Course Type	Course Code	Name	L	T	P	Credits
DE	NCSD507	**Building Software Systems**	3	0	0	3

Course Objective

This course will introduce students to the underlying concepts and techniques adopted in the industry to build modern practical systems. We will have several Guest Lectures from people in Industry and other Academic Institutes.

Learning Outcomes

Upon successful completion of this course, students will:

- gain fundamental knowledge related to planning large-scale systems
- get a working knowledge of multiple technologies used in the industry to build applications
- understand a typical lifecycle of a software product or service from architecture to delivery
- gain insights into popular classes of applications such as Cloud-native apps, Mobile apps, AI-intensive apps and apps built over Blockchains

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Fundamentals of Software Architecture:** Solution Architecture, Architectural Views, Architectural Styles, Quality Attributes, Architectural Tactics, Architectures of selected open-source Applications	9	A basic understanding of essential architectural concepts like the trade-offs between Quality Attributes
2	**Building Blocks for Modern Applications:** Linux Essentials, Bash Basics, Version Control with Git, Introduction to Virtualisation, Virtual Machines, Docker, Kubernetes, Building UI with React	7	Get an overview of common technologies used in Industry for building large-scale applications
3	**Building Cloud-native Applications:** Fundamentals of Cloud Environments, Introduction to popular Cloud Platforms (Amazon Web Services, Microsoft Azure, OpenStack), Serverless Computing	5	Attain fundamental skills for building Cloud-native Applications
4	**Building Mobile Applications:** Introduction to TypeScript and Angular Framework, Building simple Native Android Apps	5	Attain fundamental skills for building Mobile Applications
5	**Building AI-intensive Applications:** Understanding AI/ML needs for an Application, ML as a Service, Privacy Issues, Applications of Deep Learning, Case Studies (Google DialogFlow, Tesseract)	6	Attain fundamental skills for building AI-intensive Applications
6	**Building Blockchain-based Applications:** Blockchain Fundamentals, Introduction to Blockchain Platforms (Hyperledger Fabric), Case Study (Cryptocurrencies)	5	Attain fundamental skills for building Blockchain-based Applications
7	**Assorted Topics:** Service Oriented Architectures, Microservices, CI/CD pipelines, Case Study (AWS API Gateway)	5	Understand how large-scale Applications are usually architected, deployed in maintained in a dynamic environment
	Total	42	

Text Books:

1. Len Bass, Paul Clements and Rick Kazman. Software Architecture in Practice (3rd Edition). Addison-Wesley, 2013.
2. Robert C. Martin. Clean Architecture: A Craftsman's Guide to Software Structure and Design. Pearson, 2017.

Reference Books:

1. Paul Clements, Felix Bachmann, Len Bass, David Garlan, James Ivers, Reed Little, Paulo Merson, Robert Nord and Judith Stafford. Documenting Software Architectures: Views and Beyond (2nd Edition). Addison-Wesley, 2010.
2. Sam Newman. Building Microservices: Designing Fine-Grained Systems (2nd Edition). O'Reilly, 2021.
3. Matthew Portnoy. Virtualization Essentials (2nd Edition). Sybex(Wiley), 2016.
4. Lorne Lantz and Daniel Cawrey. Mastering Blockchain. O'Reilly Media, Inc. 2020.
5. Martin Kleppmann. Designing Data-Intensive Applications. O'Reilly Media, Inc. 2017.
6. Neil Smyth. Android Studio 4.0 Development Essentials - Java Edition. Packt Publishing. 2020.
7. Dan Radez. OpenStack Essentials. PACKT, 2015.