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

Affiliated to

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

Evaluation Scheme & Syllabus

For

Bachelor of Technology

Computer Science and Engineering (Data Science)

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 and Engineering (Data 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	BCSE0502	Computer Network	Mandatory	3	1	0	30	20	50		100		150	4
2	BCSCC0501	Design Thinking-II	Mandatory	2	1	0	30	20	50		100		150	3
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	BCSML0555	Machine Learning	Mandatory	0	0	6				50		100	150	3
6	BCSE0555	Web Technologies	Mandatory	0	0	6				50		100	150	3
7	BCSE0552	Computer Networks Lab	Mandatory	0	0	4				50		50	100	2
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		*Massive Open Online Courses (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	BMC0091	Master Network Automation with Python for Network Engineers	Infosys Wingspan (Infosys Springboard)	23h 24m	1.5
2	BMC0095	ReactJS	Infosys Wingspan (Infosys Springboard)	61h 2m	4

PLEASE NOTE: -

- **A 3–4-week 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 to 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

Subject Code	Subject Name	Types of subjects	Bucket Name	Branch	Semester
BCSAI0511	Cloud Storage Management	Departmental Elective- I	Cloud and Big Data	DS	5
BCSAI0520	Cloud Virtualization	Departmental Elective- II		DS	5
BCSE0511	CRM Fundamentals	Departmental Elective- I	CRM-RPA	DS	5
BCSE0513	CRM Administration	Departmental Elective- II		DS	5
BCSAI0516	Predictive Analytics	Departmental Elective- I	Data Analytics	DS	5
BCSAI0519	Business Intelligence and Data Visualization	Departmental Elective- II		DS	5
BCSE0512	Python Web Development with Django	Departmental Elective- I	Full Stack Development	DS	5
BCSE0514	Design Patterns	Departmental Elective- II		DS	5

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

Bachelor of Technology

Computer Science and Engineering (Artificial Intelligence and Machine Learning)

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	BCSAI0601	Big Data Analytics	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	BCSAI0651	Big Data Analytics Lab	Mandatory	0	0	2				25		25	50	1
6	BCSAI0652	Introduction to Cloud Computing	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 (Essential for Hons. Degree)	MOOCs											
		TOTAL		**14**	**1**	**20**	**120**	**80**	**200**	**175**	**400**	**325**	**1100**	**23**

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

S. No.	Subject Code	Course Name	University / Industry Partner Name	No of Hours	Credits
1	BMC0069	Big Data - 201	Infosys Wingspan (Infosys Springboard)	24h 13m	2
2	BMC0011	Building Machine Learning Systems with TensorFlow	Infosys Wingspan (Infosys Springboard)	27h 18m	2
3	BMC0092	Natural Language Processing Foundation Certification	Infosys Wingspan (Infosys Springboard)	16h 45m	1

PLEASE NOTE: -

- **Compulsory Audit (CA) Courses (Non-Credit - BNC0601/BNC0602)**
  - All Compulsory Audit Courses (a qualifying exam) do not require any credit.
  - The total and obtained marks are not added to 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

Sl. No.	Subject Codes	Subject Name	Types of Subject	Bucket Name	Branch	Semester
1	BCSE0611	CRM Development	Departmental Elective-III	CRM-RPA	CSE (AIML)	6
2	BCSE0613	Robotics Process Automation (RPA)	Departmental Elective-IV		CSE (AIML)	6
3	BCSAI0617	Programming for Data Analytics	Departmental Elective-III	Data Analytics	CSE (AIML)	6
4	BCSAI0622	Social Media Analytics	Departmental Elective-IV		CSE (AIML)	6
5	BCSAI0612	Advanced Java Programming	Departmental Elective-III	Full Stack Development	CSE (AIML)	6
6	BCSE0614	Web Development using MEAN Stack	Departmental Elective-IV		CSE (AIML)	6
7	BCSAI0614	Development in Swift Explorations and Data Collections	Departmental Elective-III	Mobility Management	CSE (AIML)	6
8	BCSAI0620	Augmented Reality and Virtual Reality	Departmental Elective-IV		CSE (AIML)	6

NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
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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

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

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School of Computer Science in Emerging Technologies

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	

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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

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GREATER NOIDA-201306

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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	K2
CO 2	Analyze the infrastructures for Cloud storage	K6
CO 3	Evaluate the storage solutions	K3
CO4	Understand cloud migration solutions	K4

CO 5	Analyze cloud migration solutions on different needs	K5

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

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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.	K1, K2
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	
1.	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	BCSAI0516	L T P C	Credits
Course Title	PREDICTIVE ANALYTICS	3 0 0	3

Course objective: To be able to solve complex problems that require discovering hidden patterns in the data and a deep understanding of intricate relationships between a large number of interdependent variables tasked with collecting, analysing, and interpreting large amounts of validated data sets.

Pre-requisites: Basic Knowledge of R,Python and Statistics.

Course Contents / Syllabus

Module 1	LINEAR REGRESSION	15 hours

Introduction to Predictive Analytics, Regression basics: Relationship between attributes using Covariance and Correlation, Relationship, between multiple variables: Regression (Linear, Multivariate) in prediction, Residual Analysis Identifying significant features, feature reduction using AIC, multi-collinearity, Non-normality and Hetero scedasticity, Hypothesis testing of Regression Model, Confidence intervals of Slope, R-square and goodness of fit, Influential Observations – Leverage.

Module 2	MULTIPLE LINEAR REGRESSION	14 hours

Polynomial Regression, Regularization methods, Lasso, Ridge and Elastic nets, Categorical Variables in Regression.

Module 3	NON-LINEAR REGRESSION	15 hours

Logit function and interpretation, Types of error measures (ROCR), Logistic Regression in classification.

Module 4	FORECASTING MODELS	14 hours

Trend analysis, Cyclical and Seasonal analysis, smoothing, Moving averages, Box-Jenkins, Holt-winters, Autocorrelation, ARIMA, SARIMA Examples: Applications of Time Series in financial markets.

Module 5	FEATURE ENGINEERING	14 hours

Data Science Vs. Machine Learning, Exploratory Data Analysis, Feature Encoding, Imputation Feature Scaling, determining correlation, Feature selection, Feature extraction as an application based on Code Using (LDA, PCA & FA) as CASE STUDIES on a sample Data Set.

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

CO1	Apply specific statistical and regression analysis methods applicable to predictive analytics to identify new trends and patterns, uncover relationships, create forecasts, predict likelihoods, and test predictive hypotheses.	K3
CO2	Learn how to select the appropriate method for predictive analysis, and how to build effective predictive models.	K4
CO3	Learn how to evaluate the soundness, appropriateness, and validity of their models and how to interpret and report on results for a management audience.	K5
CO4	Apply predictive analytics approaches on diverse business cases and scenarios.	K3
CO5	Understand the processof formulating business objectives, data selection/collection, preparation, and process to successfully design, build,evaluate and implement predictive models for a various business	K6

	application.	

Text books:

Dean Abbott ,"Applied Predictive Analytics Principles and Techniques for the Professional DataAnalyst" by Wiley

Reference Books:

1) Fundamentals of Machine Learning for Predictive Data Analytics by John D. Kelleher, Brian Mac Namee and Aoife D'Arcy.

Predictive & Advanced Analytics (IBM ICE Publication)

Links:

Unit 1	Predictive Analytics Tutorial :https://youtu.be/iz-PtN2aVbI
Unit 2	Predictive Analytics using Python Tutorial :https://youtu.be/Cx8Xie5042M
Unit 3	Linear Regression :https://youtu.be/E5RjzSK0fvY
Unit 4	Logistic Regression :https://youtu.be/D-ABxdjizjk
Unit 5	Imputation Feature Scaling: https://www.youtube.com/watch?v=KfC7VfDfn8I

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science in Emerging Technologies

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

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School of Computer Science in Emerging Technologies

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

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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

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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	
1.	https://youtu.be/C_oPLDaSy-8
2.	https://youtu.be/NU_1StN5Tkk

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B. TECH THIRD YEAR

Course Code	**BCSML0555**	**L T P**	**Credits**
Course Title	**MACHINE LEARNING**	**[0-0-6]**	**3**

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.

Module 2	**SUPERVISED AND UNSUPERVISED LEARNING**	**08 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.

Module 3	**ENSEMBLE AND PROBABILISTIC LEARNING**	**08 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.

Module 4	**REINFORCEMENT LEARNING AND EVALUATING HYPOTHESES**	**08 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.

Module 5	**GENETIC ALGORITHMS AND CASE STUDIES**	**08 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

CO1	Understanding utilization and implementation proper machine learning algorithm.	K2
CO2	Understand the basic supervised machine learning algorithms.	K2
CO3	Understand the difference between supervise and unsupervised learning.	K2
CO4	Understand algorithmic topics of machine learning and mathematically deep enough to introduce the required theory.	K2
CO5	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

Links: NPTEL/You Tube/Web Link

Unit 1	https://www.youtube.com/watch?v=fC7V8QsPBec&list=PL1xHD4vteKYVpaIiy295pg6_SY 5 qznc77&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

Sr. No.	Program Title	CO Mapping
1	**Data Preprocessing and Feature Selection on Titanic Dataset** • Handle missing values (impute or drop) • Encode categorical variables (LabelEncoder or OneHotEncoder) • Normalize or standardize numerical features • Split dataset into training and testing sets Perform correlation analysis for feature selection	CO1
2	**Regression Techniques on Boston Housing Dataset** • Implement Simple Linear Regression (one feature vs. target) • Implement Multiple Linear Regression (all features vs. target) • (Optional) Polynomial Regression for non-linear relationships • Visualize model fits using matplotlib/seaborn Evaluate models using MSE, RMSE, and R^2 score	CO2
3	**Logistic Regression for Binary and Multiclass Classification on Iris Dataset** • Binary classification (Setosa vs. Versicolor) using Logistic Regression • Visualize decision boundary • Evaluate accuracy, precision, recall, F1-score Extend to multiclass classification using One-vs-Rest strategy	CO2
4	**Decision Tree Classification (CART & ID3) on Wine Dataset** • Train Decision Tree classifiers using DecisionTreeClassifier • Visualize decision tree with plot_tree or graphviz Perform hyperparameter tuning (max_depth, min_samples_split) using GridSearchCV	CO2
5	**Support Vector Machines (SVM) for Classification and Regression** • Generate synthetic datasets (make_moons or make_circles) • Train SVM with linear and RBF kernels; visualize decision boundaries • Hyperparameter tuning for C and gamma using cross-validation • Apply SVM on Breast Cancer dataset and evaluate performance Implement Support Vector Regression (SVR) with linear and RBF kernels	CO2

6	**K-Nearest Neighbors (K-NN) Classification** • Train K-NN classifier on labeled dataset • Experiment with varying k and distance metrics (Euclidean, Manhattan) Evaluate with cross-validation and classification metrics (accuracy, precision, recall)	CO2
7	**Clustering using K-Means and Expectation-Maximization (EM)** • Apply K-Means and Gaussian Mixture Model (EM algorithm) on dataset • Use Elbow Method and Silhouette Coefficient to find optimal clusters Visualize clusters with scatter plots or pairplots	CO2
8	**Hierarchical Clustering Techniques** • Perform Agglomerative (AGNES) and Divisive (DIANA) clustering • Use linkage criteria: single, complete, average • Generate and interpret dendrograms for optimal clusters Compare clustering results from different linkage methods	CO3
9	**Ensemble Learning Methods: Random Forest and Boosting** • Train Random Forest classifier; evaluate accuracy, precision, recall • Implement Gradient Boosting and XGBoost; tune hyperparameters • Compare training time, accuracy, overfitting tendencies Visualize feature importance	CO3
10	**Bayesian Classification: Naïve Bayes and Bayesian Networks** • Implement Gaussian, Multinomial, and Bernoulli Naïve Bayes classifiers • Evaluate performance with classification metrics • Hyperparameter tuning and feature selection Introduce Bayesian Belief Networks with small datasets or predefined structures	CO3

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

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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	**INTRODUCTION TO WEB HOSTING**	**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	**HTML & XML FUNDAMENTALS**	**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	**CSS3 & BOOTSTRAP FUNDAMENTALS**	**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	**JAVA SCRIPT BASICS**	**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	INTRODUCTION TO FILES AND DIRECTORIES	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	Understand various HTML5 elements and construct web pages using HTML 5 and CSS3.	K1, K2
CO2	Develop responsive web pages using Bootstrap Framework.	K3, K6
CO3	Understanding and apply JavaScript and ES6 feature to create user interactive web pages.	K2, K3
CO4	Analysing and implementing concepts of XML and JSON.	K4, K6
CO5	Design and develop dynamic web pages using PHP as a server-side scripting language.	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 and 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

NIET Greater Noida Autonomous Institute	**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 or Python.	CO3
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 5th/ 6th

Course code	BNC0501	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)

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	**BCSAI0601**	**L T P**	**Credits**
Course Title	**BIG DATA ANALYTICS**	**0 0 6**	**3**

Course Objectives: The course helps students understand Big Data concepts, Hadoop ecosystem components, and tools like Hive, Pig, HBase, and Spark. It develops practical skills to design, manage, and analyze large-scale data processing pipelines.

Pre-requisites:- Basic knowledge of database systems and core Java or Python programming. Familiarity with operating systems and command-line interfaces is recommended..

Course Contents / Syllabus

UNIT-I	**INTRODUCTION TO BIG DATA**	**8 Hours**

Introduction: Types of Digital Data, History of Big Data Innovation, Introduction and platform, Drivers for Big Data, Big Data architecture and characteristics, Core 5 Vs of Big Data, Big Data technology components, Big Data importance and applications, Big Data features – security, compliance, auditing and protection, Big Data privacy and ethics, Big Data Analytics, Challenges of conventional systems, nature of data, analytic processes and tools, analysis vs reporting, modern data analytic tools.

Hadoop: History of Hadoop, HDFS Design, concepts, benefits and challenges, file sizes, Block storage mechanism in HDFS, Data replication, HDFS store, read, and write files, command-line interface, Hadoop file system interfaces, Data flow, Data ingest with Flume and Scoop, Hadoop archives, Hadoop I/O: compression, serialization, Avro and file-based data structures, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes.

UNIT-II	**HADOOP ARCHITECTURE & MAP REDUCE**	**8 Hours**

Hadoop Eco System and YARN: Hadoop ecosystem components, schedulers, fair and capacity, Hadoop 3.0 New Features - Name Node high availability, HDFS federation, MRv2, Name node and Data node functionality, replication and fault tolerance in HDFS, data locality and rack awareness, Hadoop configuration and daemons, YARNv2 architecture and resource management, Hadoop Echo Systems. Map Reduce: Map Reduce framework basics & functionality, developing a Map Reduce application, 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.

UNIT-III	**HADOOP FRAMEWORKS**	**8 Hours**

PIG: Introduction to PIG, Architecture, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin- Input and output, Relational operators, User defined functions. Working with scripts, Data Processing operators.

Hive: Apache Hive architecture and installation, Hive shell, Hive services, Hive megastore, comparison with traditional databases, HiveQL, tables, querying data and user defined functions, sorting and aggregating, Map Reduce scripts, joins & subqueries.

HBase: HBase vs RDBMS, HBase architecture, advanced indexing, region servers, tables and schema design, CRUD operations, and integration of HBase with HDFS.

Workflow and Cluster Management:

Apache Oozie: Workflow scheduling, coordinator jobs, bundle jobs, real-time log collection and ETL design using Flume and Sqoop, integrating pipelines with Hive and HDFS.

Apache Zookeeper: Zookeeper for coordination, monitoring a cluster, Configure and build applications with Zookeeper.

Apache Ambari: Apache Ambari introduction, Installation and architecture of Ambari, Various advantages of Ambari, Configure Ambari to specific Hadoop cluster needs, Work with various components to manage and monitor, Ambari Install Wizard, Work with Ambari web app.

UNIT-IV	DATA INGESTION AND INTEGRATION	8 Hours

Apache Sqoop: Sqoop Imports, Sqoop - File Formats, Jobs & Incremental Imports, Hive – Exports.

Apache Flume: Introduction to Flume, Replication, Consolidation & Multiplexing, configuration and use cases.

Kafka: Kafka Architecture, Partitions and Offsets, Kafka Consumer/Producers, Kafka Message, Kafka Serialization & Deserialization, Use Cases and Usage.

UNIT-V	REAL TIME PROCESSING	8 Hours

Scala: Introduction, classes and objects, basic types and operators, built-in control structures, functions and closures, and inheritance.

Spark: Introduction to Apache Spark as an advanced Big Data processing engine, Spark ecosystem overview, Spark Core, Spark SQL, Spark Streaming, comparison with MapReduce, Spark architecture, driver, executors, DAG scheduler, understanding RDDs and Data Frames, Spark SQL operations and integration with Hive, basics of stream processing with Spark Streaming, Machine learning using Spark MLlib, real-world Big Data pipeline design integrating Spark, Hive, HBase, and Kafka for real-time and batch analytics.

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

CO1	Recall fundamental concepts of Big Data, its characteristics, and the evolution of data generation.	K1
CO2	Understand Hadoop architecture, HDFS, YARN, and MapReduce programming model.	K2
CO3	Apply Hadoop ecosystem tools like Hive, Pig, and HBase for data storage, querying, and processing.	K3
CO4	Analyze data ingestion workflows and scheduling using Sqoop, Flume, and Oozie within the Hadoop ecosystem.	K4
CO5	Evaluate and compare Big Data processing engines such as MapReduce and Apache Spark for different analytics scenarios.	K5

Text books:

1. Big Data Analytics by Seema Acharya & Subhashini Chellappan (Wiley India)
2. Big Data Fundamentals: Concepts, Drivers & Techniques by Thomas Erl, et al.
3. Hadoop in Action by Arvind R. & Saurabh Kumar (Dreamtech Press)
4. Apache Hive Essentials by Manish S. (BPB Publications)

Reference Books:

1. Big Data and Hadoop by V. Rajaraman (PHI Learning)

2. Big Data: Principles and Best Practices of Scalable Realtime Data Systems by Nathan Marz and James Warren	
NPTEL/ Youtube/ Faculty Video Link:	
Unit-1	https://www.youtube.com/watch?v=1vbXmCrkT3Y
Unit-2	https://www.youtube.com/watch?v=p0TdBqIt3fg
Unit-3	https://www.youtube.com/watch?v=bD-Hm7PFJzE
Unit-4	https://www.youtube.com/watch?v=tUuW2zkbRr8 https://www.youtube.com/watch?v=URU14jVb7Yw
Unit-5	https://www.youtube.com/watch?v=9QxZhapbo0o https://www.youtube.com/watch?v=dkHjZNmCDlo

List of Experiments

Sr. No.	Name of Experiment
1	Installation of VMWare to setup the Hadoop environment and its ecosystems.
2	i. Perform setting up and Installing Hadoop in its three operating modes: a. Standalone, b. Pseudo distributed, c. Fully distributed. ii. Use web-based tools to monitor your Hadoop setup.
3	Implementing the basic commands of LINUX Operating System - File/Directory creation, deletion, update operations.
4	Perform various File Management tasks in Hadoop: i. Upload and download a file in HDFS. ii. See contents of a file. iii. Copy a file from source to destination. iv. Copy a file from/To Local file system to HDFS. v. Move file from source to destination. vi. Remove a file or directory in HDFS. vii. Display last few lines of a file. viii. Display the aggregate length of a file.
5	Implement Word Count Map Reduce program to understand Map Reduce Paradigm.
6	Implement matrix multiplication with Hadoop Map Reduce.
7	i. Installation of PIG. ii. Write Pig Latin scripts to sort, group, join, project, and filter your data. iii. Run the Pig Latin Scripts to find Word Count. iv. Run the Pig Latin Scripts to find a max temp for every year.
8	i. Installation of HIVE. ii. Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.
9	Install Hbase and perform CRUD operations using Hbase Shell.
10	Implement Spark Core Processing RDD to run Word Count program.
11	Implement Spark Core Processing RDD to read a table stored in a database and calculate the number of people for every age.

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science in Emerging Technologies

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	

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science in Emerging Technologies

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

Course code	BCSE0611	L T P	Credits
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	
1	www. Trailhead.salesforce.com
2	www.mindmajix.com/salesforce-tutorial
3	www,youtube.com/watch?v=7K42geizQCI

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science in Emerging Technologies

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

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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/vHmUVQKXlVo https://youtu.be/qz0aGYrrlhU https://youtu.be/BsDoLVMnmZs https://youtu.be/a8W952NBZUE

Unit 3	https://youtu.be/1Rs2ND 1ryYc https://youtu.be/vpAJ0s5 S2t0 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

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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

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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, Query optimization, 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

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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

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Course Code	**BCSE0601**	**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	**8 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	**8 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	**8 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	**8 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	8 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	Apply various testing techniques.	K3
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 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.	CO4
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

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
GREATER NOIDA-201306
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School of Computer Science in Emerging Technologies

B. TECH. THIRD YEAR 5th/ 6th

Course code	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

NIET Greater Noida Autonomous Institute	**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	BCS0601	**L T P**	**Credits**
Course title	**Introduction to Cloud Computing**	**0 0 6**	**3**

Course objective: : This course aims to provide students with an in-depth understanding of cloud computing concepts specifically tailored for data science. It covers cloud architecture, storage models, computing environments, service models, and practical applications such as deploying data pipelines and machine learning models securely and efficiently on cloud platforms

Pre-requisites: Basic knowledge of Data Science, Computer Networks, and Programming

Course Contents / Syllabus

UNIT-I	**Introduction to Cloud Computing**	**8 Hours**

Introduction to Cloud Computing: Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model. Characteristics and Benefits, Challenges Ahead, Historical Developments.

Virtualization: Introduction, Characteristics of Virtualized Environment, creating virtual machines-understanding virtual machines, create a new virtual machine on local host, Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability, simplicity ,vendors ,security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.

UNIT-II	**Cloud Computing Architecture**	**8 Hours**

Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.

UNIT-III	**Enterprise Cloud Services, Scalability, and Disaster Recovery**	**10 Hours**

Defining the Clouds for Enterprise: Storage as a service, Database as a service, Process as a service, Information as a service, Integration as a service, and Testing as a service.

Scaling a cloud infrastructure - Capacity Planning, Cloud Scale.

Disaster Recovery: Disaster Recovery Planning, Disasters in the Cloud, Disaster Management.

UNIT-IV	Introduction to AWS Cloud Platform	8 Hours
AWS global infrastructure, How to select a region, What is edge location and regional edge cache, AWS global, regional and zonal services, Local zones, wavelength zones and outposts, Benefits of using AWS cloud, AWS shared responsibility model, AWS acceptable use policy, Virtualization and hypervisors, Regions and availability zones, EC2 - Old Console vs New Console, Launch EC2 instance, Create instances with Elastic block storage (EBS), Elastic File Systems (EFS) and Simple Storage Service (S3), Amazon DynamoDB introduction, DynamoDB : Create table and add items, DynamoDB: Scan and query operations, Different types of NoSQL databases, SQL vs NoSQL.		
UNIT-V	**Compute Services and Compliance**	**8 Hours**
Virtual Machines Serverless Computing (e.g., AWS Lambda, Azure Functions) Containers and Container Orchestration, Identity and Access Management (IAM) Encryption and Key Management Security Best Practices Compliance Standards (e.g., GDPR, HIPAA). Cloud Applications: Scientific Applications – Health care, Geoscience and Biology. Business and Consumer Applications- CRM and ERP, Social Networking, Media Applications and Multiplayer Online Gaming.		
Course outcome: After completion of this course students will be able to:		

CO1	Explain the concept of virtualization and its role in enabling cloud computing.	K2
CO2	Illustrate various cloud architectures and service models with suitable examples from real-world applications.	K3
CO3	Evaluate strategies for cloud scalability, security implementations, and disaster recovery planning..	K5
CO4	Design cloud-based applications using appropriate deployment and service models.	K6
CO5	Recommend improvements in cloud-driven commercial systems based on analysis of their performance and architecture.	K6

Textbooks	
1. Mastering Cloud Computing, McGraw Hill Education, 2017 by Thomas Erl	
2. Cloud Computing: Concepts, Technology & Architecture, Pearson Education, 2014 by Valliappa Lakshmanan	
3. AWS Certified Cloud Practitioner Study Guide, 2020 by Chris Dotson	
4. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi	
Reference Books	
1.“Cloud Computing: A Hands-On Approach”, Cloud Computing: A Hands-On Approach by Simon Monk	
2. Designing Data-Intensive Applications Vijay Madisetti and Arshdeep Bahga	
3.Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, A press Publications, 2013 by Francis daCosta	
NPTEL/ YouTube/ Faculty Video Link:	
1	https://www.youtube.com/playlist?list=PLWp84cOxjEjM37o1z7SpzEefBLS-9lW07

2	https://www.youtube.com/playlist?list=PLyqSpQzTE6M-Rf2y3MT5aZ1UpTF1UQBK0
3	https://www.youtube.com/playlist?list=PLFW6lRTa1g82dte3YD_7-GoZXcBiK6K9G
4	https://www.youtube.com/playlist?list=PLShJJCRzJWxhz7SfG4hpaBD5bKOloWx9J
5	https://www.youtube.com/watch?v=RZRM6IsDQ4Y

List of Experiments

Sr. No.	Name of Experiment
1	Launch and access a virtual machine on AWS/GCP/Azure. (CO1)
2	Create and manage S3 bucket/Blob Storage for data uploads and access. (CO1)
3	Perform data cleaning and visualization in Jupyter/Colab connected to cloud storage (CO1).
4	Run distributed Spark jobs using AWS EMR/Dataproc on structured datasets. (CO2)
5	Train a regression/classification ML model using Google Vertex AI or AWS SageMaker. (CO3)
6	Deploy an ML model as REST API and test via Postman or Curl. (CO3)
7	Use Azure ML Designer or SageMaker Studio to create an end-to-end pipeline. (CO4)
8	Integrate BigQuery with Tableau/Looker Studio to create interactive dashboards. (CO4)
9	Secure data with IAM roles and enable audit logs on cloud services. (CO2)
10	Capstone Mini Project: End-to-End Cloud-based Data Analytics Pipeline for real-time business scenario. (CO4)