that specialised field of study.

Guidelines for Cohort Owner

1. Each Specialized field of study is restricted to a Cohort of 20 students which could include students from other relevant programs.
2. One faculty from the Core Discipline shall be the Cohort Owner, who for teaching and learning in allied disciplines can work with faculty from other disciplines or industry experts.
3. The course shall be delivered in boot camp mode spanning over 12 weeks of study, weekly developmental assessments and culminating in a mini capstone.
4. The industry session shall be addressed by industry subject experts (in contact mode/online / recorded video mode) in the discipline only.
5. The cohort owner shall be responsible to identify experts from the relevant field and organize industry session as per schedule.
6. Cohort owner shall plan and accompany the cohort for any industrial visits.
7. Cohort owner shall maintain and document industrial assignments, weekly assessments, practices and mini project.
8. The cohort owner shall coordinate with faculties across programs needed for their course to ensure seamless delivery as per time table
9. The cohort owner along with classroom sessions can augment or use supplementally teaching and learning opportunities including good quality online courses available on platforms like Karnataka LMS, Infosys Springboard, NPTEL, Unacademy, SWAYAM , etc.

Course outcome: A student should be able to

CO1	Explain typical business process in an organization and identify opportunities for digital transformation.
CO2	Document system requirements and write an appropriate development plan.
CO3	Design, develop and test an automated business process.
CO4	Develop RESTful API's and test functions as per the defined requirements.
CO5	Select an appropriate production environment, UI and deploy the application.

Detailed course plan

Week	CO	PO	Days	1st session (9am to 1 pm)	L	T	P	2ND session (1.30pm to 4.30pm)	L	T	P
1	1	1	1	- What is an Enterprise? - Organizing the Enterprise - process - Understanding /Types of business activities - What is business process? - Why to automate business process? **Ref. No 1**	3		1	- Digital transformation through Convergence of IT & OT - Digital Transformation Success Stories - How technology has impacted digital transformation - Case study: Digital transformation through IT/OT convergence **Ref. No 2**	1		2
	1	1,5	2	**Industrial visit:** Visit small or medium scale nearby industry and know the business entity and activities. Understand the different work divisions with a business entity.			4	**Map the relationship between various divisions of business entity both vertical and horizontal relationships** **Understanding the business process and workflow within a business entity**			3
	1	2,3	3	**Report of industrial visit.** - Document the major business divisions and their activities. - Draw the workflow for each identified division.			4	- Identify the typical processes and workflows that can be automated. - Introduction to Full stack development, its components, tools used, etc. - Understanding Full stack framework both within firewall and on the cloud			3

				- Create a map of workflows to represent interaction among divisions and the entire business process as well.							
	1,2	2,3	4	Recap - Design Thinking - Design thinking for software development - Apply design thinking to automate the observed activities in the industrial visit **Ref. No 3**	1		3	Contd.			3
			5	**Developmental Assessment**				Assessment Review and corrective action			3
	1,2	2,3, 4	6	Full stack development – industrial perspective How to create project plan and product backlog for project and User story creation	2		3	Weekly Assignment(1PM-2PM)			
2	2,3	2,3	1	**peer review** project activity: Make student teams (2 -3 students per team), each team is responsible for automating activities of an identified business entity. Integration of each team's work must lead to an enterprise application.		4		**Recap – software development (Agile methodology)** - Define goal of product - Define epics - Create roadmap for epics - Cost estimation - Risk management	2		1

								Note: Consider any web application in any sector (Retail, Health, Logistics,Finance, etc)			
	2,3	2,3	2	- Creating user stories for the epic - Creating Acceptance criteria - sprint planning - Backlog Refinement - Sprint Demo - Burn down charts - Sprint retrospective Create and manage product backlog using appropriate tool like Jira Create Sprint 1 with required user stories	2		2	Design principles - Availability - Performance - Consistency - Scalability - Manageability - cost Architectural patterns - Monolithic - Layered - Service oriented architecture - Microservice architecture **Ref. No 4** Step 01 - Need for Architecture - Viewer Page | Infosys Springboard (onwingspan.com)	2		1
	2,3	2,3	3	Design methods for security - Application security - Authentication and authorization methods and their usage and considerations o Token based	2		2	Design methods for Datastores - Structured - Semi structured - Unstructured **Recap of**	1		2

				○ Cookie based ○ OpenID ○ Third party access ○ SAML ○ Multi factor authentication - Encryption Design and implement authentication flow using anyone of the above listed.				**Data base design**			
	2,3	2,3, 4	4	Design principles for – UI / UX Create UI/UX design - for created user stories (wireframing) Technology, tools and frameworks for application development	1		3	Contd.			3
			5	**Developmental Assessment**				**Assessment Review and corrective action**			3
			6	Comparison of various enterprise application development technology stacks (development, engineering, deployment, Monitoring) Security architecture and best practices in enterprise application programming.	2		3	Weekly Assignment(1PM-2PM)			
3	2,3	4	1	Peer review Project status review Demonstration of artifacts of the project		4		DevOps engineering practices - Configuration management - Continuous integration - Automated testing	1		2

								- Infrastructure as code - Continuous delivery - Continuous deployment - Continuous monitoring Explore the various tools used - T			
	2,3	4	2	**Configuration management** Why Do We Need a Version Control System? Fundamentals of Git Git Client installation and setup basic local Git operations ▪ creating a repository, ▪ cloning a repository, ▪ making and recording changes ▪ staging and committing changes, ▪ viewing the history of all the changes undoing changes	1		3	Git Branching and merging Basic ▪ Creating and switching to new branches ▪ Switching between branches ▪ Merging local branches together GitHub - Basics of distributed git Account creation and configuration - Create and push to repositories - versioning - Collaboration - Migration Create repository – named mini project-1 Push the same to GitHub TOC - Git Essentials: Become a Git and GitHub Ninja | Infosys Springboard (onwingspan.com)	1		2

	5	1,4	3	**Cloud basics** - Cloud Infrastructure Overview - Cloud computing architecture and its components - Service models - Deployment models - Virtualization - Cloud Native Application Development o Essentials of Cloud - Viewer Page | Infosys Springboard (onwingspan.com)	3		1	- Create cloud account (AWS, GCB or any other service provider) and explore the features - Create and setup a virtual machine. - Create a simple webapp using cloud services - How to use cloud service for user authentication flow, allowing users to sign up, sign in, and reset their password - Build a Basic Web Application on AWS (amazon.com)			3
	2,3		4	**Continuous integration** - Use any suitable build CI/CD tool (such as Jenkins, bitbucket, GitHub Actions etc.) or cloud-based services to create build pipeline having steps code build, test, code quality check. - Working of the tool / cloud service used. ***Note: Create build pipeline for simple web applications such as To-do app, BMI calculator, Number converter, WordCount etc.***	1		3	- Contd..			3
			5	**CIE 1 – Written and Practice Test**				**Assessment Review and corrective action**			3

	2,3	4	6	Comparison of cloud services How to make full stack development efficient by using DevOps	2		3	Weekly Assignment(1PM-2PM)			
4	2,3, 5	3,4	1	Peer review Project status review Demonstration of artifacts of the project		4		Recap HTML, CSS and JavaScript Fundamentals (Code structure – statements, comments, variables, Constants, Data types, Interaction, Operators, Comparisons, Control flow, Functions) **Setting Up the Environment and Tools for front end development** - Installing VS Code - VS Code extensions JSON- Tutorial ***Note: suitable cases to be used to learn and implement program constructs.***	1		2
	2,3, 5	3,4	2	JS objects Methods, Constructors, Object properties - Data properties - Accessor properties - Prototype ***Practice: use suitable cases to implement above concepts***	1		3	- Contd.			3

	2,3, 5	2,3, 4	3	ES6 - Arrow functions - Template strings - Prototype methods - Spread operator - Map - Set Create a form like registration form, feedback form, after submit hide create form and enable the display section	2		2	Contd.			3
	2,3, 5	2,3, 4	4	Introduction to TypeScript Why TypeScript? Setting up development environment for TypeScript - Install TypeScript compiler - Install Live server Create and run first program in TypeScript - Basic Types - Control flow statement - Functions TypeScript "Hello, World!" (typescripttutorial.net)	2		2	- Contd..			3
			5	**Development Assessment**				Assessment Review and corrective action			3

	2,3,5	2,3,4	6	Modern UI technologies	2		3	Weekly Assignment(1PM-2PM)			
5	2,3,5	2,3,4	1	**Peer review** Project status review Demonstration of artifacts of the project		4		Introduction to React - What is React? - Setting up React development environment - Installing Node.js - Anatomy of React app (folder structure) - Creating and running a React.js app **Ref. No 7** Build a Full-Stack React Application on AWS (amazon.com)	1		2
	2,3,5	2,3,4	2	Introduction to JSX - What is JSX? - Expressions in JSX - Specifying Attributes with JSX - Specifying Children with JSX - Rendering Elements o DOM o React DOM o React Virtual DOM	2		2	- Components - What is a component? - Function and Class Components - Rendering a Component - Composing Components - Create your first React Component.	1		2
	2,3,5	2,3,4	3	Props & State - State - Props	2		2	- JSX for React components - How to crate JSX elements? - How to test components	1		2

				- Communication between components using Props - Understanding Component life cycle Component life cycle methods - Mounting phase - Updating phase - Unmounting phase - Error Handling							
	2,3, 5	2,3, 4	4	Handling Events Conditional Rendering Lists & Keys	2		2	Forms - Use of HTML tags in forms like select, input, file, textarea, etc. - controlled components - uncontrolled components Lifting State Up			3
			5	**CIE 2 – Written and Practice Test**				Assessment Review and corrective action			3
	2,3, 5	2,3, 4	6	Testing single page application	2		3	Weekly Assignment			
6	2,3, 5	2,3, 4	1	Peer review Project status review Demonstration of artifacts of the project		4		Context Fragments Higher-Order Components	2		1
	2,3, 5	2,3, 4	2	React Router - React router – parameters	1		3	Contd..			3

				- React router key components Implement navigation using react router							
	2,3, 5	2,3, 4	3	**React Hooks** - Introduction - React Hooks – useState, useEffect, useContext and useReducer Custom Hooks	1		3	Build single page application – like shopping Cart			3
	2,3, 5	2,3, 4	4	Build single page application			4	Recap - Object oriented concepts and design principles - Data Structures - Database Concepts - Java and servlet basics - Java Collections (List, Set, Map) ,Threads Setting up the environment and tools Install java (latest stable version) and add environment variable Install java editor (such as IntelliJ, Eclipse or any other) Install DBMS (MySQL, PostgreSQL or any other) XML – T	1		2

			5	**Development assessment**				Assessment Review and corrective action			3
	2,3, 5	2,3, 4	6	**State Management with Redux**				Weekly Assignment(1PM-2PM)			
7	3,4	2,3, 4	1	**Peer review** Project status review Demonstration of artifacts of the project		4		Basics of Apache Maven or Gradle – project management tool Understanding pom.xml TOC - Maven Basics | Infosys Springboard (onwingspan.com)	2		1
	3,4	2,3, 4	2	Introduction to Spring Framework What is Spring? - Why Spring Framework? - Spring Framework Architecture - Key components of Spring Framework - SpringBoot Why SpringBoot? Compare Spring and SpringBoot understanding the spring initializer interface TOC - Introducing Spring 5.0 | Infosys Springboard (onwingspan.com) TOC - Spring Essentials | Infosys Springboard (onwingspan.com)	2		2	- Spring Annotations Create Spring application with Spring Initializer using dependencies like Spring Web, Spring Data JPI How to run the project Getting Started | Building an Application with Spring Boot	1		2
	3,4	2,3, 4	3	Inversion of Control and Dependency Injection What is inversion of control?	2		2	Contd.			3

				What is dependency injection? Types of DI - Constructor - Property - Method Practice : constructor injection Property injection Method injection TOC - DI in Spring Framework | Infosys Springboard (onwingspan.com) TOC - Introduction to the Spring Framework | Infosys Springboard (onwingspan.com)						
	3,4	2,3, 4	4	Spring IoC container – ApplicationContext ComponentScanning DI in spring Boot - Constructor injection - Setter injection - Field injection Autowiring - Qualifier - Bean Scope (Object scope)	1		3	Contd..			3

				Autowiring dependencies							
			5	**CIE 3 – Written and Practice Test**				Assessment Review and corrective action			3
	3,4	2,3, 4	6	**Converting monolithic application to microservices architecture**	2		3	Weekly Assignment			
8	3,4	2,3, 4	1	**Peer review** Project status review Demonstration of artifacts of the project		4		Application Programming Interface (API) - What is an API? - How API works? - Why we need APIs? - API types (Open APIs, Partner APIs, Internal APIs, Composite APIs) - Types of API Protocols (SOAP, REST) Common API examples	2		1
	3,4	2,3, 4	2	API endpoints What is API endpoint? Why are API endpoints important? API endpoint examples How to Test API Endpoints HTTP Concepts - HTTP working - HTTP Method (GET, POST, PUT, DELETE) Understanding of JSON structure for API request and response data	2		2	Basics of REST - Evolution of API - Overview of REST - REST architectural style, components, views, - REST constraints - Properties of REST API - REST API Design Principles How to create RESTful service Install Postman	2		1

								Test created APIs with the help of Postman			
	3,4	2,3, 4	3	Spring REST – creating Spring REST controller - Controller Layer (handling request and responses) - Service Layer (Application business logic) - Repository layer (Communicate with DB)	1		3	Limitations of JDBC API Object relational Mapping – features and benefits JPA – Java Persistent API Spring Data JPA configuration Create ORM entity class Create database and configure using SpringBoot application property file ***Note – Hibernate or any other ORM framework can be used*** About Hibernate Framework - Viewer Page | Infosys Springboard (onwingspan.com)	1		2
	3,4	2,3, 4	4	Create REST controller for CRUD operations Versioning Spring REST APIs Practice: Create user registration form. Build models for considered use case.	1		3	Contd..			3
			5	**Development Assessment**				Assessment Review and corrective action			3
	3,4	2,3, 4	6	Spring Transactions				Weekly Assignment			

	3,4	2,3,4	1	**Peer review** Project status review Demonstration of artifacts of the project		4		Transaction management and compliance to ACID principles	1		2
	3,4	2,3,4	2	Securing REST APIs with Spring Security API security configuration	1		3	Build user authentication flow and authorization using SpringSecurity			3
	3,4	2,3,4	3	**Junit – Tutorial** Writing Junit test cases for CRUD operations Test controller endpoints			4	Contd..			3
9	3,4	2,3,4	4	Introduction NoSQL - 1 - Brief history - Features & Benefits - Types - Cap theorem - BASE **Explore and compare the features of various NoSQL databases - T**	1		3	Getting started with MongoDB - MongoDB overview - features - key components of Architecture - data modelling Working with MongoDB - MongoDB Shell – mongosh Mongo Compass GUI Setup - Download and Install MongoDB Community Server Or - MongoDB Atlas Setup - Create an Atlas account and get ready to use MongoDB Atlas - Configure MongoDB Atlas	1		2

								- Explore Compass (MongoDB's GUI tool) - Create and Manage MongoDB Data types and operators – T			
			5	**CIE 4 – Written and Practice Test**				Assessment Review and corrective action			3
	3,4	2,3, 4	6	API Gateway				Weekly Assignment			
10	3,4	2,3, 4	1	**Peer review** Project status review Demonstration of artifacts of the project		4		- Create and Drop database - Create and Drop Collections - CRUD Operations on document	1		2
	3,4	2,3, 4	2	- CRUD Operations on document			4	Limit and Sort Records Cursor	1		2
	3,4	2,3, 4	3	Indexing Aggregation Create and manage users and roles Migration to MongoDB	1		3	Contd.			3
	3,4	2,3, 4	4	ACID transactions in MongoDB Perform CRUD Operations on MongoDB through REST API using Spring Boot Starter Data MongoDB How to run MongoDB on cloud?	1		3	Contd.			3
			5	**Development Assessment**				Assessment Review and corrective action			3
	3,4	2,3, 4	6	MongoDB implementation, administration and deployment				Weekly Assignment			

11	3,4, 5	2,3, 4	1	Peer review Project status review Demonstration of artifacts of the project		4		Application Testing - Manual - Automated Application testing tools Functional testing UI testing TOC - Introduction to Automation Testing | Infosys Springboard (onwingspan.com)	2		1
	3,4, 5	4	2	Integration testing System testing Integrate the work of each group and carry out integration testing	1		3	Acceptance testing Acceptance tests and test plan User acceptance testing Bug tracking – using Jira or similar tools	1		2
	5	4	3	Deployment process - Manual deployment - Automated deployment How to implement automated deployment? Top Deployment tools and their features Best Deployment practices Setup deployment pipeline Continuous deployment Static code analysis Automated review and peer review Practice – code analysis using tools	2		2	Containers Why containers? What is a docker? How docker works? Components of docker - Docker container - Docker client - Docker daemon - Docker image - Docker registry	2		1

								Install docker on desktop and start the docker tool. TOC - Containers & Images | Infosys Springboard (onwingspan.com)			
	5	4	4	Docker file Docker image Commands to create docker file. Build docker image with docker file create docker container from docker image Run the docker container TOC - Docker, Dockerfile, and Docker-Compose (2020 Ready!) | Infosys Springboard (onwingspan.com) TOC - Deploying and Running Docker Containers | Infosys Springboard (onwingspan.com)	1		3	Contd..			3
			5	**CIE 5 – Written and Practice Test**				Assessment Review and corrective action		3	
	3,4	2,3, 4	6	Automation and cloud application testing							
12	5	4	1	**Peer review** Project status review Demonstration of artifacts of the project		4		**Container orchestration** What is orchestration? Orchestration engine Orchestration tools	2		**1**

								TOC - Container Orchestration | Infosys Springboard (onwingspan.com) TOC - Docker Skills: Advanced Docker Orchestration | Infosys Springboard (onwingspan.com)			
	5	4	2	Kubernetes Introduction Why Kubernetes? Kubernetes configuration - Deployment - Service - Load balancer/ingress Create a cluster and deploy an app Learn Kubernetes Basics | Kubernetes Booking.com Case Study | Kubernetes Spotify Case Study | Kubernetes	1		3	Deployment strategies Blue green deployment Canary Deployment	1		2
	5	4	3	Disaster recovery and their types How does it work? Elements of disaster recovery plan Build a disaster recovery plan Load Balancing Load balancer and its functions	2		2	Contd..			3

	5	4	4	Application monitoring - Need for application monitoring - Components of application performance management. - How to select application monitoring tools? - Explore and compare APM tools	2		2	Contd.			3
			5	**Development Assessment**				Assessment Review and corrective action			
			6	Cloud orchestration	2		3				
13	1,2, 3,4, 5	2,3, 4	1	Internship a) Secondary research on various industries and their operations to identify at least 3 companies along with the areas of work interest and develop an internship plan that clearly highlights expectations from the industry during the internship. b) Design and develop a cover letter for an internship request to all 3 identified companies and the resume to be submitted to potential companies. Prepare for an internship interview to highlight your interests, areas of study, career aspirations and personnel competence – including the areas of learning you expect to learn during internship.				Project a) Identification of the problem statement (from at least 3 known problems) the students would like to work as part of the project – either as provided by faculty or as identified by the student. Document the impact the project will have from a technical, social and business perspective. b) Design and develop the project solution or methodology to be used to solve at least one of the problems identified. Prepare a project plan that will include a schedule, WBS, Budget and known risks along with strategies to mitigate them to ensure the project achieves the desired outcome.			

**Note: Saturday session from 9 AM -2 PM

References

Sl. No	Description
1	Charlie Chaplin - Factory Scene - Modern Times (1936) - YouTube What is a Business Process? - YouTube What Is Business Process Automation? - YouTube
2	- Digital Transformation | What is Digital Transformation | Digital Transformation 2021 | Simplilearn - YouTube - Digital transformation: are you ready for exponential change? Futurist Keynote Speaker Gerd Leonhard - YouTube - Digital Transformation Through IT/OT Convergence | Accenture
3	https://www.youtube.com/watch?v=_r0VX-aU_T8
4	How to build Scalable and Robust Enterprise Web Application? | Cashapona
5	SaaS vs PaaS vs IaaS: What's The Difference & How To Choose – BMC Software | Blogs
6	https://www.atlassian.com/ https://www.atlassian.com/devops
7	Hello World – React (reactjs.org)
8	Hands-On Full Stack Development with Spring Boot 2.0 and React
9	React Cookbook , David Griffiths and Dawn Griffiths
10	Build a Basic Web Application on AWS (amazon.com)
11	A Docker Tutorial for Beginners (docker-curriculum.com)
12	Spring Boot 2.0 Projects By Mohamed Shazin Sadakath
13	Kubernetes

CIE and SEE Assessment Methodologies

CIE Assessment	Assessment Mode	Duration In hours	Max Marks
Week 3	CIE 1– Written and practice test	4	30
Week 5	CIE 2– Written and practice test	4	30
Week 7	CIE 3– Written and practice test	4	30
Week 9	CIE 4– Written and practice test	4	30
Week 11	CIE 5– Written and practice test	4	30
	On line Course work (Minimum 10 hours online course with certification from (SWAYAM/NPTEL/Infosys Springboard)		40
	Profile building for Internship / Submission of Synopsys for project work		20
Portfolio evaluation (Based on industrial assignments and weekly developmental assessment) *			30
TOTAL CIE MARKS (A)			**240**
SEE 1 - Theory exam (QP from BTE) Conducted for 100 marks 3 hrs duration reduced to 60 marks		**3**	**60**
SEE 2 – Practical		**3**	**100**
TOTAL SEE MARKS (B)			**160**
TOTAL MARKS (A+B)			**400**

* The industrial assignment shall be based on peer-to-peer assessment for a total of 10 marks (on a scale of 1 to 10) and in the event of a group assignment the marks awarded will be the same for the entire group, the developmental assessment will be for a total of 20 marks and based on MCQ/case study/demonstration and such other assignment methods

Assessment framework for CIE

Note : Theory to be conducted for 1 hour and practice for 3 hours, total duration of exam – 4 hours

Programme	**Computer Science & Engineering**	**Semester**	**V**
Course	**Full Stack Development**	**Max Marks**	**30**
Course Code	**20CS52I**	**Duration**	**4 hours**
Name of the course coordinator			

Note: Answer one full question from each section.

Qn.No	**Question**	**CL L3/L4**	**CO**	**PO**	**Marks**
	Section-1 (Theory) – 10 marks				
1.a)	Explain how digital transformation can bring revolution in teaching learning process	L4	1	1	5
b)	How DevOps enables faster development of new products and easier maintenance of existing deployments?	L3	1	4	5
2.a)	Passwords alone fail to provide protection because they can be guessed and phished. How to strengthen authentication for a banking portal?	L3	1	2	5
b)	The cloud is a hot topic from small businesses to global enterprises. If an organization begins to consider switching its business to the cloud, it is crucial to understand the differences and advantages of the various cloud services. The three main cloud services to consider are IaaS, PaaS and SaaS. For each of these service types, which of the following are managed by you as a consumer and service provider. **Applications, Virtualization, Operating System, Storage, Networking, Data, Server.**	L4	1	4	5
	Section-2 (Practical) - 20 marks				
3)	In an open-source community, many developers contribute to an application. A new contributor develops a feature 'A' and wants to commit to master repository. As an admin you have to make sure that only reviewed code is committed to master branch.	L3	5	4	20

Note : Theory questions shall be aligned to practical questions

Scheme of evaluation

Sl. No	Description	Marks
1	Problem analysis and identification of tools to be used	4
2	Implementation	12
3	Demonstration of solution	4
Total		20

Assessment framework for SEE (Theory) – 100 Marks / 3 hours (Reduced to 60 marks)

Programme:	**Computer Science & Engineering**	**Semester: V**
Course:	**Full Stack Web Development**	**Max Marks: 100**
Course Code:	**20CS52I**	**Duration: 3 Hrs**

Instruction to the Candidate:
Answer one full question from each section.

Qn.No	Question	CL	CO	Marks
	Section-1			
1.a)	Digital transformation is creating new — or modifying existing — business processes, culture, and customer experiences to meet changing business and market requirements. Explain how digital transformation has brought revolution in retail purchases with an example	L4	1	10
b)	Diagnostic imaging procedures are cutting-edge technology, but at the same time they are an unpleasant experience for patients – and even more for paediatric patients. Explain how design thinking helped Doug Dietz, an industrial designer, create a scanner experience that children loved.	L4		10

2.a)	Identify the tasks involved in the process of receiving Admission Ticket for semester exams in your college. Which of the identified tasks can be automated and illustrate automation of one task.	L4		10
b)	Identify the following cloud service types and list their characteristics and advantages. Cisco WebEx Google App Engine, Amazon EC2	L3		10
	Section-2			
3.a)	BookingHall is an online convention hall booking application that helps its users to book hall for functions across Karnataka. This application allows users to log in for booking a hall. Users can find the halls in a specific locality. Once found, user can check the availability of a hall for specific dates. Users can block a hall for required duration. Once blocked, user can get the booking details. Identify and write the user stories for this application.	L4	2	12
b)	Write test cases for the above application.	L3		8
4.a)	eDesert is an online shopping application that helps its users to buy variety of authentic deserts. This application allows users to log in for buying deserts. Users can search for a desert, sort the desert list based on rating or price. Users can select the items and add them to the cart. Once the selection is done, users can go to the cart page for payment. Identify and write the user stories for this application.	L4		12
b)	Write test plan and test cases for the above application.	L3		8
	Section- 3			
5.a)	The HR team of an organization needs an application to maintain its employee details. Create a Spring Boot application to maintain Employee details such as employee id, employee name, and department and perform the following database operations. - Insert a new employee detail - Remove employee details based on employee id - Search employee based on name or ID	L3	3	12
b)	Design an application that consumes EmailService , to send emails to recipient mail addresses. The design should accommodate any new email services. It should also support additional messaging feature.	L3		8

6.a)	The write operations on the collection are very high. Explain the technic applicable to manage the given scenario.	L3		12
b)	Compare the database communication through JDBC and ORM.	L3		8
	Section-4			
7.a)	Ram is a developing a feature of an online apparel application as service. How should he handle the different requests to the service.	L3	4	12
b)	Users of Instagram, a photo sharing application, can share photographs not only with Instagram friends but also with friends on other social networking applications such as Twitter and Facebook. Explain how is this possible.	L3		8
8.a)	Develop the data access layer of the Employee Management Application to perform the database operations given below using Spring Data JPA Add the operation given below using Spring Data JPA: Update the employeeContactNumber for the given employee id.	L3		10
b)	Create a RESTcontroller class to perform CRUD operations on product and corresponding request and response DTOs. The product class should contain three data members product name, product category, price. Use proper SpringBoot annotations.	L3		10
	Section-5			
9.a)	Discuss the Components of Docker container.	L3	5	6
b)	Draw the CI/CD build process flow diagram for an online foot ware store application and explain each component.	L3		8
c)	You want to have two versions of your application in production, but be able to switch all traffic between them. Explain the deployment strategy suitable for the given situation.	L3		6
10.a)	Create a form to add a new product detail to the product catalogue using React.	L3		10
b)	Ted is a DevOps engineer. He wants to automate the deployment process. He wants to do deployment frequently on multiple servers and change the CPU speed and RAM based on the requirement.	L3		10

Assessment framework for SEE 2 (Practice)

Problem Statement

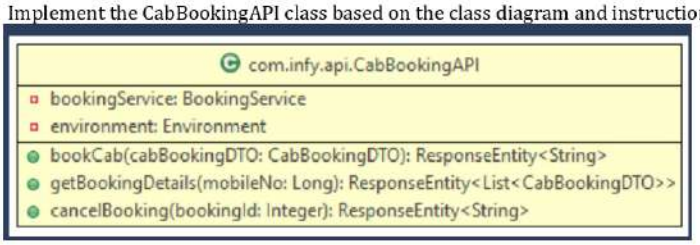
1 InfyCabs is an application for booking cabs. Its following functionalities needs to be exposed as REST API:

- Book a cab
- Get booking details
- Cancel booking

The service and persistence layer of this application is already implemented. You have to implement the API layer of this application for exposing the above functionalities.

CabBookingAPI

Implement the CabBookingAPI class based on the class diagram and instructions given below:



Annotate this class with proper annotation to declare it as REST controller class.
Annotate this class with proper annotation so that all its methods are mapped with /bookings as base URI.
Inject bookingService and environment using appropriate annotation.

Method description:

bookCab(CabBookingDTO cabBookingDTO)

- This is a REST controller method to book a cab.
- Implement it using proper annotations according to description given below:
  Resource endpoint: /
  HTTP method: POST
  Input: Booking details as part of HTTP request body.

- It should invoke the bookCab() method of BookingServiceImpl class which returns a booking id.
- Retrieve the success message associated with property API.BOOKING_SUCCESSFUL from application.properties files using environment and append it to booking id in following format:
  <success message>booking id
- It returns an object of ResponseEntity created using above message and HTTP status code as CREATED.

getBookingDetails(Long mobileNo)

- This is a REST controller method to get cab booking details based on mobile number of user.
- Implement it using proper annotations according to description given below:
  Resource endpoint: /{mobileNo}
  HTTP method: GET
  Input: mobileNo as path variable.
- It should invoke the getDetails() method of BookingServiceImpl class which returns a List<CabBookingDTO>.
- It returns an object of ResponseEntity created using List<CabBookingDTO> obtained in previous step and HTTP status code as OK.

cancelBooking(Integer bookingId)

- This is a REST controller method to cancel cab booking based on bookingId.
- Implement it using proper annotations according to description given below:
  Resource endpoint: /{bookingId}
  HTTP method: PUT
  Input: bookingId as path variable.
- It should invoke cancelBooking() method of BookingServiceImpl class.
- Retrieve the message associated with property "API.BOOKING_CANCELLED" from the properties file.
- It returns an object of ResponseEntity created using above message and HTTP status code as OK.

2. Test the thus created REST APIs

Analyse the given problem statement	10
Selecting suitable tools to implement above case	10
Implementation	40
Use of appropriate annotations	20

Testing	20
Total	100

Equipment/software list with Specification for a batch of 20 students

Sl. No.	Particulars	Specification	Quantity
5.	**Computers**	Intel i7, 4GB RAM, 500GB SSD	**20**
6.	**Eclipse/InteliJ , Java, Apache Maven, Spring 5.0, MongoDB, MySQL, Node.js, React, Jira, Git, Bitbucket,Jenkins,GitHub Actions.**		
7.	**Cloud – AWS/AZURE/GCB or any similar cloud environment**		
8.	**Broadband connection**		