NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA, G.B. NAGAR
(AN AUTONOMOUS INSTITUTE)

NIET
Greater Noida
Estd.2001
Get Future Ready
Autonomous Institute

Affiliated to

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, UTTAR PRADESH, LUCKNOW

Evaluation Scheme & Syllabus

For

Bachelor of Technology

Computer Science (CS)

Third Year

(Effective from the Session: 2025-26)

NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
(AN AUTONOMOUS INSTITUTE)

Bachelor of Technology
Computer Science

Evaluation Scheme
SEMESTER-V

Sl. No.	Subject Codes	Subject	Types of Subjects	Periods			Evaluation Schemes				End Semester		Total	Credit
				L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	BCSCC0501	Design Thinking-II	Mandatory	2	1	0	30	20	50		100		150	3
2	BCSE0502	Computer Networks	Mandatory	3	1	0	30	20	50		100		150	4
3		Departmental Elective –I	Departmental Elective	3	0	0	30	20	50		100		150	3
4		Departmental Elective –II	Departmental Elective	3	0	0	30	20	50		100		150	3
5	BCSE0552	Computer Networks Lab	Mandatory	0	0	4				50		50	100	2
6	BCS0551	Cloud Architecture and Infrastructure	Mandatory	0	0	6				50		100	150	3
7	BCSE0555	Web Technologies	Mandatory	0	0	6				50		100	150	3
8	BCSE0559	Internship Assessment -II	Mandatory	0	0	2				50			50	1
9	BNC0501/ BNC0502	Constitution of India, Law and Engineering / Essence of Indian Traditional Knowledge	Compulsory Audit	2	0	0	30	20	50		50		100	NA
10		MOOCs (For B.Tech. Hons. Degree)	MOOCs											
		TOTAL		13	2	18	120	80	200	200	400	250	1050	22

List of MOOCs Based Recommended Courses for Third year (Semester-V) B. Tech Students

Sr. No.	Subject Code	Course Name	University / Industry Partner Name	No of Hours	Credits
1	BMC0106	Cloud Computing Primer: Infrastructure as a Service (IaaS), Cloud Computing Primer: Platform as a Service (PaaS), Cloud Computing Primer: Software as a Service (SaaS)	Infosys Wingspan (Infosys Springboard)	18h 51m	1
2	BMC0091	Master Network Automation with Python for Network Engineers	Infosys Wingspan (Infosys Springboard)	23h 24 m	1.5

PLEASE NOTE: -

- **A 3-4 weeks Internship shall be conducted during summer break after semester-IV and will be assessed during semester-V.**
- **Compulsory Audit (CA) Courses (Non-Credit - BNC0501/BNC0502)**
  - ➤ All Compulsory Audit Courses (a qualifying exam) do not require any credit.
  - ➤ The Total and obtained marks are not added in the Grand Total.

Abbreviation Used:
L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam.,
CE: Core Elective, OE: Open Elective, DE: Departmental Elective, PE: Practical End Semester Exam, CA: Compulsory Audit,
MOOCs: Massive Open Online Courses.

DEPARTMENTAL ELECTIVES

Subjects Code	Subject Name	Types of subjects	Bucket Name	Branch	Semester
BCSAI0511	Cloud Storage Management	Departmental Elective- I	Cloud and Big Data	CS	5
BCSAI0520	Cloud Virtualization	Departmental Elective- II		CS	5
BCSE0511	CRM Fundamentals	Departmental Elective- I	CRM-RPA	CS	5
BCSE0513	CRM Administration	Departmental Elective- II		CS	5
BCSDS0511	Data Analytics	Departmental Elective- I	Data Analytics	CS	5
BCSAI0519	Business Intelligence and Data Visualization	Departmental Elective- II		CS	5
BCSE0512	Python Web Development with Django	Departmental Elective- I	Full Stack Development	CS	5
BCSE0514	Design Patterns	Departmental Elective- II		CS	5

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Bachelor of Technology
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Evaluation Scheme
SEMESTER-VI

Sl. No.	Subject Codes	Subject	Types of Subjects	Periods			Evaluation Schemes				End Semester		Total	Credit
				L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	BCSML0601	Machine Learning	Mandatory	3	1	0	30	20	50		100		150	4
2		Departmental Elective -III	Departmental Elective	3	0	0	30	20	50		100		150	3
3		Departmental Elective -IV	Departmental Elective	3	0	0	30	20	50		100		150	3
4		Open Elective -I	Open Elective	3	0	0	30	20	50		100		150	3
5	BCSML0651	Machine Learning Lab	Mandatory	0	0	2				25		25	50	1
6	BCS0601	Cloud Application Development	Mandatory	0	0	6				50		100	150	3
7	BCSE0653	Software Engineering and Design	Mandatory	0	0	6				50		100	150	3
8	BCSE0659	Mini Project	Mandatory	0	0	6				50		100	150	3
9	BNC0601/ BNC0602	Constitution of India, Law and Engineering / Essence of Indian Traditional Knowledge	Compulsory Audit	2	0	0	30	20	50		50		100	NA
10		MOOCs (For B.Tech. Hons. Degree)	MOOCs											
		TOTAL		**14**	**1**	**20**	**120**	**80**	**200**	**175**	**400**	**325**	**1100**	**23**

DEPARTMENTAL ELECTIVES

Subject Code	Subject Name	Types of subjects	Bucket Name	Branch	Semester
BCSAI0615	DevOps on Cloud	Departmental Elective- III	Cloud and Big Data	CS	6
BCSAI0621	Big Data	Departmental Elective- IV		CS	6
BCSE0611	CRM Development	Departmental Elective- III	CRM-RPA	CS	6
BCSE0613	Robotics Process Automation (RPA)	Departmental Elective- IV		CS	6
BCSAI0617	Programming for Data Analytics	Departmental Elective- III	Data Analytics	CS	6
BCSAI0622	Social Media Analytics	Departmental Elective- IV		CS	6
BCSAI0612	Advanced Java Programming	Departmental Elective- III	Full Stack Development	CS	6
BCSE0614	Web Development using MEAN Stack	Departmental Elective- IV		CS	6

List of MOOCs Based Recommended Courses for Third year (Semester-VI) B. Tech Students

Sr. No.	Subject Code	Course Name	University / Industry Partner Name	No of Hours	Credits
1	BMC0107	Continuous Integration and Delivery- DevOps	Infosys Wingspan (Infosys Springboard)	46h 41m	3.5
2	BMC0072	Cloud -Native Applications in Java	Infosys Wingspan (Infosys Springboard)	14h 49m	1

PLEASE NOTE: -

- **Compulsory Audit (CA) Courses (Non-Credit - ANC0601/ ANC0602)**
  - ➢ All Compulsory Audit Courses (a qualifying exam) do not require any credit.
  - ➢ The total and obtained marks are not added in the grand total.

Abbreviation Used:
L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam.,
CE: Core Elective, OE: Open Elective, DE: Departmental Elective, PE: Practical End Semester Exam, CA: Compulsory Audit,
MOOCs: Massive Open Online Courses.

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A student will be eligible to get Under Graduate degree with Honours only, if he/she completes the additional MOOCs courses such as Coursera certifications, or any other online courses recommended by the Institute (Equivalent to 20 credits). During Complete B.Tech. Program Guidelines for credit calculations are as follows.

1. For 6 to 12 Hours =0.5 Credit
2. For 13 to18 =1 Credit
3. For 19 to 24 =1.5 Credit
4. For 25 to 30 =2 Credit
5. For 31 to 35 =2.5 Credit
6. For 36 to 41 =3 Credit
7. For 42 to 47 =3.5 Credit
8. For 48 and above =4 Credit

For registration to MOOCs Courses, the students shall follow Coursera registration details as per the assigned login and password by the Institute these courses may be cleared during the B. Tech degree program (as per the list provided). After successful completion of these MOOCs courses, the students shall provide their successful completion status/certificates to the Controller of Examination (COE) of the Institute through their coordinators/Mentors only.

The students shall be awarded Honours Degree as per following criterion.

i. If he / she secures 7.50 as above CGPA.

ii. Passed each subject of that degree program in the single attempt without any grace.

iii. Successful completion of MOOCs based 20 credits

B. TECH THIRD YEAR

Course Code	BCSCC0501	L	T	P	Credits
Course Title	DESIGN THINKING-II	2	1	0	3

Course objective: The objective of this course is to upgrade Design Thinking skills by learning & applying advanced and contextual Design Thinking Tools. It aims to solve a Real-Life Problem by applying Design Thinking to create an impact for all the stakeholders

Pre-requisites: Student must complete Design Thinking-I course.

Course Contents / Syllabus	
UNIT-I INTRODUCTION	**8 Hours**

Design thinking & Innovation, Design Thinking Mindset and Principles, recap of 5-Step Process of Design Thinking, Design Approaches, additional in-depth examples of each design approaches. Simon Sinek's – Start with Why, The Golden Circle , Asking the "Why" behind each example (an in-class activity of asking 5-WHYS) , The Higher Purpose, in-class activity for LDO & sharing insights.

Visualization and its importance in design thinking , reflections on wheel of life (in-class activity for visualization & Wheel of Life), Linking it with Balancing Priorities (in class activity), DBS Singapore and Bank of Americas' Keep the Change Campaign. Litter of Light & Arvind Eye Care Examples, understanding practical application of design thinking tools and concepts, case study on McDonald's Milkshake / Amazon India's Rural Ecommerce & Gillette.

Working on 1-hour Design problem, Applying RCA and Brainstorm on innovative solutions. Main project allocation and expectations from the project.

UNIT-II REFINEMENT AND PROTOTYPING	**8 Hours**

Refine and narrow down to the best idea, 10-100-1000gm, QBL, Design Tools for Convergence – SWOT Analysis for 1000gm discussion. In-class activity for 10-100-1000gm & QBL

Prototyping (Convergence): Prototyping mindset, tools for prototyping – Sketching, paper models, pseudo-codes, physical mockups, Interaction flows, storyboards, acting/role-playing etc, importance of garnering user feedback for revisiting Brainstormed ideas.
Napkin Pitch, Usability, Minimum Viable Prototype, Connecting Prototype with 3 Laws, A/B Testing, Learning Launch. Decision Making Tools and Approaches – Vroom Yetton Matrix, Shift-Left, Up, Right, Value Proposition, Case study: Careerbuddy, You-Me-Health Story & IBM Learning Launch.
In-class activities on prototyping- paper-pen / physical prototype/ digital prototype of project's 1000gm idea.

UNIT-III STORYTELLING, TESTING AND ASSESSMENT	**8 Hours**

Storytelling: Elements of storytelling, Mapping personas with storytelling, Art of influencing, Elevator Pitch, Successful Campaigns of well-known examples, in-class activity on storytelling. Testing of design with people, conducting usability test, testing as hypothesis, testing as empathy, observation and shadowing methods, Guerrilla Interviews, validation workshops, user feedback, record results, enhance, retest, and refine design, Software validation tools, design parameters, alpha &beta testing, Taguchi, defect classification, random sampling.

Final Project Presentation and assessing the impact of using design thinking.

UNIT-IV	INNOVATION, QUALITY AND LEADERSHIP	8 Hours

Innovation: Need & Importance, Principles of innovations, Asking the Right Questions for innovation, Rationale for innovation, Quality: Principles & Philosophies, Customer perception on quality, Kaizen, 6 Sigma. FinTech case study of Design Thinking application – CANVAS

Leadership, types, qualities and traits of leaders and leadership styles, Leaders vs Manager, Personas of Leaders & Managers, Connecting Leaders-Managers with 13 Musical Notes, Trait theory, LSM (Leadership Situational Model), Team Building Models: Tuckman's and Belbin's. Importance of Spatial elements for innovation.

UNIT-V	UNDERSTANDING HUMAN DESIRABILITY	8 Hours

Comprehensive human goal: the five dimensions of human endeavour (Manaviya - Vyavstha) are: Education- Right living (Sikhsa- Sanskar), Health – Self-regulation (Swasthya - Sanyam), Justice – Preservation (Nyaya- Suraksha), Production – Work (Utpadan – Karya), Exchange – Storage (Vinimya – Kosh), Darshan-Gyan-Charitra (Shifting the Thinking)

Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature, Thinking expansion for harmony: Self-exploration (Johari's window), group behaviour, interpersonal behaviour and skills, Myers-Briggs personality types (MBTI), FIRO-B test to repair relationships.

Course outcome: After completion of this course students will be able to

CO 1	Learn sophisticated design tools to sharpen their problem-solving skills.	K2
CO 2	Construct innovate ideas using design thinking tools and converge to feasible idea for breakthrough solution.	K6
CO 3	Implement storytelling for persuasive articulation.	K3
CO 4	Understanding the nature of leadership empowerment.	K2
CO 5	Understand the role of a human being in ensuring harmony in society and nature.	K2

Text books:	

1. Arun Jain, UnMukt : Science & Art of Design Thinking, 2020, Polaris

2. Gavin Ambrose and Paul Harris, Basics Design 08: Design Thinking, 2010, AVA Publishing SA

3. R R Gaur, R Sangal, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, First Edition, 2009, Excel Books: New Delhi

REFERENCE BOOKS

1. Jeanne Liedta, Andrew King and Kevin Benett , Solving Problems with Design Thinking – Ten Stories of What Works, 2013, Columbia Business School Publishing.

2. Dr Ritu Soryan, Universal Human Values and Professional Ethics, 2022, Katson Books.

3. Vijay Kumar, 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, 2013, John Wiley and Sons Inc, New Jersey.

4. Roger L. Martin, Design of Business: Why Design Thinking is the Next Competitive Advantage, 2009, Harvard Business Press, Boston MA.

5. Tim Brown, Change by Design, 2009, Harper Collins.

6. Pavan Soni, Design your Thinking : The Mindsets, Toolsets and Skill Sets for Creative Problem-Solving, 2020,

	Penguin Books.
Links: NPTEL/ YouTube/ Web Link	
Unit 1	I https://www.youtube.com/watch?v=6_mHCOAAEI8 https://nptel.ac.in/courses/110106124https://designthinking.ideo.com/ https://blog.experiencepoint.com/how-mcdonalds-evolved-with-design-thinking
Unit 2	https://www.coursera.org/lecture/uva-darden-design-thinking-innovation/the-ibm-story-iq0kE https://www.coursera.org/lecture/uva-darden-design-thinking-innovation/the-meyouhealth-story-part-i- what-is-W6tTs https://onlinecourses.nptel.ac.in/noc19_mg60/preview
Unit 3	https://nptel.ac.in/courses/109/104/109104109/ https://www.d-thinking.com/2021/07/01/how-to-use-storytelling-in-design-thinking/
Unit 4	https://www.worldofinsights.co/2020/10/infographic-8-design-thinking-skills-for-leadership- development/
Unit 5	https://www.youtube.com/watch?v=hFGVcx1Us5Y

B. TECH THIRD YEAR

Course Code	BCSE0502		**L**	**T**	**P**	**Credits**
Course Title	**COMPUTER NETWORKS**		**3**	**1**	**0**	**4**

Course objective:
Objective of this course is to develop an understanding of computer networking basics, different components of computer networks, various protocols, modern technologies and their applications.

Pre-requisites: Basic knowledge of Computer system and their interconnection, operating system, Digital logic and design and hands on experience of programming languages.

Course Contents / Syllabus		
UNIT-I	**Introduction**	10 hours

INTRODUCTION: Goals and applications of networks, Categories of networks, Organization of the Internet, ISP, The OSI reference model, TCP/IP protocol suite, Network devices and components, Mode of communications
PHYSICAL LAYER: Network topology design, Types of connections, LAN, MAN and MAN Transmission media, Signal transmission and encoding, Network performance and transmission impairments, Switching techniques and multiplexing, IEEE standards.

UNIT-II	**Data Link layer**	10 hours

Data Link Layer: Framing, Error Detection and Correction, Flow control (Elementary Data Link Protocols, Sliding Window protocols).
Medium Access Control and Local Area Networks: Channel allocation, Multiple access protocols, LAN standards, Link layer switches & bridges.

UNIT-III	**Network Layer**	10 hours

Network Layer: Point-to-point networks, Logical addressing, Basic internetworking (IP, CIDR, ARP, RARP, DHCP, ICMP). IPv4 and IPv6. Routing, forwarding and delivery, Static and dynamic routing, Routing algorithms and protocols, Congestion control algorithms.

UNIT-IV	**Transport Layer**	8 hours

Process-to-process delivery, Transport layer protocols (UDP and TCP), Connection management, Flow control and retransmission, Window management, TCP Congestion control, Quality of service.

UNIT-V	**Application Layer**	10 hours

Application Layer: Domain Name System, World Wide Web and Hyper Text Transfer Protocol, Electronic mail.
File Transfer Protocol, Remote login, Network management, Data compression, VPN.
Cryptography – basic concepts, Firewalls.

Course outcome: After completion of this course students will be able to		
CO1	Build an understanding of the fundamental concepts and Layered Architecture of computer networking.	K2, K6

CO2	Understand the basic concepts of link layer properties to detect error and develop the solution for error control and flow control.	K2, K6
CO3	Design, calculate, and apply subnet masks and addresses to fulfil networking requirements and calculate distance among routers in subnet.	K3, K4, K6
CO4	Understand the duties of transport layer, Session layer with connection management of TCP protocol.	K2, K4
CO5	Discuss the different protocols used at application layer.	K2

Text books:

Behrouz Forouzan, "Data Communication and Networking" Fourth Edition-2006, Tata McGraw Hill

Andrew Tanenbaum "Computer Networks", Fifth Edition-2011, Prentice Hall.

William Stallings, "Data and Computer Communication", Eighth Edition-2008, Pearson.

Reference Books:

Kurose and Ross, "Computer Networking- A Top-Down Approach", Eighth Edition-2021, Pearson.

Peterson and Davie, "Computer Networks: A Systems Approach", Fourth Edition-1996, Morgan Kaufmann

NPTEL/ YouTube/ Faculty Video Link:

Unit 1	https://www.youtube.com/watch?v=LX_b2M3IzN8
Unit 2	https://www.youtube.com/watch?v=LnbvhoxHn8M
Unit 3	https://www.youtube.com/watch?v=ddM9AcreVqY
Unit 4	https://www.youtube.com/watch?v=uwoD5YsGACg
Unit 5	https://www.youtube.com/watch?v=bTwYSA478eA&list=PLJ5C_6qdAvBH01tVf0V4PQsCxGE3hSqEr https://www.youtube.com/watch?v=tSodBEAJz9Y

B. TECH. THIRD YEAR (ELECTIVE-I)

Course code	BCSAI0511	L	T	P	Credits
Course title	**CLOUD STORAGE MANAGEMENT**	3	0	0	3

Course objective: The course intends to introduce students to the fundamentals of cloud storage applications and services, specifically private clouds such as AWS, AZURE, and Google. Students would be able to appreciate the fundamentals and core of cloud storage also understand and design virtual storage solutions for various needs and analyze the role of technology in the design of a storage solution in a cloud architecture.

Pre-requisites: Adequate knowledge of Basics of Cloud Computing and its architecture covered through courses prior to this semester.

	Course Contents / Syllabus	

UNIT-I	**INTRODUCTION**	**8 Hours**

Importance of data storage - Business issues and IT challenges - Business and IT opportunities opportunity for Cloud, Virtualization and Data Storage Networking - Server and Storage I/O Fundamentals - I/O connectivity and Networking Fundamentals - IT Clouds - Virtualization - Virtualization and Storage Services - Data and Storage Access.

UNIT-II	**CLOUD INFRASTRUCTURE AND STORAGE**	**8 Hours**

Managing Data Infrastructures for Cloud and Virtual Environments, Being Secure without Being Scared - Eliminating Blind Spots, Gaps in Coverage, or Dark Territories - Security Threat Risks Challenges - Taking Action to resources - Securing Networks- Securing Storage - Virtual Servers, Physical Servers, and Desktops - Security Clouds - Disposing of Digital Assets and Technology - Security Checklist.

UNIT-III	**CLOUD STORAGE SOLUTIONS**	**8 Hours**

Tiered Storage - Storage Reliability - Availability - Serviceability (RAS) - Storage Services and Functionalities - Storage System Architectures - Storage Virtualization and Virtual Storage, Cloud storage, Types of storage in cloud, AWS: S3, EBS, EFS FSx. Google Cloud Storage: Persistent Disk, Filestore, Cloud Storage, Archival storage. Hybrid cloud storage: AWS storage gateway.

UNIT-IV	**CLOUD INFRASTRUCTURE AND MIGRATION SOLUTIONS**	**8 Hours**

Data Movement and Migration, IaaS migration, PaaS Migration, SaaS migration, VM migration, Migration solutions, AWS: Snow family, DataSync, Transfer family. Google cloud migration, Database Migration Services (DMS).

UNIT-V	**MIGRATION CASE STUDY**	**8 Hours**

Case Study 1: The company struggled with the maintenance difficulties and lack of scalability of the bare metal infrastructure supporting their operations.		
Case Study 2: Analyse the benefits with data of a company that has switched its computing solutions to cloud.		
Course outcome: After completion of this course students will be able to:		
CO 1	Understand the basics of data storage, Virtualization and storage services	K 2
CO 2	Analyze the infrastructures for Cloud storage	K 6
CO 3	Evaluate the storage solutions	K 3
CO4	Understand cloud migration solutions	K 4
CO 5	Analyze cloud migration solutions on different needs	K 5

Textbooks:

1) AWS Docs.

Links:

UNIT-I	s07/slides/cse497b-lecture-26-virtualmachine.pdf
UNIT-II	https://docs.aws.amazon.com/Security
UNIT-III	https://aws.amazon.com/what-is-cloud-storage/ https://docs.aws.amazon.com/S3
UNIT-IV	**Error! Hyperlink reference not valid.**www.ibm.com/in-en/cloud/learn/iaas-paas-saas
UNIT-V	https://aws.amazon.com/cloud-migration/ https://docs.aws.amazon.com/migrationhub/?id=docs_gateway

B. TECH. THIRD YEAR (ELECTIVE-I)

Course code	BCSE0511		L T P	Credits
Course title	**CRM FUNDAMENTALS**		3 0 0	3

Course objective: This course is designed to help in understanding the fundamentals of CRM. It will help in providing better services for Sales, Marketing and Customer Relations in an Enterprise. To make the students understand the organizational need, benefits and process of creating long-term value for individual customers. To disseminate knowledge regarding the concept of e-CRM and e-CRM technologies. To enable the students understand the technological and human issues relating to implementation of Customer Relationship Management in the organizations.

Pre-requisites: None.

Course Contents / Syllabus

UNIT-I	INTRODUCTION	8 Hours

CRM- definition, history, goals. Sources of CRM value. Components of CRM: people, process, technology. Evolution of CRM: marketing and its principles, customer relations to CRM. Dynamics of Customer Supplier Relationships, Nature and context of CRM, Strategy and Organization of CRM: strategy, The relationship-oriented organization: Mission, Culture, Structure, People, Communication & Information Systems.

UNIT-II	CRM Strategy and Framework	8 Hours

 Developing a CRM strategy. Customer oriented (C in CRM), Relationship driven, 360 degree view of customer. CRM system features- functions, application, benefits and solutions. Importance of loyalty- active, passive, split, shifting and switchers, customer profiling, customer segmentation model, Customer Experience, relationship marketing and journey, Case study.

UNIT-III	Solution Design and Architecture	8 Hours

CRM system solution- specifications. Data Analysis, Solution Requirements. Types of CRM- On-Premise, cloud based. Pros and Cons of each. Integration CRM with other enterprise applications.
The Technology of CRM: Data warehouses and customer relationships, creating data mart model, components of operational data warehouse.

UNIT-IV	CRM for Business	8 Hours

CRM in Sales, Service, Marketing, E-commerce. Social Customer Relationship Management. Analytical CRM: Predictive Analytics Vs Operational Analytics. Channel Partner Relationship management, Collaborative CRM (using data pooling), Business Benefits of Cloud Based System, SLAs, Practical Challenges.

UNIT-V	CRM implementation	8 Hours

Building CRM roadmaps: current processes, customers, strategic goals, technology issues, pilot and proof of concept projects. Preliminary Roadmap and its template, developing roadmap midstream. Design stage, custom development, integration, reporting, data migration, and implementation, testing, launching and application management.

Introduction to following CRM tools: ZOHO, Pega, Microsoft Dynamics 365, Sales force.

Course outcome: After completion of this course students will be able to:

CO1	Understand the basic concepts of Customer relationship management.	K 1, K 2
CO2	To understand strategy and framework of Customer relationship management.	K2
CO3	Learn basics of Cloud Based Customer relationship management.	K1
CO4	Understand Customer relationship management in context with business use cases.	K3
CO5	Understand implementation basics of CRM.	K3

Textbooks	
Sr No	**Book Details**
1.	CRM Fundamentals by Scott Kostojohn Mathew Johnson Brian Paulen. Apress, 2011.
2.	. Customer Relationship Management- How to develop and execute a CRM strategy By Michael Pearce, Business Expert Press, 2021.

Reference Books	
Sr No	**Book Details**
1.	The CRM Handbook-A Business Guide to Customer Relationship Management by Jill Dyché; Addison-Wesley (for case studies)
2.	Customer Relationship Management Systems handbook by Duane E Sharp. AUERBACH PUBLICATIONS by CRC Press Company

Links
https://onlinecourses.nptel.ac.in/noc20_mg57/preview https://archive.nptel.ac.in/courses/110/105/110105145/

B. TECH THIRD YEAR (ELECTIVE-I)

Course Code	BCSDS0511	L T P	Credits
Course Title	**DATA ANALYTICS**	3 0 0	3

Course objective: The objective of this course is to understand the fundamental concepts of Data analytics and learn about various types of data formats and their manipulations. It helps students to learn exploratory data analysis and visualization techniques in addition to R/Python/Tableau programming language**.**

Pre-requisites: Basic Knowledge of Statistics and Probability.

Course Contents / Syllabus		

UNIT-I	**Introduction To Data Science**	15 hours

Introduction to Data Science, Big Data, the 5 V's, Evolution of Data Science, Datafication, Skillsets needed, Data Science Lifecycle, types of Data Analysis, Data Science Tools and technologies, Need for Data Science, Analysis Vs Analytics Vs Reporting, Big Data Ecosystem, Future of Data Science, Applications of Data Science in various fields, Use cases of Data science-Facebook, Netflix, Amazon, Uber, Airbnb.

UNIT-II	**Data Handling**	14 hours

Types of Data: structured, semi-structured, unstructured data, Numeric, Categorical, Graphical, High Dimensional Data, Transactional Data, Spatial Data, Social Network Data, standard datasets, Data Classification, Sources of Data, Data manipulation in various formats, for example, CSV file, pdf file, XML file, HTML file, text file, JSON, image files etc. import and export data in R/Python.

UNIT-III	**Data Pre-processing**	15 hours

Form of Data Pre-processing, data Attribute and its types, understanding and extracting useful variables,KDD process, Data Cleaning: Missing Values, Noisy Data, Discretization and Concept hierarchy generation (Binning, Clustering, Histogram), Inconsistent Data, Data Integration and Transformation. Data Reduction: Data Cube Aggregation, Data Compression, Numerosity Reduction.

UNIT-IV	**Exploratory Data Analysis**	14 hours

Handling Missing data, Removing Redundant variables, variable Selection, identifying outliers, Removing Outliers, Time series Analysis, Data transformation and dimensionality reduction techniques such as Principal Component Analysis (PCA), Factor Analysis (FA) and Linear Discriminant Analysis (LDA), Univariate and Multivariate Exploratory Data Analysis. Data Munging, Data Wrangling- APIs and other tools for scrapping data from the web/ internet using R/Python.

UNIT-V	**Data Visualization**	14 hours

Introductions and overview, Debug and troubleshoot installation and configuration of the Tableau. Creating Your First visualization: Getting started with Tableau Software, Using Data file formats, connecting your Data to Tableau, creating basic charts (line, bar charts, Tree maps), Using the Show me panel.

Tableau Calculations: Overview of SUM, AVR, and Aggregate Features Creating custom calculations and fields, Applying new data calculations to your visualization. Manipulating Data in Tableau: Cleaning-up the data with the Data Interpreter, structuring your data, Sorting, and filtering Tableau data, Pivoting Tableau data.

Advanced Visualization Tools: Using Filters, Using the Detail Panel Using the Size panels, customizing filters, Using and Customizing tooltips, formatting your data with colours, Creating Dashboards & Stories, Distributing & Publishing Your Visualization.

Course outcome: After completion of this course students will be able to:

CO1	Understand the fundamental concepts of data analytics in the areas that plays major roles within the realm of data science.	K1
CO2	Explain and exemplify most common forms of data types and its representations.	K2
CO3	Apply data pre-processing techniques to real-world datasets.	K3
CO4	Analyze datasets through exploratory data analysis techniques.	K4
CO5	Illustrate appropriate data visualization methods different types of datasets and application scenarios.	K5

Text books:

1)Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 2007.

2)Data Analysis and Data Mining, 2nd Edition, John Wiley & Sons Publication, 2014.

Reference Books:

1)Open Data for Sustainable Community: Glocalized Sustainable Development Goals, Neha Sharma, Santanu Ghosh, Monodeep Saha, Springer, 2021.

2)The Data Science Handbook, Field Cady, John Wiley & Sons, Inc, 2017

3)Data Mining Concepts and Techniques, Third Edition, Jiawei Han, Micheline Kamber, Jian Pei, Morgan Kaufmann, 2012.

Links:

Unit 1	https://www.youtube.com/playlist?list=PL15FRvx6P0OWTlNBS_93NHG2hIn9cynVT
Unit 2	https://www.youtube.com/playlist?list=PLLy_2iUCG87DxxkLX4Pc3wCvsF1yAvz0T
Unit 3	https://www.youtube.com/watch?v=lhO3fBiMDag
Unit 4	https://www.youtube.com/watch?v=q4pyaVZjqk0
Unit 5	https://www.youtube.com/playlist?list=PLWPirh4EWFpGXTBu8ldLZGJCUeTMBpJFK

B. TECH THIRD YEAR (ELECTIVE-I)

Course Code	BCSE0512	L T P	Credits
Course Title	**PYTHON WEB DEVELOPMENT WITH DJANGO**	3 0 0	3

Course objective: This course focuses on how to design and build static as well as dynamic webpages and interactive web based applications. These courses mainly focus how Python operates within web development using the increasingly popular Django framework.

Pre-requisites: Students should have good knowledge of Python Programming and Python coding experience.

Course Contents / Syllabus		
UNIT-I	**Python libraries for web development**	**8 Hours**

Collections-Container datatypes, Tkinter-GUI applications, Requests-HTTP requests, BeautifulSoup4-web scraping, Scrapy, Zappa, Dash, CherryPy, Turbo Gears, Flask, Web2Py, Bottle, Falcon, Cubic Web, Quixote, Pyramid.

UNIT-II	**Introduction to Django Framework**	**8 Hours**

Understanding Django environment, Features of Django and Django architecture, MVC and MTV, Urls and Views. Mapping the views to URLs, Django Template, Template inheritance Django Models, Creating model for site, Converting the model into a table, Fields in Models, Integrating Bootstrap into Django, Creating tables, Creating grids, Creating carousels.

UNIT-III	**Integrating Accounts & Authentication on Django**	**8 Hours**

Introduction to Django Authentication System, Security Problem & Solution with Django Creating Registration Form using Django, Adding Email Field in Forms, Configuring email settings, Sending emails with Django, Adding Grid Layout On Registration Page, Adding Page Restrictions, Login Functionality Test and Logout.

UNIT-IV	**Connecting SQLite with Django**	**8 Hours**

Database Migrations, Fetch Data From Database, Displaying Data On Templates, Adding Condition On Data, Sending data from url to view, Sending data from view to template, Saving objects into database, Sorting objects, Filtering objects, Deleting objects, Difference between session and cookie, Creating sessions and cookies in Django.

UNIT-V	**Deploying Django Web Application on Cloud**	**8 Hours**

Creating a functional website in Django, Four Important Pillars to Deploy, registering on Heroku and GitHub, Push project from Local System to GitHub, Working with Django Heroku, Working with Static Root, Handling WSGI with gunicorn, Setting up Database & adding users.

Course Outcome: After completion of this course students will be able to

CO1	Apply the knowledge of python programing that are vital in understanding Django application and analyze the concepts, principles and methods in current client-side technology to implement Django application over the web.	K3,K6
CO2	Demonstrate web application framework i.e. Django to design and implement typical dynamic web pages and interactive web based applications.	K3, K6
CO3	Implementing and analyzing the concept of Integrating Accounts & Authentication on Django.	K3, K4
CO4	Understand the impact of web designing by database connectivity with SQLite in the current market place where everyone uses to prefer electronic medium for shoping, commerce, and even social life also.	K2, K3

CO5	Analyzing and creating a functional website in Django and deploy Django Web Application on Cloud.	K3, K6

Text books:

1. Martin C. Brown, "Python: The Complete Reference Paperback", 4th Edition 2018, McGraw Hill Education Publication.

2. Reema Thareja, "Python Programming: Using Problem Solving Approach", 3rd Edition 2017, Oxford University Press Publication.

3. Daniel Rubio, Apress," Beginning Django Web Application Development and Deployment with Python", 2nd Edition 2017, Apress Publication.

4. William Jordon, "Python Django Web Development: The Ultimate Django web framework guide for Beginners", 2nd Edition 2019, Kindle Edition.

Reference Books:

1. Tom Aratyn, "Building Django 2.0 Web Applications: Create enterprise-grade, scalable Python web applications easily with Django 2.0", 2nd Edition 2018, and Packt Publishing.

2. Nigel George, "Build a website with Django", 1st Edition 2019, GNW Independent Publishing Edition.

3. Ray Yao," Django in 8 Hours: For Beginners, Learn Coding Fast! 2nd Edition 2020, independently published Edition.

4. Harry Percival, "Test-Driven Development with Python: Obey the Testing Goat: Using Django, Selenium, and JavaScript", 2nd Edition 2019, Kindle Edition.

NPTEL/ YouTube/ Faculty Video Link:

Unit 1	https://youtu.be/eoPsX7MKfe8?list=PLIdgECt554OVFKXRpo_kuI0XpUQKk0ycO https://youtu.be/tA42nHmmEKw?list=PLh2mXjKcTPSACrQxPM2_1Ojus5HX88ht7 https://youtu.be/8ndsDXohLMQ?list=PLDsnL5pk7-N_9oy2RN4A65Z-PEnvtc7rf https://youtu.be/QXeEoD0pB3E?list=PLsyeobzWxl7poL9JTVyndKe62ieoN-MZ3 https://youtu.be/9MmC_uGjBsM?list=PL3pGy4HtqwD02GVgM96-V0sq4_DSinqvf
Unit 2	https://youtu.be/F5mRW0jo-U4 https://youtu.be/yD0_1DPmfKM?list=PLQVvvaa0QuDe9nqlirjacLkBYdgc2inh3 https://youtu.be/rHux0gMZ3Eg https://youtu.be/jBzwzrDvZ18 https://youtu.be/RiMRJMbLZmg
Unit 3	https://youtu.be/8DF1zJA7cfc https://youtu.be/CTrVDi3tt8o https://youtu.be/z4lfVsb_7MA https://youtu.be/WuyKxdLcw3w
Unit 4	https://youtu.be/2Oe55iXjZQI https://youtu.be/zV8GOI5Zd6E https://youtu.be/uf2tdzh7Bq4
Unit 5	https://youtu.be/kBwhtEIXGII https://youtu.be/Q_YOYNiSVDY https://youtu.be/_3AKAdHUY1M https://youtu.be/6DI_7Zja8Zc https://youtu.be/UkokhawLKDU

B. TECH. THIRD YEAR (ELECTIVE-II)				
Course code	**BCSAI0520**		**L T P**	**Credits**
Course title	**CLOUD VIRTUALIZATION**		**3 0 0**	**3**

Course objective: The course intends to introduce students to the fundamentals of developing application on Cloud, specifically public clouds such as AWS, AZURE and Google.

Pre-requisites: Adequate knowledge of Basics of Cloud Computing and its architecture covered through courses prior to this semester.

Course Contents / Syllabus		
UNIT-I	**CLOUD AND VIRTUALIZATION**	**8 Hours**

Virtual Machines and Virtualization of Clusters Virtualization Structures/Tools and Mechanisms and Data Centers, Implementation Levels of Virtualization, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Centre Automation.

UNIT-II	**VIRTUALIZATION ARCHITECTURE**	**8 Hours**

Architecture over Virtualized Data Centers, Cloud Computing and Service Models, Data-Centre Design and Interconnection Networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms: GAB, AWS, and Azure, Inter-cloud Resource Management, Cloud Security and Trust Management.

UNIT-III	**AWS VIRTUAL INFRASTRUCTURE**	**8 Hours**

Building Virtual Infrastructure consisting of Servers and Networking, Using Virtual Servers: EC2, Programming your Infrastructure: The Command-Line Interface, SDKs, AWS CloudFormation, Automating Deployment: CloudFormation, Elastic Beanstalk, OPSWORKS, Securing your System: IAM, Security Groups, VPC.

UNIT-IV	**CLOUD STORAGE AND MIGRATION SOLUTIONS**	**8 Hours**

Storing data in the cloud, storing your objects: S3 and Glacier, Securing your System: IAM, Security Groups, VPC, Storing your Data on Hard Drives: EBS and Instance Store, Using Relational Database Service: RDS, Programming for NoSQL DataBase Service: DynamoDB.

UNIT-V	**CLOUD SECURITY & VIRTUALIZED SOLUTIONS**	**8 Hours**

Federation in the Cloud, Presence in the Cloud, Privacy and Its Relation to Cloud-Based Information Systems, Cloud Security Challenges, Software-as-a-Service Security, architecting on AWS, Achieving high Availability: Availability Zones, Auto-Scaling, CloudWatch, DeCoupling your Infrastructure: ELB and SQS, Designing for Fault- Tolerance, Scaling Up and Down: Auto-Scaling and Cloudwatch.

Course outcome: After completion of this course students will be able to:

CO 1	Understand the fundamentals and core of Virtualization	K2

CO 2	Create Virtual Machines (VM) and compute instances of various configurations.	K6
CO 3	Develop virtual private connection using various network virtualization techniques	K3
CO4	Understand and analyze virtual storage solutions for various usage.	K4
CO 5	Analyze cloud security solutions and monitoring tools to evaluate the performance of cloud resources.	K5

Textbooks:

1)   Distributed and Cloud Computing: From Parallel Processing to the Internet of Things Geoffrey C. Fox, Jack Dongarra, and Kai Hwang.

2)   Amazon Web Services in Action , Michael Wittig and Andreas Wittig

Reference Books:

1) 'Cloud Computing' by Shailendra Singh ; Oxford higher education 2022

Links:

UNIT-I	https://acloud.guru/ https://nptel.ac.in/courses/106105167
UNIT-II	https://aws.amazon.com/ https://nptel.ac.in/courses/106105223
UNIT-III	https://docs.aws.amazon.com/vpc https://docs.aws.amazon.com/ElasticBeanstalk https://docs.aws.amazon.com/EC2
UNIT-IV	https://docs.aws.amazon.com/S3
UNIT-V	https://docs.aws.amazon.com/Security https://docs.aws.amazon.com/CloudWatch

B. TECH. THIRD YEAR (ELECTIVE-II)

Course code	BCSE0513		L	T	P	Credits
Course title	**CRM ADMINISTRATION**		3	0	0	3

Course objective: This course focus on to understand the concept of Sales force, and the concepts of Sales force App which familiarize with the concepts administration to understand the concepts of Admin Essentials in Lightning Experience.

Pre-requisites: Creative thinking and which is being used by the creative talent in your business areas.

Course Contents / Syllabus

UNIT-I	Introduction	8 Hours

Sales force Platform Basics, User Management, Data Modelling ,Data Management, Identity Basic , Data Security, Lightning Experience Customization, Lightning APP Builder Sales force Mobile App Customization, User Engagement, Formulas and Validation, Data Security, Picklist Administration.

UNIT-II	Lightning & Salesforce App Experience Customization	8 Hours

Formula and Validation, Accounts and Contacts for Lightning Experience, Lead and Opportunity for Lightning Experience, Product Quotes and Contracts, Campaign Basic.

UNIT-III	Salesforce Administration	8 Hours

Service Cloud for lightning Experience, Sales force mobile app customization, AppExchange basic Duplicate Management Lightning Experience for Sales force Classic Users, Chatter Administration for Lightning Experience, Reports and Dashboards for lightning experience, Lightning experience customization, Lightning experience rollout , Sales force flow, Lightning experience report dashboard Specialist.

UNIT-IV	Lightning Experience	8 Hours

Prepare Your Sales force Org for Users, Customize an Org to Support a New Business Unit, Protect Your Data in Sales force, Customize a Sales Path for Your Team, Customize a Sales force Object, Import and Export with Data Management Tools.

UNIT-V	Learn Admin Essentials in Lightning Experience	8 Hours

Create Reports and Dashboards for Sales and Marketing Managers, Improve Data Quality for Your Sales and Support Teams, Create a Process for Managing Support Cases, User Engagement, Business Administration Specialist.

Course outcome: After completion of this course students will be able to:

CO1	Understand the basic working environment of Sales force	K2
CO2	Understand the concepts of Lightning & Sales force App Experience Customization	K2
CO3	Familiarize with concepts reports chatter administration	K3
CO4	Understand the concepts of Lightning Experience	K2
CO5	Learn Admin Essentials in Lightning Experience	K3

Textbooks	
Sr No	**Book Details**
1.	Alok Kumar Rai : Customer Relationship Management : Concepts and Cases(Second Edition), PHI Learning, 2018.
2.	Bhasin- Customer Relationship Management (Wiley Dreamtech) ,2019

Reference Books	
Sr No	**Book Details**
1.	Sales force Essentials for Administrators , By ShrivasthavaMohith, Edition Ist ,2018
2.	Sales force : A quick Study laminated Reference Guide by Christopher Mathew Spencer eBook by Amazon (Online)
3.	Mastering Sales force CRM Administration By Gupta Rakesh Edition IInd 2018

Links
www. Trailhead.salesforce.com
www.mindmajix.com/salesforce-tutorial
www,youtube.com/watch?v=7K42geizQCI

B. TECH THIRD YEAR (ELECTIVE-II)

Course code	BCSAI0519		L T P	Credits
Course title	**BUSINESS INTELLIGENCE AND DATA VISUALIZATION**		**3 0 0**	**3**

Course objective: This course covers fundamental concepts of Business Intelligence tools, techniques, components and its future. As well as a bit more formal understanding of data visualization concepts and techniques. The underlying theme in the course is feature of Tableau, its capabilities.

Pre-requisites: Basic Knowledge of Business intelligence.

Course Contents / Syllabus		
UNIT-I	**INTRODUCTION TO BUSINESS INTELLIGENCE**	**8 HOURS**

Business Intelligence (BI), Scope of BI solutions and their fitting into existing infrastructure, BI Components and architecture, BI Components, Future of Business Intelligence, Functional areas of BI tools, End user assumptions, setting up data for BI, Data warehouse, OLAP and advanced analytics, Supporting the requirements of senior executives including performance management, Glossary of terms and their definitions specific to the field of BI and BI systems.

UNIT-II	**ELEMENTS OF BUSINESS INTELLIGENCE SOLUTIONS**	**8 HOURS**

Business Query and Reporting, Reporting, Dashboards and Scorecards Development, Development, Scorecards, Metadata models, Automated Tasks and Events, Mobile Business **B** Intelligence, Software development kit (SDK). Stages of Business Intelligence Projects, Project Tasks, Risk Management and Mitigation, Cost justifying BI solutions and measuring success, BI Design and Development, Building Reports, Building a Report, Drill-up, Drill-down Capabilities.

UNIT-III	**TABLEAU**	**8 HOURS**

Introductions and overview: What Tableau can and cannot do well, Debug and troubleshoot installation and configuration of the software.
Creating Your First visualization: Getting started with Tableau Software, Using Data file formats, connecting your Data to Tableau, creating basic charts (line, bar charts, Tree maps), Using the Show me panel
Tableau Calculations: Overview of SUM, AVR, and Aggregate features Creating custom calculations and fields, Applying new data calculations to your visualization.

Formatting Visualizations: Formatting Tools and Menus, formatting specific parts of the view, Editing and Formatting Axes.

UNIT-IV	**DATA VISUALIZATION**	**8 HOURS**

Manipulating Data in Tableau: Cleaning-up the data with the Data Interpreter, structuring your data, Sorting, and filtering Tableau data, Pivoting Tableau data.
Advanced Visualization Tools: Using Filters, Using the Detail panel Using the Size panels, customizing filters, Using and Customizing tooltips, Formatting your data with colours.
Creating Dashboards & Stories: Using Storytelling, creating your first dashboard and Story, Design for different displays, Adding interactivity to your Dashboard
Distributing & Publishing Your Visualization: Tableau file types, Publishing to Tableau Online, sharing your visualization, Printing, and exporting.

Given a case study: Perform Interactive Data Visualization with Tableau

UNIT-V	INTRODUCTION TO POWER BI	8 HOURS

Describe the Power BI ecosystem, Define Power BI and its relationship with Excel, Discuss the Power BI suite of products, Describe how the Power BI products integrate, Explain the typical analytics process flow, Differentiate between the various data sources, Connect Power BI to a data source, Clean and transform data to ensure data quality, Load the data to the Power BI Data Model, Describe the Power BI ecosystem, Define Power BI and its relationship with Excel, Discuss the Power BI suite of products, Describe how the Power BI products integrate, Explain the typical analytics process flow.

Course outcome: After completion of this course students will be able to

CO 1	Apply quantitative modelling and data analysis techniques to the solution of real-world business problems	K2
CO 2	Understand the importance of data visualization and the design and use of many visual components	K2
CO 3	Understand as products integrate defining various analytical process flow.	K2
CO 4	Learn the basics of troubleshooting and creating charts using various formatting tools.	K4
CO 5	Learn basics of structuring data and creating dashboard stories adding interactivity dashboard stories.	K6

Textbooks:

1. Efraim Turban, Ramesh Sharda, Dursun Delen, "Decision Support and Business Intelligence Systems", 9th Edition, Pearson 2013.
2. Learning Tableau 10 - Second Edition: Business Intelligence and data visualization that brings your business into focus" by Joshua N. Milligan
3. Tableau Your Data! - "Daniel G. Murray and the Inter Works BI Team"-Wiley

Reference Books:

1. Larissa T. Moss, S. Atre, "Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making", Addison Wesley, 2003.
2. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", Wiley Publications, 2009.
3. David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Manager"s Guide", Second Edition, 2012.

NPTEL/ Youtube/ Faculty Video Link:

Unit 1	Introduction to Business Intelligence - YouTube
Unit 2	Business Intelligence Tutorial - YouTube
Unit 3	What Is Power BI?	Introduction To Microsoft Power BI	Power BI Training	Edureka - YouTube
Unit 4	https://www.tableau.com/academic/students

B. TECH THIRD YEAR (ELECTIVE-II)

Course Code	BCSE0514		L T P	Credits
Course Title	**DESIGN PATTERNS**		3 0 0	3

Course objective The course objective is to familiarize the student with techniques for designing reusable combinations of Java classes and organizing their cooperation to produce modular and maintainable Java programs..

Pre-requisites: Object Oriented Analysis and Design. Data structures and algorithms. Programming Language (C++ or Java).

Course Contents / Syllabus

UNIT-I	Introduction	8 Hours

Describing Design Patterns, Design Patterns in Smalltalk MVC, The Catalog of Design Patterns, Organizing the Catalogue, Design Patterns for Solving the Real life Problems, Selection and Use of Design patterns. Principle of least knowledge.

UNIT-II	Creational Design Pattern	8 Hours

Creational Patterns: Abstract Factory, Builder, Factory Pattern, Prototype Pattern, Singleton pattern.

UNIT-III	Structural Design Pattern on Django	8 Hours

Structural Pattern Part-I, Adapter, Bridge, Composite.
Structural Pattern Part-II, Decorator Pattern, Façade Pattern, Flyweight Pattern, Proxy Pattern

UNIT-IV	Behavioural Design Pattern – I	8 Hours

Behavioural Patterns Part: I, Chain of Responsibility Pattern, Command Pattern, Interpreter Pattern, Iterator Pattern.
Behavioural Patterns Part: II, Mediator, Memento, Observer Pattern.

UNIT-V	Behavioural Design Pattern – II	8 Hours

Behavioural Patterns Part: III, State Patterns, Strategy, Template Patterns, Visitor, Expectation from Design Patterns.

Course outcome: After completion of this course students will be able to

CO1	Construct a design consisting of a collection of modules.	K2, K6
CO2	Exploit well-known design patterns (such as Iterator, Observer, Factory and Visitor)	K4, K5
CO3	Distinguish between different categories of design patterns	K4
CO4	Ability to understand and apply common design patterns to incremental/iterative Development	K2, K6
CO5	Ability to identify appropriate patterns for design of given problem and Design the software using Pattern Oriented Architectures	K1, K2, K6

Textbooks	
Sr No	**Book Details**
1.	Eric Freeman, Elisabeth Freeman, Kathy Sierra, Bert Bates Head First Design Patterns, 2004, O'Reilly
2.	Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides Design Patterns: Elements of Reusable Object- oriented Software Addison-Wesley, 1995

Reference Books	
Sr No	**Book Details**
1.	Design Pattern s By Erich Gamma , Pearson Education
2.	Patterns in JAVA Volume -I By Mark Grand, Wiley Dream
Links	
	https://youtu.be/C_oPLDaSy-8
	https://youtu.be/NU_1StN5Tkk

	NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306 **(An Autonomous Institute)** School of Computer Science in Emerging Technologies	
	B.TECH THIRD YEAR	
Subject Code: BCSE0552		**L T P** **0 0 4**
Subject Name: Computer Networks Lab		**Credits** **2**

Course Objective: The objective of this course is to provide students with practical exposure to the fundamental concepts of computer networks. Through hands-on experiments, students will learn the construction and testing of physical media, implementation of networking protocols, network configuration, and basic network security techniques. The course aims to develop technical skills in network setup, IP addressing, protocol analysis, and network simulation using industry tools like Cisco Packet Tracer.

Course outcome: After completion of this practical, student will be able to:

CO1	Build an understanding of UTP cable with RJ-45 connector, and build and test simple network using UTP cable.	K2, K4, K6
CO2	Understand and implementation of the bit stuffing protocol.	K2, K3
CO3	Understand and test the various network connection commands of TCP/IP and error control, flow control.	K2, K4
CO4	Understand and implementation of the concept of IP addressing and security technique likes Caesar cipher and RSA.	K2, K3
CO5	Design and understanding the various topology and configuration of switch and router using cisco packet tracer	K2, K6

List of Practical

Lab No.	Program Logic Building	CO Mapping
1.	To make an UTP cable with RJ-45 connector, and build and test simple network using UTP cable (crossover) and a hub based network.	CO1
2.	Implementation of data link layer framing method such as bit stuffing in any language like C++, Java or Python.	CO2
3.	Test the Network connection using ping command and use of ipconfig, netstat and trcert command provided by TCP/IP.	CO3
4.	Develop a client-server chat application using TCP sockets in Python (or C/Java).	CO3
5.	Implementation of CRC algorithm in any language like C++ , Java or Python.	CO3
6.	Implementation of stop and wait protocol in any language like C++ , Java	CO3

	or Python.	
7.	Implementation of hamming code (7, 4) code to limit the noise. We have to code the bit data in to 7bit data by adding 3 parity bits. Implement in in any language like C++ , Java or Python.	CO3
8.	Implement Sliding Window Protocol for Reliable Data Transmission.	CO3
9.	Implementation of Caesar cipher technique & RSA algorithm in any language like C++ , Java or Python.	CO4
10.	Write a program in java to find the IP address of the system.	CO4
11.	Write a program in java to find the IP address of the any site if name is given.	CO4
12.	Develop a program that, given an IP address and the required number of hosts, calculates: • The appropriate subnet mask • The number of subnets • The broadcast address for the subnet	CO4
13.	Introduction to Network Devices (Repeater, Hub, Bridge, Switch, Router, Gateways, NIC etc.).	CO5
14.	Introduction to CISCO Packet Tracer. Design Bus, Star, Mesh, Ring Topology and check the connectivity using ping command.	CO5
15.	Switch Configuration on CISCO packet tracer using CLI.	CO5

	NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
	GREATER NOIDA-201306
	(An Autonomous Institute)
	School of Computer Science in Emerging Technologies

B. TECH THIRD YEAR

Course Code	BCS0551	L T P	Credits
Course Title	**Cloud Architecture and Infrastructure**	**[0-0-6]**	**3**

Course objective: Cloud Architecture and Infrastructure" aims to equip learners with the knowledge and skills necessary to design, deploy, manage, and optimize cloud-based solutions using modern cloud architectures and infrastructure management practices

Pre-requisites: Fundamental of Cloud Computing, Computer Networks

Course Contents / Syllabus

UNIT-I		14 Hours

Definition, provisioning and manageability of cloud computing, underlying principles of parallel and distributed computing. AWS global infrastructure (for example, Availability Zones, AWS Regions), AWS federated access and identity services**,** SOA, Web services, RESTful services, and Publish-subscribe model.

UNIT-II		14 Hours

.   **Introduction to Cloud Computing Reference Architecture (CCRA):** CCRA Evolution,   Benefits of CCRA:
  Architectural overview: The conceptual Reference Model, Cloud Consumer, Cloud provider,   Cloud Auditor, Cloud carrier, Scope of control between Provider and Consumer.
Functional and Non-functional requirements of cloud architecture: IBM's Cloud Computing Reference Architecture (CCRA 4.0), Introduction, Roles, Architectural Elements.

UNIT-III		14 Hours

Selection of appropriate compute options, features, type and size for deployment of EC2, Scalability capabilities for Amazon EC2 Auto Scaling and AWS Auto Scaling, Serverless technologies and patterns with AWS Lambda and AWS Fargate, and Serverless Architecture.
AWS Storage Services: Elastic Block Storage (EBS), Elastic File Storage (EFS), Amazon S3, Amazon RDS, and DynamoDB to support scalable and reliable data management.

UNIT-IV		15 Hours

Networking Fundamentals: Subnets, Routing, Security Groups, DNS, Federated Access, ACL, NAT, VPC, VPC architecture, Network segmentation strategies, VPN, AWS Direct Connect, VPC Peering, VPC Endpoint, Security Groups, AWS Route 53

UNIT-V		15 Hours

AWS Network Firewall, AWS Firewall Manager, Applying AWS security best practices to IAM users and root users (Ex: Multi-Factor Authentication), authorization model that includes IAM users, groups, roles, and policies , role-based access control strategy (Ex: AWS Security Token Service [AWS STS], role switching, cross-account access, AWS Key Management Service, AWS Resource Access Manager

Course outcome: After completion of this course students will be able to

CO 1	Develop a comprehensive understanding of federal cloud infrastructure and its web services.	K2
CO 2	Analyze Cloud Computing Reference Architectures and challenges in open architecture.	K4
CO 3	Deploy Amazon EC2 applications, ensuring reliability and cost-effectiveness under varying workloads.	K3
CO 4	Deploy cloud network architecture solutions to ensure secure, scalable, and efficient connectivity.	K3
CO 5	Implement security mechanisms and identity management strategies within cloud computing environments to ensure data protection and controlled access.	K5

Text books:

1. 'Mastering Cloud Computing', Mc Graw Hill 2013, **Raj Kumar Buyya**

2. **Solutions Architect's Handbook, Third Edition, Packt, 2024, Saurabh Shrivastava, Neelanjali Srivastav**

REFERENCE BOOKS:

1 **Cloud Computing'** Oxford higher education 2022, **Shailendra Singh**

2 **AWS for Solutions Architects, Packt Publishing, 2021, Alberto Artasanchez**

Links: NPTEL/You Tube/Web Link

Unit 1	https://nptel.ac.in/courses/106/105/106105167/
Unit 2	https://nptel.ac.in/courses/106/105/106105223/
Unit 3	https://aws.amazon.com/docs
Unit 4	https://nptel.ac.in/courses/106/104/106104182
Unit 5	https://www.nist.gov/

B. TECH THIRD YEAR			
Course Code	**BCSE0555**	**L T P**	**Credits**
Course Title	**Web Technologies**	**[0-0-6]**	**3**

Course objective: Develop a comprehensive understanding of the web development lifecycle, including planning, design, development, and deployment, while gaining proficiency in core web technologies such as HTML, CSS, JavaScript, and server-side programming. Acquire the skills to create responsive, accessible, and user-friendly websites that address real-world problems and meet the functional and aesthetic requirements of users and stakeholders **.**

Pre-requisites: Basic Knowledge of any programming language like C/C++/Python/Java. Familiarity with basic concepts of Internet.

Course Contents / Syllabus	
UNIT-I	**10 hours**

Introduction: Introduction to Web Technology, History of Web and Internet, Connecting to Internet, Introduction to Internet services and tools, Client-Server Computing, Protocols Governing Web, Basic principles involved in developing a web site, Planning process, Types of Websites, Web Standards and W3C recommendations.

Web Hosting: Web Hosting Basics, Types of Hosting Packages, Registering domains, Defining Name Servers, Using Control Panel, Creating Emails in Cpanel, Using FTP Client, Maintaining a Website.

UNIT-II	**14 Hours**

HTML: What is HTML, DOM- Introduction to Document Object Model, Basic structure of an HTML document, Mark up Tags, Heading-Paragraphs , Line Breaks, Understand the structure of HTML tables. Lists, Working with Hyperlinks, Image Handling, Understanding Frames and their needs, HTML forms for User inputs. New form Elements- date, number, range, email, search and data list, Understanding audio, video and article tags.

XML: Introduction, Tree, Syntax, Elements, Attributes, Namespaces, Display, HTTP request, Parser, DOM, XPath, XSLT, XQuerry, XLink, Validator, DTD, Schema, Server.

UNIT-III	**16 hours**

Concept of CSS 3: Creating Style Sheet, CSS Properties , CSS Styling(Background, Text Format, Controlling Fonts) , Working with block elements and objects , Working with Lists and Tables , CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin properties) CSS Advanced(Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector) , CSS Color, Creating page Layout and Site.

Bootstrap: Introduction, Bootstrap grid system, Bootstrap Components.

UNIT-IV	**16 hours**

JavaScript Essentials: Introduction to Java Script , Javascript Types , Var, Let and Const Keywords, Operators in JS , Conditions Statements , Java Script Loops, JS Popup Boxes , JS Events , JS Arrays, Working with Arrays, JS Objects ,JS Functions , Using Java Script in Real time , Validation of Forms, Arrow functions and default arguments, Template Strings, Strings methods, Callback functions, Object de-structuring, Spread and Rest

Operator, Typescript fundamentals, Typescript OOPs- Classes, Interfaces, Constructor etc. Decorator and Spread Operator

Difference == & ===, Asynchronous Programming in ES6, Promise Constructor, Promise with Chain, Promise Race.

UNIT-V		16 Hours

Introduction to PHP, Basic Syntax, Variables & Constants, Data Type, Operator & Expressions, Control flow and Decision making statements, Functions, Strings, Arrays.

Working with files and directories: Understanding file& directory, Opening and closing, a file, Coping, renaming and deleting a file, working with directories, Creating and deleting folder, File Uploading & Downloading.

Session & Cookies: Introduction to Session Control, Session Functionality What is a Cookie, Setting Cookies with PHP. Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session.

Course outcome: After completion of this course students will be able to

CO1	Identify the basic facts and explaining the basic ideas of Web technology and internet.	K1, K2
CO2	Applying and creating various HTML5 semantic elements and application with working on HTML forms for user input.	K3, K6
CO3	Understanding and applyingtheconceptsofCreatingStyleSheetCSS3 and bootstrap.	K2, K3
CO4	Analysing and implementing concept of JavaScript and its applications.	K4, K6
CO5	Creating and evaluating dynamic web pages using the concept of PHP.	K5, K6

Text books:	

C Xavier, "Web Technology and Design", 1nd Edition 2003, New Age International.

Raj Kamal, "Internet and Web Technologies", 2nd Edition 2017,Mc Graw Hill Education.

Oluwafemi Alofe, "Beginning PHP Laravel",2nd Edition 2020, kindle Publication.

Reference Books	
Sr. No.	**Book Details**
1	Burdman, Jessica, "Collaborative Web Development" 5th Edition 1999, Addison Wesley Publication.
2	Randy Connolly, "Fundamentals of Web Development",3rd Edition 2016,
3	Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", 4th Edition 2010 BPB Publication

Links: NPTEL/You Tube/Web Link	
Unit 1	1 https://youtu.be/96xF9phMsWA https://youtu.be/Zopo5C79m2k https://youtu.be/ZliIs7jHi1s https://youtu.be/htbY9-yggB0
Unit 2	2 https://youtu.be/vHmUVQKXlVo https://youtu.be/qz0aGYrrlhU https://youtu.be/BsDoLVMnmZs https://youtu.be/a8W952NBZUE
Unit 3	https://youtu.be/1Rs2ND1ryYc

	https://youtu.be/vpAJ0s5S2t0
	https://youtu.be/GBOK1-nvdU4
	https://youtu.be/Eu7G0jV0ImY
Unit 4	4 https://youtu.be/-qfEOE4vtxE
	https://youtu.be/PkZNo7MFNFg
	https://youtu.be/W6NZfCO5SIk
	https://youtu.be/DqaTKBU9TZk
Unit 5	https://youtu.be/_GMEqhUyyFM
	https://youtu.be/ImtZ5yENzgE
	https://youtu.be/xIApzP4mWyA
	https://youtu.be/qKR5V9rdht0

Sr. No.	Program Title	CO Mapping
1	A.Overview and Installation of various code editors.	CO1
2	B. Overview and Installation of various servers	CO1
3	Implementing HTML program that represent in the document as a start tag, which gives the name and attributes	CO2
4	Implementing HTML program that represents a document	CO2
5	Implementing HTML program to display your simple CV	CO2
6	Creating html document that represents document object model	CO2
7	To Create a table to show your class time table.	CO2
8	Apply various colors to suitably distinguish keywords , also apply font styling like italics, underline and two other fonts to words you find appropriate , also use header tags.	CO2
9	Create a webpage with HTML describing your department use paragraph and list tags	CO2
10	Implementing HTML program that for Heading	CO2
11	Implementing program that implement paragraph and line-break	CO2
12	Use tables to provide layout to your HTML page describing your college infrastructure.	CO2
13	Use <span> and <div> tags to provide a layout to the above page instead of a table layout	CO2

14	Create links on the words e.g. —Wi-Fi and —LAN to link them to Wikipedia pages	CO2
15	Insert an image and create a link such that clicking on image takes user to other page	CO2
16	Change the background color of the page; At the bottom create a link to take user to the top of the page.	CO2
17	Creating HTML program to implement three articles with independent, self-contained content.	CO2
18	Creating a XML document that defines the self-descriptive tags	CO2
19	Designing XML document that store various book data such as: book category, title, author, year and price	CO2
20	To Describe the various types of XML key components	CO2
21	Design XML DTD to define the structure and legal element and attribute of XML document	CO2
22	To implement internal and external DTD	CO2
23	Use frames such that page is divided into 3 frames 20% on left to show contents of pages, 60% in center to show body of page, remaining on right to show remarks.	CO2
24	Design a HTML registration form that takes user name, user password and mobile number with submit button control	CO2
25	Design a HTML5 document that implement of date, number, range, email, search and data list.	CO3
26	Implementation in HTML5 that include native audio and video support without the need for Flash.	CO3
27	Create a simple form to submit user input like his name, age, address and favourite subject, movie and singer.	CO3
28	Add few form elements such as radio buttons, check boxes and password field. Add a submit button at last.	CO3
29	Add CSS property assign a style or behavior to an HTML element such as: color, border, margin and font-style.	CO3
30	Add To Style Text Elements with Font, Size, and Color in CSS	CO3
31	Applying a block element in CSS acquires up the full width available for that content.	CO3

32	Demonstrating the CSS Box model with consists of: borders, padding, margins, and the actual content.	CO3
33	Design a web page by applying CSS grouping and dimensions property.	CO3
34	Design a XML Schema that describes the structure of an XML document.	CO3
35	Design a XML document that describe the well-formed XML document	CO3
36	Design a XML document of CD Catalog through each <CD> element, and displays the values of the <ARTIST> and the <TITLE> elements in an HTML table	CO3
37	Create a XSL document for and taken xml document by you.	CO3
38	Create a XSLT document for and taken xml document by you with all steps	CO3
39	Design a web page by applying CSS Display and Positioning property.	CO3
40	Design a web page by applying CSS Display and Positioning property .	CO3
41	Design a web page by applying CSS pseudo classes.	CO3
42	Creating a Java Script code to implement all data types.	CO4
43	Design a basic structure of Bootstrap Grid system.	CO4
44	Design All Bootstrap Components with example.	CO4
45	Implementing a program in Java script to implement augmented function.	CO4
46	Implementing a program to implement calculator application as real time.	CO4
47	Design a HTML form validation using Java Script.	CO4
48	Write a program to implement Arrow function with default argument in ES6	CO4
49	Implementing a program in ES6 to implement Template string concepts	CO4
50	Implementing a program in ES6 to implement all string methods.	CO4
51	Creating a Java Script program to implement Dialog, Confirm and Message Popup Boxes.	CO4
52	Implementing a Java Script program to implement onClick and onSubmit event	CO4
53	Creating a java script code to implement 'let' keyword	CO4
54	Creating a java script code to implement 'const' keyword	CO4
55	Implementing a program to implement call back functions in ES6.	CO4

56	Implementing a program for de-structuring of an array in ES6	CO4
57	Javascript code to implement object and class concepts in Typescript.	CO4
58	Write a Typescript program that implement interface and constructor	CO4
59	Write a code in typescript that implement decorator and spread operator	CO4
60	Create a constant by using define() function with its proper syntax	CO4
61	Creating PHP script that return any data types whatever you use.	CO4
62	Implementing a code in Java Script to implement Spread and rest operator	CO4
63	Javascript code that should compile by Typescript compiler as'tsc'	CO4
64	Write a code in typescript that implement Asynchronous Programming concepts.	CO4
65	Write a program in Typescript that implement promise constructor	CO4
66	Implementing promise and chain concepts in Typescript	CO4
67	Write a code in typescript that implement Promise.race() static method.	CO4
68	Crating a program that implement control flow and decision making statement.	CO4
69	Creating PHP to implements parameterized function	CO5
70	Creating program in PHP to store multiple string and concatenate these string and print it.	CO5
71	Write a PHP script to create and delete directory structure	CO5
72	Program to upload and download a file in PHP	CO5
73	Implements single dimension array in PHP	CO5
74	Write a PHP code to open and close a file in a proper manner	CO5
75	Write a PHP script to copying, renaming and deleting a file.	CO5
76	PHP program to create and destroy a session.	CO5
77	PHP program to set and delete a cookie.	CO5
78	PHP program to manually register the session variable	CO5
79	PHP program to manually destroy the session variable	CO5

80	PHP program to store the session data on one page and would be available on second page.	CO5

B. TECH. THIRD YEAR 5th/ 6th

Course code	BNC0501/BNC0601	L	T	P	Credits
Course Title	CONSTITUTION OF INDIA, LAW AND ENGINEERING	2	0	0	2

Course objective: To acquaint the students with legacies of constitutional development in India and help them to understand the most diversified legal document of India and philosophy behind it.

Pre-requisites: Computer Organization and Architecture

Course Contents / Syllabus		
UNIT-I	INTRODUCTION AND BASIC INFORMATION ABOUT INDIAN CONSTITUTION	8 Hours

Meaning of the constitution law and constitutionalism, Historical Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947,Enforcement of the Constitution, Indian Constitution and its Salient Features, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Parliamentary System, Federal System, Centre-State Relations, Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency, and Local Self Government –
Constitutional Scheme in India.

UNIT-II	UNION EXECUTIVE AND STATE EXECUTIVE	8 Hours

Powers of Indian Parliament Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States, Powers and Functions of Vice- President, Powers and Functions of the Prime Minister, Judiciary – The Independence of the Supreme Court, Appointment of Judges, Judicial Review, Public Interest Litigation, Judicial Activism, LokPal, Lok Ayukta, The Lokpal and Lok ayuktas Act 2013, State Executives – Powers and Functions of the Governor, Powers and Functions of the Chief Minister, Functions of State Cabinet, Functions of State Legislature, Functions of High Court and
Subordinate Courts.

UNIT-III	INTRODUCTION AND BASIC INFORMATION ABOUT LEGAL SYSTEM	8 Hours

The Legal System: Sources of Law and the Court Structure: Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law, Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court). Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration. Contract law, Tort, Law at workplace.

UNIT-IV	INTELLECTUAL PROPERTY LAWS AND REGULATION TO INFORMATION	8 Hours

Intellectual Property Laws: Introduction, Legal Aspects of Patents, Filing of Patent Applications, Rights from Patents, Infringement of Patents, Copyright and its Ownership, Infringement of Copyright, Civil Remedies for Infringement, Regulation to Information, Introduction, Right to Information Act, 2005, Information Technology Act, 2000, Electronic Governance, Secure Electronic Records and Digital Signatures, Digital Signature Certificates, Cyber Regulations Appellate Tribunal, Offences, Limitations of the Information Technology Act.

UNIT-V	BUSINESS ORGANIZATIONS AND E-GOVERNANCE	8 Hours

Sole Traders, Partnerships: Companies: The Company's Act: Introduction, Formation of a Company, Memorandum of Association, Articles of Association, Prospectus, Shares, Directors, General Meetings and Proceedings, Auditor, Winding up. E-Governance and role of engineers in E-Governance, Need for reformed engineering serving at the Union and State level, Role of I.T. professionals in Judiciary, Problem of Alienation and Secessionism in few states

creating hurdles in Industrial development.

COURSE OUTCOMES: After completion of this course students will be able to

CO 1	Identify and explore the basic features and modalities about Indian constitution.	K1
CO 2	Differentiate and relate the functioning of Indian parliamentary system at the center and state level.	K2
CO 3	Differentiate different aspects of Indian Legal System and its related bodies.	K4
CO 4	Discover and apply different laws and regulations related to engineering practices.	K4
CO 5	Correlate role of engineers with different organizations and governance models	K4

Text Books:

1. M Laxmikanth: Indian Polity for civil services and other State Examination,6th Edition, Mc Graw Hill

2. Brij Kishore Sharma: Introduction to the Indian Constitution, 8th Edition, PHI Learning Pvt. Ltd.

3. Granville Austin: The Indian Constitution: Cornerstone of a Nation (Classic Reissue), Oxford University Press.

Reference Books:

1. Madhav Khosla: The Indian Constitution, Oxford University Press.

2. PM Bakshi: The Constitution of India, Latest Edition, Universal Law Publishing.

3. V.K. Ahuja: Law Relating to Intellectual Property Rights (2007)

B. TECH THIRD YEAR

Course Code	BCSML0601	**L**	**T**	**P**	**Credits**
Course Title	Machine Learning	3	1	0	4

Course objective: To introduction to the fundamental concepts in machine learning and popular machine learning algorithms. To understand the standard and most popular supervised learning algorithm

Pre-requisites: Basic Knowledge of Machine learning

Course Contents / Syllabus

UNIT-I	INTRODUCTION TO MACHINE LEARNING	8 Hours

Introduction, Components of Learning, Learning Models, Geometric Models, Probabilistic Models, Logic Models, Grouping and Grading, designing a Learning System, Types of Learning, Supervised, Unsupervised, Reinforcement, Perspectives and Issues, Version Spaces, PAC Learning, VC Dimension. Introduction to Model Building, Sensitivity Analysis, Underfitting and Overfitting, Bias and Variance, Concept Learning Task, Issues in Machine Learning and Data Science Vs Machine Learning.

UNIT-II	SUPERVISED AND UNSUPERVISED LEARNING	8 Hours

Decision Trees: ID3, Classification and Regression Trees, Regression: Linear Regression, Multiple Linear Regression, Logistic Regression, Neural Networks: Introduction, Perception, Multilayer Perception, Support Vector Machines: Linear and Non-Linear, Kernel Functions, K Nearest Neighbors. Introduction to clustering, K-means clustering, K-Mode Clustering.
Apriori Algorithm: Market basket analysis, Association Rules

UNIT-III	ENSEMBLE AND PROBABILISTIC LEARNING	8 Hours

Model Combination Schemes, Voting, Error-Correcting Output Codes, Bagging: Random Forest Trees, Boosting: Adaboost, Stacking. Gaussian mixture models - The Expectation-Maximization (EM) Algorithm, Information Criteria, Nearest neighbour methods - Nearest Neighbour Smoothing, Efficient Distance Computations: the KD-Tree, Distance Measures

UNIT-IV	REINFORCEMENT LEARNING AND EVALUATING HYPOTHESES	8 Hours

Introduction, Learning Task, Q Learning, Nondeterministic Rewards and actions, temporal-difference learning, Relationship to Dynamic Programming, Active reinforcement learning, Generalization in reinforcement learning. Motivation, Basics of Sampling Theory: Error Estimation and Estimating Binomial Proportions, The Binomial Distribution, Estimators, Bias, and Variance

UNIT-V	GENETIC ALGORITHMS AND CASE STUDIES	8 Hours

Motivation, Genetic Algorithms: Representing Hypotheses, Genetic Operator, Fitness Function and Selection, An Illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning: Lamarkian Evolution, Baldwin Effect, Parallelizing Genetic Algorithms.
Case Study: Health Care, E Commerce, Smart Cities.

Course outcome: After completion of this course students will be able to

CO 1	Understanding utilization and implementation proper machine learning algorithm.	K2
CO 2	Understand the basic supervised machine learning algorithms.	K2
CO 3	Understand the difference between supervise and unsupervised learning.	K2
CO 4	Understand algorithmic topics of machine learning and mathematically deep enough to introduce the required theory.	K2
CO 5	Apply an appreciation for what is involved in learning from data.	K3

Text books:

1) Marco Gori , Machine Learning: A Constraint-Based Approach, Morgan Kaufmann. 2017

2) Ethem Alpaydin, Machine Learning: The New AI, MIT Press-2016

3) Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995

4) Tom M. Mitchell, "Machine Learning", McGraw-Hill, 2010

Reference Books:

1) Ryszard, S., Michalski, J. G. Carbonell and Tom M. Mitchell, Machine Learning: An Artificial Intelligence Approach, Volume 1, Elsevier. 2014

2) Stephen Marsland, Taylor & Francis 2009. Machine Learning: An Algorithmic Perspective.

3) Ethem Alpaydin, (2004) "Introduction to Machine Learning (Adaptive Computation and Machine Learning)", The MIT Press.

4) Fundamentals of Machine Learning for Predictive Data Anayltics: Algorithms, Worked Examples, and Case Studies 1st Edition by John D. Kelleher

NPTEL/ Youtube/ Faculty Video Link:

Unit 1	https://www.youtube.com/watch?v=fC7V8QsPBec&list=PL1xHD4vteKYVpaIiy295pg6_SY_5qznc77&index=2
Unit 2	https://www.youtube.com/watch?v=OTAR0kT1swg&list=PL1xHD4vteKYVpaIiy295pg6_S Y5qznc77&index=3 https://www.youtube.com/watch?v=OCwZyYH14uw https://www.youtube.com/watch?v=9_LY0LiFqRQ https://www.youtube.com/watch?v=EYeF2e2IKEo https://www.youtube.com/watch?v=_PwhiWxHK8o https://www.youtube.com/watch?v=wTF6vzS9fy4 https://www.youtube.com/watch?v=lt65K-REdHw
Unit 3	https://www.youtube.com/watch?v=HTSCbxSxsg&list=PL1xHD4vteKYVpaIiy295pg6_SY5__qznc77&index=4 https://www.youtube.com/watch?v=NnlS2BzXvyM https://www.youtube.com/watch?v=7enWesSofhg
Unit 4	https://youtu.be/rthuFS5LSOo https://youtu.be/kho6oANGu_A
Unit 5	https://www.youtube.com/watch?v=9vMpHk44XXo&list=PL1xHD4vteKYVpaIiy295pg6_S Y5qznc77&index=5 Reinforcement Learning Tutorial	Reinforcement Learning Example Using Python	Edureka - YouTube Association Rule Mining – Solved Numerical Question on Apriori Algorithm(Hindi) - YouTube Q Learning Explained	Reinforcement Learning Using Python	Q Learning in AI	Edureka - YouTube

B. TECH. THIRD-YEAR (ELECTIVE-III)

Course code	BCSAI0615	L	T	P		Credits
Course title	DevOps on Cloud	3	0	0		3

Course objective: The objective of this course is to give a strong foundation of the Development and its Operations.

Pre-requisites: Adequate knowledge of Basics of Cloud Computing and its architecture covered through courses prior to this semester.

Course Contents / Syllabus

UNIT-I	DEVOPS INTRODUCTION	8 Hours

The Advent of Software Engineering - Waterfall method - Developers vs IT Operations conflict, Emergence and definition of DevOps, History of DevOps, Transformation with DevOps and Agile, Business Case for DevOps, Benefits of DevOps, Agile Practices, Focus on Products and Service, Autonomy of Teams, Introducing CALMS.

UNIT-II	RISE OF AGILE METHODOLOGIES	8 Hours

Agile movement in 2000 - Agile Vs Waterfall Method - Iterative Agile Software Development - Individual and team interactions over processes and tools - Working software over -comprehensive documentation - Customer collaboration over contract negotiation - Responding to change over following a plan.

UNIT-III	DEVOPS FOUNDATION	8 Hours

Foundational Terminology and Concepts, The Four Pillars of Effective DevOps, DevOps and Agile, Version Control Systems, DevOps using AWS. Security Management - IAM (Identity and Access Management), WAF (Web Application Firewall), AWS Shield, Guard Duty, Trusted Advisor, Governance Strategies.

UNIT-IV	PURPOSE OF DEVOPS	8 Hours

Minimum Viable Product - Application Deployment Continuous Integration, Continuous Deployment, and Build Tools, Tools: Ecosystem Overview (Software Development, Automation, Monitoring).

UNIT-V	CAMS (CULTURE, AUTOMATION, MEASUREMENT AND SHARING)	8 Hours

CAMS – Culture - CAMS – Automation - CAMS – Measurement - CAMS – Sharing Test-Driven Development - Configuration Management - Infrastructure Automation Root Cause Analysis – Blamelessness - Organizational Learning. Case Study: DevOps Using Cloud.

Course outcome: After completion of this course students will be able to

CO 1	Understand the traditional software development.	K2
CO 2	Learn the rise of agile methodologies.	K6
CO 3	Define and design the purpose of DevOps.	K3

CO 4	Understand the purpose of DevOps.	K4
CO 5	Analyze the culture and automation of DevOps	K5

Textbooks:

1) Effective Devops: Building A Culture of Collaboration, Affinity, And Tooling At Scale Paperback –2016 by Jennifer Davis.
2) The DevOps Handbook - Book by Gene Kim, Jez Humble, Patrick Debois, and Willis Willis.

Reference Books:

1) What is DevOps? - by Mike Loukides.

Links:

UNIT-I	https://aws.amazon.com/devops/what-is-devops/
UNIT-II	https://www.oreilly.com/library/view/agile-for-everybody/9781492033509/ch01.html
UNIT-III	https://docs.aws.amazon.com/IAM/latest/UserGuide/introduction.html https://docs.aws.amazon.com/waf/latest/developerguide/waf-chapter.html
UNIT-IV	https://www.scaledagileframework.com/devops/ https://www.youtube.com/watch?v=hQcFE0RD0cQ
UNIT-V	https://medium.com/@seanguthrie/devops-principles-the-cams-model-9687591ca37a https://www.urolime.com/blogs/cams-approach-to-devops/ https://www.youtube.com/watch?v=VySUutlo91E

B. TECH. THIRD-YEAR (ELECTIVE-III)

Course code	BCSE0611	L	T	P	Cre dits
Course title	**CRM DEVELOPMENT**	3	0	0	3

Course objective: Meet the tools and technologies that power development on the Salesforce platform. Give your data structure with objects, fields, and relationships. Automate processes for every app, experience, and portal with declarative tools. Use Visual force to build custom user interfaces for mobile and web apps. Write robust code by executing Apex unit tests.

Pre-requisites: Creative thinking and which is being used by the creative talent in your business areas.

Course Contents / Syllabus		
UNIT-I	**Salesforce Fundamentals**	**8 Hours**

Building blocks of Salesforce, Data model & Security model, Business process automation options, Master Sales Cloud and Service Cloud , Salesforce platform, Salesforce terminology, force platform,Multi-tenancy and cloud, Salesforce metadata and APIs, Salesforce architecture.

UNIT-II	**Salesforce Data Modeling**	**8 Hours**

Salesforce Data model, IDIC model QIC model, CRM value chain model ,Payne & Frow's five forces and CRM objects , Relationship types, Formula fields and roll-up summary fields ,Importing and exporting data

UNIT-III	**Logic and Process Automation**	**8 Hours**

Logic and Process Automation: Formulas and Validations, Formula Operators and Functions, Screen Flow Distribution, Salesforce Flow, Apex Basics, Apex Triggers, Database & .NET Basics, Search Solution Basics, Triggers and Order of Execution, Platform Events Basics, Process Automation Specialist, Apex Specialist, Apex integration Services, Apex Metadata API.

UNIT-IV	**User Interface**	**8 Hours**

User Interface : General development, Apex code development Visualforce development , Sales dashboard , Visualforce performance
 ,Technique for optimizing performance Lightning Web Components Basics Lightning App Builders
 Development.

UNIT-V	**Testing, Debugging, and Deployment**	**8 Hours**

Testing, Debugging, and Deployment : Apex Testing, Apex code Test Method, Custom controller and Controller Extension, Test Data Developer Console
Basics, Asynchronous Apex, Debugging Tool and Techniques, Debug logs, Application lifecycle and development model, Change Set Development model.

Course outcome: After completion of this course students will be able to

CO 1	Implement the working concept of variables	K1, K2
CO2	Apply the concepts of Data Management	K1, K2
CO3	Understand the concepts of APEX	K3
CO4	Understand the concepts of APEX Code development	K1, K2
CO5	Implement concepts of APEX Integration	K1, K3

Textbooks	
Sr. No.	**Book Details**
1.	Alok Kumar Rai : Customer Relationship Management : Concepts and Cases(Second Edition), PHI Learning, 2018
2	Bhasin- Customer Relationship Management (Wiley Dreamtech),2019
3	Salesforce for beginners by Shaarif Sahaalane book by Amazon(Online Edition)

Reference Books	
Sr. No.	**Book Details**
1	Salesforce : A quick Study laminated Reference Guide by Christopher Mathew Spencer eBook by Amazon(Online)
2	Salesforce Platform Developer By Vandevelde Jain Edition Ist 2018
3	Learning Salesforce Development By Paul Battisson E-book (Online)

Links	
	www. Trailhead.salesforce.com
	www.mindmajix.com/salesforce-tutorial
	www,youtube.com/watch?v=7K42geizQCI

B.TECH. THIRD YEAR (ELECTIVE-III)

Course code	BCSAI0617		L T P	Credits
Course title	**PROGRAMMING FOR DATA ANALYTICS**		3 0 0	3

Course objective: Demonstrate knowledge of statistical data analysis techniques utilized in business decision making. Apply principles of Data Science to the analysis of business problems. Use data mining software to solve real-world problems. Employ cutting edge tools and technologies to analyze Big Data.

Pre-requisites: Basic Knowledge of Python and R

Course Contents / Syllabus

UNIT-I	**BASIC DATA ANALYSIS USING PYTHON/R**	**8 Hours**

Pandas data structures – Series and Data Frame, Data wrangling using pandas, Statistics with Pandas, Mathematical Computing Using NumPy, Data visualization with Python Descriptive and Inferential Statistics, Introduction to Model Building, Probability and Hypothesis Testing, Sensitivity Analysis, Regular expression: RE packages.

UNIT-II	**R GRAPHICAL USER INTERFACES**	**8 Hours**

Built-in functions, Data Objects-Data Types & Data Structure, Structure of Data Items, Manipulating and Processing Data in R using Dplyr package & Stringr package, Building R Packages, Running and Manipulating Packages, data import and export, attribute and data types, descriptive statistics, exploratory data analysis, Flexdashboard and R-shiny.

UNIT-III	**DATA ENGINEERING FOUNDATION**	**8 Hours**

Connecting to a database (sqlite) using Python, Sending DML and DDL queries and processing the result from a Python Program, Handling error, NOSQL query using MongoDB, MongoDB Compass.

UNIT-IV	**INTRODUCTION TO TENSOR FLOW AND AI**	**8 Hours**

Introduction, Using TensorFlow for AI Systems, Up and Running with TensorFlow, Understanding TensorFlow Basics, Convolutional Neural Networks, Working with Text and Sequences, and TensorBoard Visualization, Word Vectors, Advanced RNN, and Embedding Visualization. TensorFlow Abstractions and Simplifications, Queues, Threads, and Reading Data, Distributed TensorFlow, Exporting and Serving Models with TensorFlow.

UNIT-V	**DEEP LEARNING WITH KERAS**	**8 Hours**

Introducing Advanced Deep Learning with Keras, Deep Neural Networks, Autoencoders, Generative Adversarial Networks (GANs), Improved GANs, Disentangled Representation GANs, Cross-Domain GANs, Variational Autoencoders (VAEs), Deep Reinforcement Learning, Policy Gradient Methods.

Course outcome: After completion of this course students will be able to:		
CO1	Install, Code and Use Python & R Programming Language in R Studio IDE to perform basic tasks on Vectors, Matrices and Data frames.	K1
CO2	Implement the concept of the R packages.	K3
CO3	Understand the basic concept of the MongoDB.	K2
CO4	Understand and apply the concept of the RNN and tensorflow.	K4
CO5	Understand and evaluate the concept of the keras in deep learning.	K4

Textbooks:

1.Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 2007.

2. Learning TensorFlow by Tom Hope, Yehezkel S. Resheff, Itay Lieder O'Reilly Media, Inc.

3. Advanced Deep Learning with TensorFlow 2 and Keras: Apply DL, GANs, VAEs, deep RL, unsupervised learning, object detection and segmentation, and more, 2nd Edition.

4. Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 2007.

Reference Books:

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", 1 st Edition, Wrox, 2013.

2. Chris Eaton, Dirk Deroos et. al., "Understanding Big data", Indian Edition, McGraw Hill, 2015.

3. Tom White, "HADOOP: The definitive Guide", 3 rd Edition, O Reilly, 2012

Links:

Unit 1	https://www.ibm.com/cloud/blog/python-vs-r
Unit 2	https://www.youtube.com/watch?v=C5R5SdYzQBI
Unit 3	https://hevodata.com/learn/data-engineering-and-data-engineers/
Unit 4	https://www.youtube.com/watch?v=IjEZmH7byZQ
Unit 5	https://www.youtube.com/watch?v=pWp3PhYI-OU

B. TECH THIRD YEAR (ELECTIVE III)

Course Code	BCSAI0612	L T P	Credits
Course Title	**ADVANCED JAVA PROGRAMMING**	3 0 0	3

Course objective:

Objective of this course is to provide the ability to design console based, GUI based ,web based applications,

integrated development environment to create, debug and run multi-tier and enterprise-level applications.

Pre-requisites: Basics of C, C++, and basic concept of Core JAVA.

Course Contents / Syllabus

UNIT-I	**Introduction**	8 Hours

JDBC: Introduction, JDBC Driver, DB Connectivity, Driver Manager, Connection, Statement, Result Set, Prepared

Statement, Transaction Management, Stored Procedures.

Servlet: Servlet Overview, Servlet API, Servlet Interface, Generic Servlet, HTTP Servlet, Servlet Life Cycle,

Redirect requests to other resources, Session Tracking, Event and Listener.

UNIT-II	**JSP**	8 Hours

JSP: Introduction, Overview, JSP Scriptlet Tag, JSP expression Tag, JSP declaration Tag, Life Cycle of JSP, JSP API,

Implicit Objects: JSP request, JSP response, JSP config, JSP session, JSP Application, JSP Page Context; JSP

Page, JSP Exception.

UNIT-III	**Spring 5.0**	8 Hours

Spring 5.0: Spring Core Introduction and Overview, Managing Beans, The Spring Container, The Factory Pattern,

Dependency Injection (DI), Spring Managed Bean Lifecycle, Constructor Injection, Metadata/Configuration: Life

Cycle Annotations, Java Configuration, XML Free configuration.

UNIT-IV	**Spring MVC & Spring Boot**	8 Hours

Spring MVC: Introduction/Developing Web Application with Spring MVC, Advanced Techniques, Spring Controllers
Spring Boot: Spring Boot Starters, CLI, Application Class, Logging, Auto Configuration Classes, Spring Boot

dependencies, Spring data JPA introduction and Overview.

UNIT-V	**JPA**	8 Hours

	JPA: Introduction & overview of data persistence, Overview of ORM tools, Understanding JPA, Entities: Requirement for Entity Class, Persistent Fields and Properties, Primary keys in Entries, Entity Management, Querying Entities, Entities Relationships.	
Course outcome: After completion of this course students will be able to		
CO 1	Understand the concept of implementing the connection between Java and Database using JDBC.	K2, K4
CO 2	Understand, Analyse, and Build dynamic web pages for server-side programming	K2, K3
CO 3	Analyze and design the Spring Core Modules and DI to configure and wire beans (application objects) together	K4, K5
CO 4	Design Model View Controller architecture and ready components that can be used to develop flexible and loosely coupled web applications.	K2, K3, K6
CO 5	Deploy JPA to Map, store, retrieve, and update data from java objects to relational databases and vice versa.	K5

Text books:

1. Bhave, "Programming with Java", Pearson Education, 2009

2. Herbert Schieldt, "The Complete Refernce: Java", TMH, 1991

3. Hans Bergsten, "Java Server Pages", SPD O'Really, 1985

4. Katy Sierra and Bert Bates, "Head First: Java", O'Really, 2008

5. Katy Sierra and Bert Bates, "Head First: Servlets & JSP", O'Really , 2008

Reference Books:

1. NaughtonSchildt, "The Complete Refernce: JAVA2", TMH ,1991

2. Balagurusamy E, "Programming in JAVA", TMH, 2010

3. Introduction to Web Development with HTML, CSS, JavaScript (Cousera Course)

NPTEL/ YouTube/ Faculty Video Link:

Unit1	https://youtu.be/96xF9phMsWA
	https://youtu.be/Zopo5C79m2k
	https://youtu.be/ZliIs7jHi1s
	https://youtu.be/htbY9-yggB0

Unit2	https://youtu.be/vHmUVQKXlV o https://youtu.be/qz0aGYrrlhU https://youtu.be/BsDoLVMnmZs https://youtu.be/a8W952NBZUE
Unit 3	https://youtu.be/1Rs2ND1rc https://youtu.be/vpAJ0s 5S2t0 https://youtu.be/GBOK1-nvdU4 https://youtu.be/Eu7G0jV0ImY
Unit 4	https://youtu.be/-qfEOE4vtxE
	https://youtu.be/PkZNo7MFNFg https://youtu.be/W6NZfCO5SIk https://youtu.be/DqaTKBU9TZk
Unit 5	https://youtu.be/_GMEqhUyyFM https://youtu.be/ImtZ5yENzgE https://youtu.be/xIApzP4mWyA https://youtu.be/qKR5V9rdht0

B. TECH. THIRD YEAR (ELECTIVE-IV)

Course code	BCSAI0621	L T P	Credits
Course title	BIG DATA	3 0 0	3

Course objective: To understand the basic concepts of Big Data in cloud and analyse sample dataset using big data ecosystem.

Pre-requisite: Java and event handling concept

Course Contents / Syllabus

UNIT-I	INTRODUCTION TO BIG DATA AND CLOUD	8 Hours

Introduction to Big Data: Types of digital data, history of Big Data innovation, introduction to Big Data platform, drivers for Big Data, Big Data architecture and characteristics, 5 Vs of Big Data, Big Data technology components, Big Data importance and applications, Big Data features, Big Data Analytics, modern data analytic tools.
Introduction to Cloud Computing: Definition of Cloud, Evolution of Cloud Computing, Underlying Principles of Parallel and Distributed Computing, Cloud Characteristics

UNIT-II	HADOOP AND MAP-REDUCE	8 Hours

Hadoop: History of Hadoop, Apache Hadoop, the Hadoop Distributed File System, components of Hadoop, data format analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, Hadoop Echo System.

Map Reduce: Map-Reduce framework and basics, how Map Reduce works, anatomy of a Map-Reduce job run, failures, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats, Map Reduce features, Real world Map Reduce. **Hadoop Eco System and YARN:** Hadoop ecosystem components, Hadoop 2.0 New Features, MRv2 YARN

UNIT-III	HADOOP ARCHITECTURE & FRAMEWORK	8 Hours

Hadoop: History of Hadoop, Apache Hadoop, the Hadoop Distributed File System, components of Hadoop, data format analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, Hadoop Echo System.

Map Reduce: Map-Reduce framework and basics, how Map Reduce works, anatomy of a Map-Reduce job run, failures, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats, Map Reduce features, Real world Map Reduce. **Hadoop Eco System and YARN:** Hadoop ecosystem components, Hadoop 2.0 New Features, MRv2 YARN

Importing and Handling Relational Data in Hadoop using Sqoop , Scala , spark.

UNIT-IV	HADOOP IN CLOUD	8 Hours

Cloud Technologies And Advancements Hadoop: MapReduce, Cloud overview & characteristics, cloud service model (iaas paas, saas) , cloud deployment model (public, private, hybrid), Google cloud platform (gcp) infrastructure overview create gcp account & console overview, Virtual Box , Google App Engine, Programming Environment for Google App Engine Open Stack Federation in the Cloud, our Levels of Federation, ederated Services and Applications, Future of Federation.

UNIT-V	NETWORK AND DATA STORAGE SERVICES	8 Hours

Virtual networks: virtual private cloud (vpc) & types, subnets , ip addresses (public/private), nic ,routes & route table , firewalls , network topology options .

Google cloud storage overview & Structure: cloud datastore, cloud bigtable : nosql big data service bigquery basics, how to use machine learning with Bigquery.

Course outcome:	After completion of this course students will be able to	
CO1	Identify Big Data and relevance of Big Data Analytics.	K2
CO2	Analyze Map Reduce and demonstrate its use in features extraction.	K4
CO3	Explain the YARN and HDFC in Data management	K2
CO4	Articulate the concept of Cloud Computing and evolution of cloud computing with characteristics .	K3
CO5	Analyze the components of open stack & Google Cloud platform	K4

Text books:

"Programming Hive", O'Reilley, 2012. 7. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011. E. Capriolo, D. Wampler, and J. Rutherglen

"Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012. 5. Eric Sammer, "Hadoop Operations", O'Reilley, 2012. Tom White

Reference Books:

"Programming Pig", O'Reilley, Alan Gates

Big Data: A Revolution that will transform how we live,work and think. Viktor Mayer-Schonberger, ennethCukier

Links:

Unit 1	(4) noc19-cs33 Lecture 1-Introduction to Big Data - YouTube
Unit 2	(4) Lecture 26: Map-reduce and Hadoop - YouTube(3) Lecture 2	Image Classification - YouTube
Unit 3	4) Hadoop Ecosystem	Big Data Analytics Tools	Hadoop Tutorial	Edureka - YouTube (4) What is HDFS	Hadoop Distributed File System (HDFS) Introduction	Hadoop Training	Edureka - YouTube
Unit 4	(4) Hive Tutorial for Beginners	Hive Architecture	Hadoop Hive Tutorial	Hadoop Training	Edureka - YouTube (4) HBase Tutorial for Beginners	Introduction to Apache HBase	Hadoop Training	Edureka - YouTube https://www.youtube.com/watch?v=Qhc6RMaDkgY
Unit 5	(4) Sqoop Tutorial - How To Import Data From RDBMS To HDFS	Sqoop Hadoop Tutorial	Simplilearn - YouTube (4) Java in Spark	Spark-Submit Job with Spark UI Example	Tech Primers - YouTube (4) Java in Spark	Spark-Submit Job with Spark UI Example	Tech Primers - YouTube

B. TECH THIRD YEAR (ELECTIVE-IV)

Course code	BCSE0613	L	T	P	Credits
Course Title	**ROBOTICS PROCESS AUTOMATION (RPA)**	3	0	0	3

Course objective: This course focus on The Robotic Process Automation (RPA) specialization offers comprehensive knowledge and professional-level skills focused on developing and deploying software robots. It starts with the basic concepts of Robotic Process Automation. It builds on these concepts and introduces key RPA Design and Development strategies and methodologies, specifically in the context of UiPath products. A student undergoing the course shall develop the competence to design and develop automation solutions for business processes.

Pre-requisites: Computer Organization and Architecture

Course Contents / Syllabus

UNIT-I	PROGRAMMING BASICS &RECAP	8 Hours

PROGRAMMING BASICS &RECAP: Programming Concepts Basics - Understanding the application - Basic Web Concepts - Protocols - Email Clients -. Data Structures - Data Tables - Algorithms - Software Processes - Software Design - Scripting - .Net Framework - .Net Fundamentals - XML - Control structures and functions - XML - HTML - CSS - Variables & Arguments.

UNIT-II	RPA Concepts	8 Hours

RPA Concepts: RPA Basics - History of Automation - What is RPA - RPA vs Automation - Processes & Flowcharts - Programming Constructs in RPA - What Processes can be Automated - Types of Bots - Workloads which can be automated - RPA Advanced Concepts - Standardization of processes - RPA Development methodologies - Difference from SDLC - Robotic control flow architecture - RPA business case - RPA Team - Process Design Document/Solution Design Document - Industries best suited for RPA - Risks & Challenges with RPA - RPA and emerging ecosystem

UNIT-III	RPA TOOL INTRODUCTION &BASICS	8 Hours

RPA TOOL INTRODUCTION &BASICS: Introduction to RPA Tool - The User Interface - Variables - Managing Variables - Naming Best Practices - The Variables Panel - Generic Value Variables - Text Variables - True or False Variables - Number Variables - Array Variables - Date and Time Variables - Data Table Variables - Managing Arguments - Naming Best Practices - The Arguments Panel - Using Arguments - About Imported Namespaces - Importing New Namespaces Control Flow - Control Flow Introduction - If Else Statements - Loops

Advanced Control Flow - Sequences - Flowcharts - About Control Flow - Control Flow Activities - The Assign Activity - The Delay Activity - The Do While Activity - The If Activity - The Switch Activity - The While Activity

The For Each Activity - The Break Activity - Data Manipulation - Data Manipulation Introduction - Scalar variables, collections and Tables - Text Manipulation - Data Manipulation - Gathering and Assembling Data.

UNIT-IV	ADVANCED AUTOMATION CONCEPTS AND TECHNIQUES	8 Hours

ADVANCED AUTOMATION CONCEPTS AND TECHNIQUES : Recording and Advanced UI Interaction-Recording Introduction-Basic and Desktop Recording-Web Recording - Input/output Methods - Screen Scraping- Data Scraping - Scraping advanced techniques - Selectors - Selectors - Defining and Assessing Selectors - Customization - Debugging - Dynamic Selectors - Partial Selectors - RPA Challenge - Image, Text & Advanced Citrix Automation - Introduction to Image & Text Automation - Image based automation - Keyboard based automation - Information Retrieval - Advanced Citrix Automation challenges - Best Practices - Using tab for Images

- Starting Apps - Excel Data Tables & PDF - Data Tables in RPA - Excel and Data Table basics - Data Manipulation

in excel - Extracting Data from PDF - Extracting a single piece of data - Anchors - Using anchors in PDF

UNIT-V	EMAIL AUTOMATION & EXCEPTIONAL	8 Hours

EMAIL AUTOMATION & EXCEPTIONAL: Email Automation - Email Automation - Incoming Email automation - Sending Email, automation - Debugging and Exception Handling - Debugging Tools - Strategies for solving issues - Catching errors

COURSE OUTCOMES: After completion of this course students will be able to

CO 1	Understand RPA principles, its features and applications	K3
CO2	Demonstrate proficiency in handling several types of variables inside a workflow and data manipulation techniques	K3
CO3	Gain insights into Desktop, Web, Citrix, Email Automation and exception handling.	K2
CO4	Analyze and design a real-world automation project and debug the workflows.	K2
CO5	Student will be able to understand architecture of computing technology.	K2

TEXT BOOKS:

1. Tripathi, Alok Mani. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool–UiPath. Packt Publishing Ltd, 2018.

2. Primer, A. "Introduction to Robotic Process Automation." Institute for Robotic Process Automation (2015).

3. Murdoch, Richard. Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become an RPA Consultant. Richard Murdoch & RPA Ultra, 2018.

4. Taulli, Tom. "The robotic process automation handbook." The Robotic Process Automation Handbook. https://doi. org/10.1007/978-1-4842-5729-6 (2020).

Reference Books:

1. Gaonkar, Sushant. "Future of work: Leveraging the power of technologies to create a near-human like digital worker." Gavesana Journal of Management 13.1 (2020): 15-23.

2. Vellaichamy, Mr NMS S., Mr R. Dinesh, and Mrs JR Rajalakshmi. "Reskillng Indian Workforce: The Need of the Hour LavanyanjaliMukkerlaDr.Braou."

NPTEL/YouTube/Faculty Video Links:

Unit 1	https://www.youtube.com/watch?v=3SMZHd_ngIw
Unit 2	https://www.youtube.com/watch?v=3zXb8H3odek
Unit 3	https://www.youtube.com/watch?v=3zXb8H3odek
Unit 4	https://www.youtube.com/watch?v=3zXb8H3odek

B. TECH THIRD YEAR

Course code	BCSAI0622			L T P	Credits
Course title	**SOCIAL MEDIA ANALYTICS**			3 0 0	3

Course objective: To understand text mining and social media data analytic activities and apply the complexities of processing text and network data from different data sources.

Pre-requisites: Python/R.

Course Contents / Syllabus

UNIT-I	**SENTIMENT MINING**	8 HOURS

Overview: Text and Sentiment Mining, Semantic Analysis Applications, Sentiment Analysis Process, Speech Analytics, Text Representation- tokenization, stemming, stop words, TF-IDF, Feature Vector Representation, Named Entity Recognition (NER), N-gram modelling, Text Clustering, Text Classification, Topic Modelling-LDA, HDP. Sentiment Classification, feature based opinion mining, comparative sentence, and relational mining, Opinion Summarization, Opinion spam detection.

UNIT-II	**WEB-MINING**	8 HOURS

Web Mining Overview, Web Structure Mining, Search Engine, Web Analytics, Machine Learning for extracting knowledge from the web, Inverted indices and Boolean queries. PLSI, Queryoptimization, SEO, page ranking, social graphs (Interaction, Latent and Following Graphs), Ethics of Scraping, Static data extraction and Web Scraping using Python.

UNIT-III	**MINING SOCIAL MEDIA**	8 HOURS

Introduction to Social Media Mining, Challenges in Social Media Mining, Process of Social media mining, Essentials of social graphs and its types, Social Networks Measures, Network Models, Information Diffusion in social media, Behavioral Analytics, Influence and Homophily, Recommendation in social media.

UNIT-IV	**TEXT SUMMARIZATION**	8 HOURS

Introduction to Text Summarization, Text extraction, classification and clustering, Anomaly and Trend Detection, Text Processing, N-gram Frequency Count and Phrase Mining, Page Rank and Text Rank Algorithm, LDA Topic Modelling, Machine-Learned Classification and Semantic Topic Tagging, Python libraries for Text Summarization. (NumPy, Pandas, Ntlk, Matplotlib).

UNIT-V	**RECENT TRENDS**	8 HOURS

Trend Analysis, Types of trend analysis, Recent Trends in Text, Data Localization Role of Web Mining in E-Commerce, Social Media Analytics, Social media analytics tools.
Case Studies: Facebook Insights Using Python, Sentiment and Text Mining of Twitter data and Google analytics.

Course outcome: After completion of this course students will be able to		
CO 1	Apply state of the art mining tools and libraries on realistic data sets as a basis for business decisions and applications.	K3
CO 2	Apply a wide range of classification, clustering, estimation and prediction algorithms on web data.	K3
CO 3	Implement social network analysis to identify important social actors, subgroups and network properties in social media sites.	K3
CO 4	Interpret the terminologies, metaphors and perspectives of text summarization.	K3
CO 5	Design new solutions to opinion extraction, sentiment classification and data summarization problems.	K6

Textbooks

1. BingLiu,"WebDataMining-ExploringHyperlinks,Contents,andUsageData",Springer,Second Edition, 2011.

2. RezaZafarani, Mohammad AliAbbasiandHuanLiu,"SocialMediaMining-AnIntroduction", Cambridge University Press, 2014.

3. Bing Liu, "Sentiment Analysis and Opinion Mining", Morgan & Claypool Publishers, 2012.

Reference Books

1. NitinIndurkhya, FredJDamerau,"HandbookofNaturalLanguageProcess",2ndEdition,CRC Press, 2010.

2. Matthew A. Russell, "Mining the social web", 2nd edition- O'Reilly Media, 2013.

3. M Berry, "Text Mining: Applications and Theory", John Wiley & Sons Inc; 1st edition (12 March 2010)

NPTEL/ YouTube/ Faculty Video Link:

Unit 1	https://www.youtube.com/watch?v=Uqs0GewlMkQ https://www.youtube.com/watch?v=tUNwSH7671Y&t=2s https://www.youtube.com/watch?v=zz1CFBS4NaY
Unit 2	https://slideplayer.com/slide/14222744/
Unit 3	https://www.youtube.com/watch?v=KjWu1-dZn00
Unit 4	https://www.youtube.com/watch?v=ntOaoW0T604
Unit 5	https://www.youtube.com/watch?v=otoXeVPhT7Q&list=PL34t5iLfZddt0tt5GdDy3ny6X5RQvwrp6&index=2

B. TECH THIRD YEAR (ELECTIVE IV)

Course Code	BCSE0614	L	T	P	Credits
Course Title	WEB DEVELOPMENT USING MEAN STACK	3	0	0	3

Course objective:
This course focuses on how to design and build static as well as dynamic webpages and interactive web applications. Students examine advanced topics like Angular, nodejs, Mongodb and Express framework for interactive web applications that use rich user interfaces.

Pre-requisites: Basic knowledge of HTML, CSS and ES6 required.

Course Contents / Syllabus	

UNIT-I	Introduction to Nodejs	8 Hours

Introduction to Nodejs : Installing Nodejs, Node in-built packages (buffer, fs, http, os, path, util, url) Node.js modules, File System Module, Json data, Http Server and Client, Error handling with appropriate HTTP, Callback function, asynchronous programing REST API's(GET, POST PUT, DELETE UPDATE), GraphQL, Promises, Promise Chaining, Introduction to template engine (EJS).

UNIT-II	Express Framework	8 Hours

Express Framework: Configuring Express, Postman configuration, Environment Variables, Routing, Defining pug templates, HTTP method of Express, URL binding, middleware function, Serving static files, Express sessions, REST full API's, FORM data in Express, document modeling with Mongoose.

UNIT-III	Basics of Angular js	8 Hours

Basics of Angular js : Typescript, Setup and installation, Power of Types, Functions, Function as types Optional and default parameters, Arrow functions, Function overloading, Access modifiers, Getters and setters, Read-only & static, Abstract classes,

Interfaces, Extending and Implementing Interface, Import and Export modules.

UNIT-IV	Building Single Page App with Angular js	8 Hours

Building Single Page App with Angular js: MVC Architecture, One-way and Two-way data binding, AngularJS Expressions, AngularJS Controllers, AngularJS
Modules, adding controller to a module, Component, Dependency Injection, Filters, Tables, AngularJS Forms and Forms validation, Select using ng-option, AngularJS AJAX.

UNIT-V	Connecting Angular js with MongoDB	8 Hours

Connecting Angular js with MongoDB : Environment Setup of Mongodb, data modeling, The current SQL/NoSQL landscape, Create collection in Mongodb,
CRUD Operations in MongoDB. Mongo's feature set, Introduction to Mongoose, understanding mongoose schemas and datatypes, Connecting Angular with mongoDB using API.

Course outcome: After completion of this course students will be able to

CO 1	Explain, analyze and apply the role of server-side scripting language like Nodejs in the workings of the web and web applications.	K2, K3
CO2	Demonstrate web application framework i.e., Express is to design and implement typical dynamic web pages and interactive web based applications.	K3, K6
CO3	Apply the knowledge of Typescript that are vital in understanding angular is, and analyze the concepts, principles and methods in current client-side technology to implement angular application over the web.	K3, K6
CO4	Analyze, build and develop single page application using client-side programming i.e. angular js and also develop a static web application.	K3, K4
CO5	Understand the impact of web designing by database connectivity with Mongodb in the current market place where everyone use to prefer electronic medium for shoping, commerce, and even social life also.	K2, K3

Text books:

1. Amos Q. Haviv (Author), Adrian Mejia (Author), Robert Onodi (Author), "Web Application Development with MEAN",3rdIllustrated Edition 2017,Packt Publications.
2. Simon Holmes (Author), Clive Herber (Author), "Getting MEAN with Mongo, Express, Angular, and Node", 2nd Edition 2016, Addison Wesley Publication.
3. Dhruti Shah, "Comprehensive guide to learn Node.js", 1st Edition, 2018 BPB Publications.
4. Christoffer Noring, Pablo Deeleman, "Learning Angular",3rd Edition,2017
5. Packt publications.

Reference Books:

1. Anthony Accomazzo, Ari Lerner, and Nate Murray, "Fullstack Angular: The Complete Guide to AngularJS and Friends",4th edition, 2020 International Publishing.
2. David Cho, "Full-Stack Angular, Type Script, and Node: Build cloud-ready web applications using Angular 10 with Hooks and GraphQL",2nd edition, 2017 Packt Publishing Limited.
3. Richard Haltman & Shubham Vernekar, "Complete node.js: The fast guide: Learn complete backend development with node.js"5th edition, 2017 SMV publication.
4. Glenn Geenen,Sandro Pasquali , Kevin Faaborg, "Mastering Node.js: Build robust and scalable real-time server-side web applications efficiently" 2nd edition Packt Publishing Limited.
5. Greg Lim,"Beginning Node.js, Express & MongoDB Development ,kindle edition, international publishing.
6. Daniel Perkins, "AngularJS Master Angular.js with simple steps, guide and instructions" 3rd edition, 2015 SMV publication.
7. Peter Membrey, David Hows, Eelco Plugge, "MongoDB Basics", 2nd edition,2018 International Publication.

NPTEL/ YouTube/ Faculty Video Link:

Unit-1	https://youtu.be/BLl32FvcdVM https://youtu.be/fCACk9ziarQ https://youtu.be/YSyFSnisip0 https://youtu.be/mGVFltBxLKU https://youtu.be/bWaucYA1YRI

Unit-2	https://youtu.be/7H_QH9nipNs https://youtu.be/AX1AP83CuK4 https://youtu.be/SccSCuHhOw0 https://youtu.be/lY6icfhap2o https://youtu.be/z7ikpQCWbtQ
Unit-3	https://youtu.be/0LhBvp8qpro https://youtu.be/k5E2AVpwsko https://youtu.be/SQJkj0WYWOE?list=PLvQjNLQMdagP3OzoBMfBT48uJ-SPfSsWj https://youtu.be/0eWrpsCLMJQ?list=PLC3y8-rFHvwhBRAgFinJR8KHIrCdTkZcZ https://youtu.be/ZSB4JcLLrIo
Unit-4	https://youtu.be/0LhBvp8qpro https://youtu.be/k5E2AVpwsko https://youtu.be/SQJkj0WYWOE?list=PLvQjNLQMdagP3OzoBMfBT48uJ-SPfSsWj https://youtu.be/0eWrpsCLMJQ?list=PLC3y8-rFHvwhBRAgFinJR8KHIrCdTkZcZ https://youtu.be/ZSB4JcLLrIo
Unit-5	https://youtu.be/Kvb0cHWFkdc

B.TECH THIRD YEAR	
Subject Code: BCSML0651	**L T P 0 0 4**
Subject Name: Machine Learning Lab	**Credits 2**
Pre- requisites: Basic knowledge of Python and R Programming.	
Course outcome: After completion of this practical, student will be able to:	

CO1	Understand the implementation procedures for the machine learning algorithms.	K2
CO2	Identify and apply Machine Learning algorithms to solve real-world problems.	K3
CO3	Examine the requirements on special databases.	K4

List of Practical:

Lab No.	**Program Logic Building**	**CO Mapping**
	Data Preprocessing and Feature Selection	CO1
1	Write a program to perform various types of regression (Linear & Logistic).	CO1
2	Implement Apriori algorithm using sample data in Python	CO1
3	Implement a program to demonstrate the working of the decision tree based ID3algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.	CO1
4	Write a program to implement k-Nearest Neighbour algorithm to classify the iris dataset. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem	CO2
5	Implement Support Vector Machine using Scikit-learn.	CO2
6	Implement of ANN algorithm using a sample dataset.	CO2
7	Implement the non-parametric Locally Weighted Regression algorithm to fit data points. Select appropriate data set for your experiment and draw graphs.	CO2
8	Apply EM algorithm to cluster a set of data. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering	CO3
9	Implement Gradient Boosting Machine Ensemble in Python.	CO3

| 10 | Implement naïve Bayesian Classifier model. Write the program to calculate the accuracy, precision, and recall for your data set. | CO3 |

B. TECH THIRD YEAR

Course Code	BCS0601	L	T	P	Credits
Course Title	Cloud Application and Development	0	0	6	3

Course objective:
1. Equip students with the skills to develop, deploy, and manage applications in cloud computing environments.
2. Provide in-depth knowledge of various frameworks, platforms, and APIs used for building cloud-based applications.
3. Enable students to effectively use cloud management tools to analyze and optimize digital service ecosystems and cloud-based products.

Pre-requisites:- JDK 1.7/1.8, Eclipse IDE, Dropbox API, Apache tomcat server 7.0/8.0, Google AppEngine API, Servlets, Struts, Spring framework.
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Course Contents / Syllabus		
UNIT-I	**Core Principles and Application development framework**	**14 Hours**
Business case for implementing cloud application, Requirements collection for cloud application development, Cloud service models and deployment models, Exploring Cloud Access: Comparison Between Web Applications and Cloud-Based Applications, Development Frameworks: MVC Architecture, Struts, and Spring Framework, Industry Cloud Platforms: Google App Engine, Microsoft Azure, OpenShift, and Cloud Foundry		
UNIT-II	**Cloud Delivery Models and Architecture Design**	**14 Hours**
Cloud Object Storage and Session Handling, Integration with Third-Party APIs: Understanding Connectivity in Cloud Ecosystems (e.g., Facebook, Twitter, Google APIs), Developing Cloud Applications on AWS: Using Amazon SQS and RabbitMQ for Messaging Services		
UNIT-III	**Cloud App Development and Data Management**	**14 Hours**
Amazon SNS, Cloud-Based Multiplayer Game Hosting, and Content Delivery Network Construction, Securing Cloud Data: ACL, OAuth, OpenID, XACML, and Data Transport Security, Ensuring Scalability of Cloud Applications and Services		
UNIT-IV	**Automation and provisioning tool**	**15 Hours**
. Puppet and Chef Automation Steps: Overview, Managing Files and Packages, Handling Services and Subscriptions, Executing Commands and Notifications, Using Facts, Conditional Logic, and Logging		
UNIT-V	**AI and Machine Learning in Cloud**	**15 Hours**
Cloud AI and ML Services (AWS SageMaker, Google AI, Azure ML), Integrating AI Models into Cloud-Based Applications, Hands-on: Deploying a Simple AI Model in a Cloud Environment, Use Cases in IoT, Real-Time Data Processing, Autonomous Systems, Popular Edge Computing Platforms (AWS Greengrass, Azure IoT Edge)		

Course outcome: After completion of this course students will be able to

CO1	Understand the concept of cloud computing and the business case for implementing cloud applications in different business scenarios.	K2

CO2	Design cloud-based applications using cloud messaging services like Amazon SQS and RabbitMQ to ensure reliable message delivery and system communication.	K3
CO3	Host cloud-based multiplayer games and construct content delivery networks (CDN) to ensure optimized delivery of media content.	K4
CO4	Automate the management of files, services, and subscriptions in cloud environments using Puppet and Chef.	K5
CO5	Deploy AI models in a cloud environment and evaluate their performance in real-time data processing scenarios.	K4

Text books:

1. Mastering cloud computing, TataMcGraw Hill Education Private Limited, 2013, Rajkumar buyya, Christian vecchiola, S Thamarai Selvi
2. Cloud Computing a Practical Approach, Tata McGraw-HILL, 2010 Edition, Anthony T .Velte, Toby J. Velte, Robert Elsenpeter

Reference Books:

1. Cloud computing bible, Wiley publishing, Barrie sosinsky

2. Managing Infrastructure with puppet, O'REILLY , June 2011, James Loope

NPTEL/ Youtube/ Faculty Video Link:

1	https://cloud.google.com/appengine/docs
2	https://www.chef.io/solutions/cloud-management/
3	https://aws.amazon.com/documentation
4	https://www.youtube.com/watch?v=q3m1AB9ECXo
5	https://www.youtube.com/watch?v=q3m1GDFTCPe

List of Experiments

Sr. No.	Name of Experiment
1	Design and Development of Web applications using MVC Framework
2	Installing and Configuring required platform for Google App Engine
3	Studying the features of GAE PaaS model
4	Creating and running Web applications (Guest book, MVC) on localhost and deploying the same in Google App Engine
5	Design and Development of Web applications using Struts
6	Design and Development of Web applications using Spring framework
7	Developing an ASP.NET based web application on Azure platform
8	Creating an application in Dropbox to store data securely and developing source code using Dropbox API for updating and retrieving files

9	Installing Cloud Foundry in localhost and exploring CF commands
10	Cloud application development using open-source virtualization (e.g., VirtualBox, KVM, or Proxmox)
11	Installing and configuring Docker on a local host and running multiple images on a Docker platform.
12	Configuring and deploying VMs/Dockers using Chef/Puppet automation tools

Reference Books

Sr. No.	Book Details
1	Pankaj Jalote, Software Engineering, Wiley.
2	Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication. 2nd Edition.
3	Kassem Saleh, "Software Engineering", Cengage Learning.
	Ian Summerville, Software Engineering, Addison Wesley. 9th Edition.

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306
(An Autonomous Institute)
School of Computer Science in Emerging Technologies

Course Code	BCSE0653	L T P	Credits
Course Title	**Software Engineering & Design**	[0-0-6]	3

Course objective:- To help students understand all phases of the Software Development Life Cycle (SDLC) both theoretically and practically, enabling them to systematically apply principles of analysis, design, development, testing, and maintenance to build cost-effective software solutions and become competent software engineering professionals

Pre-requisites:. **Basic knowledge of computer fundamentals and software development processes**

Course Contents / Syllabus

UNIT-I	Introduction and development models	14 Hours

Evolving role of software, Software Characteristics, Software crisis, silver bullet, Software myths, Software Engineering Phases, Team Software Process (TSP), Emergence of software engineering, Software process, project and product, Software Process Models: Waterfall Model, Prototype Model, Spiral Model, Iterative Model, Incremental Model, Agile Methodology: Scrum Sprint, Scrum Team, Scrum Master, Product Owner, Kanban framework.

UNIT-II	Software Requirement Quality Assurance	14 Hours

Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Use Case Diagram, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA): Quality concepts, SQA activities, Formal approaches to SQA; Statistical software quality assurance; CMM, The ISO standard.

UNIT-III	Software Design	14 Hours

Design principles, the design process; Design concepts: refinement, modularity: Cohesion, Coupling, Effective modular design: Functional independence, Design Heuristics for effective modularity, Software architecture: Function Oriented Design, Object Oriented Design: OOPs concepts-Abstraction, object, classification, inheritance, encapsulation, UML Diagrams-Class Diagram, Interaction diagram, Activity Diagram, Control hierarchy: Top-Down and Bottom-Up Design, structural partitioning, software procedure.

UNIT-IV	Software Testing	15 Hours

Software Testing: Testing Objectives, 7 Principals of Testing, Levels of Testing: Unit Testing, System Testing, Integration Testing, User Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural (White Box Testing Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha, and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards, Test Management, Test Planning and Estimation, Test Monitoring and Control, Configuration Management, Risks and Testing, Defect Management, Tool Support for Testing, Effective Use of Tools.

UNIT-V	Project Maintenance Management Concepts	15 Hours

Software Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Need for Maintenance. Project management concepts, Planning the software project, Estimation: Software Measurement and Metrics, Various Size Oriented Measures-LOC based, FP based, Halestead's Software Science, Cyclomatic Complexity Measures: Control Flow Graphs, Use-case based empirical estimation COCOMO- A Heuristic estimation technique, staffing level estimation, team structures, risk analysis and management. Configuration Management, Software reengineering, reverse engineering, restructuring forward engineering, Clean Room software engineering. Case Tools.

Course outcome: After completion of this course students will be able to

CO1	Understand various software characteristics and analyze different software Development Models	K4
CO2	Demonstrate the concept of SRS and apply basic software quality assurance practices.	K3
CO3	Understand design principles and logic to effectively compare various software design methods.	K4
CO4 K3	Apply various testing techniques.	
CO5	Maintain and apply software project management tools for software development.	K5

Text books:

1.	KK Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers 3RDEdition
2.	RS Pressman, Software Engineering: A Practitioners Approach, McGraw Hill. 7thEdition
3.	Rajib Mall, Fundamentals of Software Engineering, PHI Publication.4th Edition

Reference Books:

Pankaj Jalote, Software Engineering, Wiley.

Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication. 2nd Edition.

Kassem Saleh, "Software Engineering", Cengage Learning.

Ian Summerville, Software Engineering, Addison Wesley. 9th Edition.

Links: NPTEL/You Tube/Web Link

Unit 1	https://www.youtube.com/watch?v=bLrbX4ZCQeY
Unit 2	https://www.youtube.com/watch?v=ZloPeQA1G4E
Unit 3	https://www.youtube.com/watch?v=rpk7fSkTIu8
Unit 4	https://www.youtube.com/watch?v=T0TynxN77oY
Unit 5	https://www.youtube.com/watch?v=nulFv99VBGs

	List of Practical	
Sr. No.	**Program Title**	**CO Mapping**
1	Team formation and allotment of Mini project: Problem statement, Literature survey, Requirement. analysis.	CO1
2	Draw the use case diagram	CO2
3	Draw the Data Flow Diagram (DFD): All levels.	CO2
4	Design an ER diagram for with multiplicity	CO2
5	Prepare SRS document in line with the IEEE recommended standards.	CO2
6	Draw State chart diagram.	CO3
7	Draw Object and Class diagram.	CO3
8	Create Interaction diagram: sequence diagram for SDD	CO3
9	Create Interaction diagram: collaboration diagram for SDD.	CO3
10	Create Activity diagram	CO3
11	Create Component diagram	CO3
12	Create Deployment diagram	CO3
13	Estimation of Test Coverage Metrics and Structural Complexity.	CO4
14	Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on boundary-value analysis, execute the test cases, and discuss the results	CO4
15	Design, develop, code, and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of boundary value testing, derive different test cases, execute these test cases, and discuss the test results.	CO4
16	Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an	CO4

	equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on equivalence class partitioning, execute the test cases, and discuss the results.	
17	Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Derive test cases for your program based on decision-table approach, execute the test cases, and discuss the results.	CO4
18	Create test cases for a program which determine whether an integer is prime or not by using path testing.	CO4
19	Create test cases for a program which determine whether an integer is prime or not by using Cyclomatic complexity.	CO4
20	Consider a program to input two numbers and print them in ascending order. Find all du paths and identify those du-paths that are not feasible. Also find all dc paths and generate the test cases for all paths (dc paths and non dc paths).	CO4
21	Consider the code to arrange the nos. in ascending order. Generate the test cases for loop coverage and path testing. Check the adequacy of the test cases through mutation testing and compute the mutation score for each.	CO4
22	Write Test cases for any Known Application (e.g., Banking Application)	CO4
23	Create a test plan document for any application (e.g., Library Management System)	CO4
24	Study of any testing tool (e.g., Win Runner)	CO4
25	Study of any bug tracking tool (e.g., Bugzilla, Bug bit)	CO4
26	Study of any test management tool (e.g., Test Director)	CO4
27	Study of any open source-Testing tool (e.g., Test link, Test Rail)	CO4
28	Study of any web testing tool (e.g., Selenium)	CO4
29	Mini Project with CASE tools.	CO5
30	Case Study Provided by Industry.	CO5

B. TECH. THIRD YEAR 5th/ 6th

Course code	BNC0502/BNC0602	L	T	P	Credits
Course Title	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2	0	0	2

Course objective: This course aims to provide basic knowledge about different theories of society, state and polity in India, Indian literature, culture, Indian religion, philosophy, science, management, cultural heritage and different arts in India

Pre-requisites: Computer Organization and Architecture

Course Contents / Syllabus

UNIT-I	SOCIETY STATE AND POLITY IN INDIA	8 Hours

State in Ancient India: Evolutionary Theory, Force Theory, Mystical Theory Contract Theory, Stages of State Formation in Ancient India, Kingship , Council of Ministers Administration Political Ideals in Ancient India Conditions' of the Welfare of Societies, The Seven Limbs of the State, Society in Ancient India, Purusārtha, Varnāshrama System, Āshrama or the Stages of Life, Marriage, Understanding Gender as a social category, The
representation of Women in Historical traditions, Challenges faced by Women.

UNIT-II	INDIAN LITERATURE, CULTURE, TRADITION, AND PRACTICES	8 Hours

Evolution of script and languages in India: Harappan Script and Brahmi Script. The Vedas, the Upanishads, the Ramayana and the Mahabharata, Puranas, Buddhist And Jain Literature in Pali,Prakrit And Sanskrit, Sikh Literature, Kautilya's Arthashastra, Famous Sanskrit Authors, Telugu Literature, Kannada Literature,Malayalam Literature ,Sangama Literature Northern Indian Languages & Literature, Persian And Urdu ,Hindi Literature

UNIT-III	INDIAN RELIGION, PHILOSOPHY, AND PRACTICES	8 Hours

Pre-Vedic and Vedic Religion, Buddhism, Jainism, Six System Indian Philosophy, Shankaracharya, Various Philosophical Doctrines, Other Heterodox Sects, Bhakti Movement, Sufi movement, Socio religious reform movement of 19th century, Modern religious practices.

UNIT-IV	SCIENCE, MANAGEMENT AND INDIAN KNOWLEDGE SYSTEM	8 Hours

Astronomy in India, Chemistry in India, Mathematics in India, Physics in India, Agriculture in India, Medicine in India, Metallurgy in India, Geography, Biology, Harappan Technologies, Water Management in India, Textile Technology in India ,Writing Technology in India Pyrotechnics in India Trade in Ancient India/,India's Dominance up to Pre-colonial Times.

UNIT-V	CULTURAL HERITAGE AND PERFORMING ARTS	8 Hours

Indian Architect, Engineering and Architecture in Ancient India, Sculptures, Pottery, Painting, Indian Handicraft, UNESCO'S List of World Heritage sites in India, Seals, coins, Puppetry, Dance, Music, Theatre, drama, Martial Arts Traditions, Fairs and Festivals, UNESCO'S List of Intangible Cultural Heritage, Calenders, Current
developments in Arts and Cultural, Indian's Cultural Contribution to the World. Indian Cinema.

COURSE OUTCOMES: After completion of this course students will be able to

CO 1	Understand the basics of past Indian politics and state polity.	K2
CO 2	Understand the Vedas, Upanishads, languages & literature of Indian society.	K2
CO 3	Know the different religions and religious movements in India.	K4

CO 4	Identify and explore the basic knowledge about the ancient history of Indian agriculture, science & technology, and ayurveda.	K4
CO 5	Identify Indian dances, fairs & festivals, and cinema.	K1

Text Books:

1. Behrouz Forouzan, "Data Communication and Networking" Fourth Edition-2006, Tata McGraw Hill

2. Andrew Tanenbaum "Computer Networks", Fifth Edition-2011, Prentice Hall.

3. William Stallings, "Data and Computer Communication", Eighth Edition-2008, Pearson.

Reference Books:

1. Kurose and Ross, "Computer Networking- A Top-Down Approach", Eighth Edition-2021, Pearson.

2. Peterson and Davie, "Computer Networks: A Systems Approach", Fourth Edition-1996, Morgan Kaufmann

Links: NPTEL/You Tube/Web Link

https://www.youtube.com/watch?v=LX_b2M3IzN8

https://www.youtube.com/watch?v=LnbvhoxHn8M

https://www.youtube.com/watch?v=ddM9AcreVqY

https://www.youtube.com/watch?v=uwoD5YsGACg

https://www.youtube.com/watch?v=bTwYSA478eA&list=PLJ5C_6qdAvBH01tVf0V4PQsCxGE3hSqEr
https://www.youtube.com/watch?v=tSodBEAJz9Y