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 (Artificial Intelligence and Machine Learning)

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 (Artificial Intelligence and Machine Learning)

Evaluation Scheme

SEMESTER-V

Sl. No.	Subject Codes	Subject	Types of Subjects	Periods		Evaluation Schemes					End Semester		Total	Credit
				L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	BCSCC0501	Design Thinking-II	Mandatory	2	1	0	30	20	50		100		150	3
2	BCSE0502	Computer Networks	Mandatory	3	1	0	30	20	50		100		150	4
3		Departmental Elective –I	Departmental Elective	3	0	0	30	20	50		100		150	3
4		Departmental Elective –II	Departmental Elective	3	0	0	30	20	50		100		150	3
5	BCSE0552	Computer Networks Lab	Mandatory	0	0	4				50		50	100	2
6	BCSML0552	Deep Learning	Mandatory	0	0	6				50		100	150	3
7	BCSE0555	Web Technologies	Mandatory	0	0	6				50		100	150	3
8	BCSE0559	Internship Assessment -II	Mandatory	0	0	2				50			50	1
9	BNC0501/ BNC0502	Constitution of India, Law and Engineering / Essence of Indian Traditional Knowledge	Compulsory Audit	2	0	0	30	20	50		50		100	NA
10		*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	BMC0077	Deep Learning for Developers	Infosys Wingspan (Infosys Springboard)	34h 51m	2.5
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

Sl. No.	Subject Codes	Subject Name	Types of Subjects	Bucket Name	Branch	Semester
1	BCSE0511	CRM Fundamentals	Departmental Elective-I	CRM-RPA	CSE (AIML)	5
2	BCSE0513	CRM Administration	Departmental Elective-II		CSE (AIML)	5
3	BCSDS0511	Data Analytics	Departmental Elective-I	Data Analytics	CSE (AIML)	5
4	BCSAI0519	Business Intelligence and Data Visualization	Departmental Elective-II		CSE (AIML)	5
5	BCSE0512	Python Web Development with Django	Departmental Elective-I	Full Stack Development	CSE (AIML)	5
6	BCSE0514	Design Patterns	Departmental Elective-II		CSE (AIML)	5
7	BCSAI0515	Mobile Application Development	Departmental Elective-I	Mobility Management	CSE (AIML)	5
8	BCSAI0521	Development in Swift Fundamentals	Departmental Elective-II		CSE (AIML)	5

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Evaluation Scheme

SEMESTER-VI

Sl. No.	Subject Codes	Subject	Types of Subjects	Periods			Evaluation Schemes				End Semester		Total	Credit
				L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	BCSAI0601	Natural Language Processing	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	BCSAI0551	Natural Language Processing Lab	Mandatory	0	0	2				25		25	50	1
6	BCSAI0652	Generative AI	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 /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	BMC0084	Introduction to ML and AI	Infosys Wingspan (Infosys Springboard)	62h 54m	4
2	BMC0087	JavaScript Essential	Infosys Wingspan (Infosys Springboard)	19h 42m	1.5
3	BMC0093	Natural Language Processing using Python	Infosys Wingspan (Infosys Springboard)	15h 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:

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DEPARTMENTAL ELECTIVES

Sl. No.	Subject Codes	Subject Name	Types of Subjects	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

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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

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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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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**	**8 Hours**

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**	**8 Hours**

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**	**8 Hours**

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

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**	**8 Hours**

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

CO 1	Build an understanding of the fundamental concepts and Layered Architecture of computer networking.	K2, K6
CO 2	Understand the basic concepts of link layer properties to detect error and develop the solution for error control and flow control.	K2, K6

CO 3	Design, calculate, and apply subnet masks and addresses to fulfil networking requirements and calculate distance among routers in subnet.	K3, K4, K6
CO 4	Understand the duties of transport layer, Session layer with connection management of TCP protocol.	K2, K4
CO 5	Discuss the different protocols used at application layer.	K2
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		
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 (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**

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:

CO 1	Understand the basic concepts of Customer relationship management.	K1, K2
CO 2	To understand strategy and framework of Customer relationship management.	K2
CO 3	Learn basics of Cloud Based Customer relationship management.	K1
CO4	Understand Customer relationship management in context with business use cases.	K3
CO 5	Understand implementation basics of CRM.	K3

Textbooks	
Sr No	**Book Details**
1.	CRM Fundamentals by Scott Kostojohn Mathew Johnson Brian Paulen. Apress, 2011.
2.	Customer Relationship Management- How to develop and execute a CRM strategy By Michael Pearce, Business Expert Press, 2021.
Reference Books	
Sr No	**Book Details**
1.	The CRM Handbook-A Business Guide to Customer Relationship Management by Jill Dyché; Addison-Wesley (for case studies)
2.	Customer Relationship Management Systems handbook by Duane E Sharp. AUERBACH PUBLICATIONS by CRC Press Company
Links	
	https://onlinecourses.nptel.ac.in/noc20_mg57/preview https://archive.nptel.ac.in/courses/110/105/110105145/

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B. TECH THIRD YEAR (ELECTIVE-I)			
Course Code	**BCSAI0512**	**L T P**	**Credits**
Course Title	**DATA ANALYTICS**	**3 0 0**	**3**

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

Pre-requisites: Basic Knowledge of Statistics and Probability.

Course Contents / Syllabus

UNIT-I	**Introduction To Data Science**	**8 Hours**

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

UNIT-II	**Data Handling**	**8 Hours**

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

UNIT-III	**Data Pre-processing**	**8 Hours**

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

UNIT-IV	**Exploratory Data Analysis**	**8 Hours**

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

UNIT-V	**Data Visualization**	**8 Hours**

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

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

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

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

CO 1	Understand the fundamental concepts of data analytics in the areas that plays major role within the realm of data science.	K1
CO 2	Explain and exemplify the most common forms of data and its representations.	K2
CO 3	Understand and apply data pre-processing techniques.	K3
CO4	Analyse data using exploratory data analysis.	K4
CO 5	Illustrate various visualization methods for different types of data sets and application scenarios.	K3

Text books:

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

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

Reference Books:

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

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

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

Links:

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

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B. TECH THIRD YEAR (ELECTIVE-I)

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

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

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

Course Contents / Syllabus

UNIT -I	**Python libraries for web development**	**8 Hours**

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

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

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

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

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

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

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

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

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

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

CO 1	Apply the knowledge of python programing that are vital in understanding Django application and analyze the concepts, principles and methods in current client-side technology to implement Django application over the web.	K3,K6

CO 2	Demonstrate web application framework i.e. Django to design and implement typical dynamic web pages and interactive web based applications.	K3, K6
CO 3	Implementing and analyzing the concept of Integrating Accounts & Authentication on Django.	K3, K4
CO 4	Understand the impact of web designing by database connectivity with SQLite in the current market place where everyone uses to prefer electronic medium for shoping, commerce, and even social life also.	K2, K3
CO 5	Analyzing and creating a functional website in Django and deploy Django Web Application on Cloud.	K3, K6

Text books:

1. Martin C. Brown, "Python: The Complete Reference Paperback", 4th Edition 2018, McGraw Hill Education Publication.
2. Reema Thareja, "Python Programming: Using Problem Solving Approach", 3rd Edition 2017, Oxford University Press Publication.
3. Daniel Rubio, Apress," Beginning Django Web Application Development and Deployment with Python", 2nd Edition 2017, Apress Publication.
4. William Jordon, "Python Django Web Development: The Ultimate Django web framework guide for Beginners", 2nd Edition 2019, Kindle Edition.

Reference Books:

1. Tom Aratyn, "Building Django 2.0 Web Applications: Create enterprise-grade, scalable Python web applications easily with Django 2.0", 2nd Edition 2018, and Packt Publishing.
2. Nigel George, "Build a website with Django", 1st Edition 2019, GNW Independent Publishing Edition.
3. Ray Yao," Django in 8 Hours: For Beginners, Learn Coding Fast! 2nd Edition 2020, independently published Edition.
4. Harry Percival, "Test-Driven Development with Python: Obey the Testing Goat: Using Django, Selenium, and JavaScript", 2nd Edition 2019, Kindle Edition.

NPTEL/ YouTube/ Faculty Video Link:

Unit 1	https://youtu.be/eoPsX7MKfe8?list=PLIdgECt554OVFKXRpo_kuI0XpUQKk0ycO https://youtu.be/tA42nHmmEKw?list=PLh2mXjKcTPSACrQxPM2_1Ojus5HX88ht7 https://youtu.be/8ndsDXohLMQ?list=PLDsnL5pk7-N_9oy2RN4A65Z-PEnvtc7rf https://youtu.be/QXeEoD0pB3E?list=PLsyeobzWxl7poL9JTVyndKe62ieoN-MZ3 https://youtu.be/9MmC_uGjBsM?list=PL3pGy4HtqwD02GVgM96-V0sq4_DSinqvf
Unit 2	https://youtu.be/F5mRW0jo-U4 https://youtu.be/yD0_1DPmfKM?list=PLQVvvaa0QuDe9nqlirjacLkBYdgc2inh3 https://youtu.be/rHux0gMZ3Eg https://youtu.be/jBzwzrDvZ18 https://youtu.be/RiMRJMbLZmg
Unit 3	https://youtu.be/8DF1zJA7cf c https://youtu.be/CTrVDi3tt8 o https://youtu.be/FzGTpnI5tp o https://youtu.be/z4lfVsb_7MA https://youtu.be/WuyKxdLcw3w
Unit 4	https://youtu.be/UxTwFMZ4r5k https://youtu.be/2Oe55iXjZQI https://youtu.be/zV8GOI5Zd6E https://youtu.be/uf2tdzh7Bq4 https://youtu.be/RzkVbz7Ie44

Unit 5	https://youtu.be/kBwhtEIXGII https://youtu.be/Q_YOYNiSVDY https://youtu.be/_3AKAdHUY1M https://youtu.be/6DI_7Zja8Zc https://youtu.be/UkokhawLKDU

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B. TECH THIRD YEAR (ELECTIVE -I)			
Course Code	**BCSAI0515**	**L T P**	**Credits**
Course Title	**MOBILE APPLICATION DEVELOPMENT**	**3 0 0**	**3**

Course objective:

This course introduces students to programming technologies, design and development related to mobile applications using android/ iOS. Course also aims at mobile application development frameworks; mobile architecture, design and engineering issues, techniques, methodologies for mobile application development.

Pre-requisites: Overview of programming language: JAVA and XML.

Course Contents / Syllabus

UNIT-I	**Introduction to Mobile Application and Architecture**	**8 Hours**

Mobile applications, History of mobile application frameworks, Characteristics and types of mobile applications, Achieving quality constraints.

Mobile Architecture- Mobile Hardware Architecture: processors used for Mobile and Handheld devices and SoC architecture; Mobile Software Architecture: Real Time Operating systems and Mobile Real Time Operating Systems, SDK's.

UNIT-II	**Android Developing Environment**	**6 Hours**

Introduction to Android, Android ecosystem, Android SDK and Installation, Layered Architecture of Android,Android API levels (versions & version names), Android Development Tools, Basic Building blocks –
Protocols, Activities, Services, Broadcast Receivers & Content providers.

UNIT-III	**UI Components and Multimedia**	**10 Hours**

Fundamental UI design, layout and view types, Interaction with server-side applications – Using Google Maps, GPS and Wi-Fi, Integration with social media applications, Interfacing sensor data with mobile application, Accessing applications hosted in a cloud computing environment.

Multimedia Supported audio and video formats, Audio capture, Bluetooth, Animation.

UNIT-IV	**Android Application Deployment**	**8 Hours**

Persisting data using SQLite database, Testing and debugging Android Application, Packaging and Android Application Deployment on device with Windows, Android Permissions. Testing and publishing of Mobile Applications on different app stores.

UNIT-V	**iOS and Swift**	**8 Hours**

Introduction to Objective C, iOS features, UI implementation, Touch frameworks, Data persistence using Core Data and SQLite, Location aware applications using Core Location and Map Kit, integrating calendar and address book with social media application, using Wifi - iPhone marketplace.
Swift: Introduction to Swift, Features of swift.

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

CO 1	Recall vision, definition, conceptual framework, architecture of mobile applications.	K1
CO 2	Describe and configure android development environment, tools, and architecture.	K2
CO 3	Create and implement UI components and multimedia framework, fragments, audio capture, animation, and other activities.	K6
CO 4	Integrate and interact with server-side applications with testing and deployment of android application.	K3
CO 5	Analyze iOS and swift features, frameworks, map kit, and social media applications.	K4

Textbooks:

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
2. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012

Reference Books:

1. Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, Android Programming: The Big Nerd Ranch Guide, Big Nerd Ranch LLC, 3rd edition, 2017
2. S. Poslad, “Ubiquitous Computing: Smart Devices, Environments and Interactions,” Wiley, 2009
3. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013
4. Nick Lecrenski, Karli Watson, “Windows Phone 7 Application Development” version 2011
5. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012

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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
3.	Sales force for beginners by ShaarifSahaalane book by Amazon (Online edition)
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	

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

CO 1	Construct a design consisting of a collection of modules.	K2, K6
CO 2	Exploit well-known design patterns (such as Iterator, Observer, Factory and Visitor)	K4, K5
CO 3	Distinguish between different categories of design patterns	K4
CO 4	Ability to understand and apply common design patterns to incremental/iterative Development	K2, K6
CO 5	Ability to identify appropriate patterns for design of given problem and Design the software using Pattern Oriented Architectures	K1, K2, K6

Textbooks

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

Reference Books

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

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B. TECH THIRD YEAR (ELECTIVE- II)			
Course code	**BCSAI0521**	**L T P**	**Credits**
Course title	**DEVELOPMENT IN SWIFT FUNDAMENTALS**	**3 0 0**	**3**
Course objective: The objective of this course is to learn the fundamental iOS app development skills with Swift. The objective of this course is to provide the ability to design and develop iOS Apps from scratch.			
Pre-requisites: Basic understanding of Object-Oriented Concepts and Programming Languages			
Course Contents / Syllabus			
UNIT-I	**INTRODUCTION TO SWIFT -I**		**8 Hours**
Introduction to Swift and Playgrounds, Constants, Variables, and Data Types, Operators, Control Flow, Strings, Functions, Collections, Loops.			
UNIT-II	**INTRODUCTION TO SWIFT -II**		**8 Hours**
Structures, Classes and Inheritance, Optionals, Type Casting, Guard, Scope, Enumerations.			
UNIT-III	**XCODE - I**		**8 Hours**
XCode: Basics, Building, Running, and Debugging an App, Introduction to UIKit: Displaying Data, Controls in Action.			
UNIT-IV	**XCODE - II**		**8 Hours**
Auto layout and Stack Views, Segues, Navigation Controllers, Tab Bar Controllers			
UNIT-V	**GUIDED PROJECTS**		**8 Hours**
Light, Apple Pie, Personality Quiz.			
Course outcome: After completion of this course students will be able to			
CO 1	Build fundamental iOS app development skills with Swift		K6
CO 2	Learn key computing concepts, building a solid foundation in programming with Swift.		K1
CO 3	Understand the XCode interface and its capabilities and build a basic fluency in XCode source and UI editors.		K6
CO 4	Create iOS apps that adhere to standard practices, including the use of stock UI elements, layout techniques, and common navigation interfaces.		K6
CO 5	Apply the basic concepts of Swift and XCode to build the projects		K3

Textbooks:
1) Develop in Swift Fundamentals, XCode 12 or Higher, Apple Inc.
Reference Books:
1) Develop in Swift Fundamentals, XCode 12 or Higher, Apple Inc.
Links: NPTEL/ YouTube/ Faculty Video Link
https://developer.apple.com/videos/swift
https://developer.apple.com/videos/play/wwdc2020/10119/
https://developer.apple.com/videos/play/wwdc2019/405/

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B.TECH THIRD YEAR

Subject Code: BCSE0552	**L T P** **0 0 2**
Subject Name: Computer Networks & Programming Lab	**Credits** **2**

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

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

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

List of Practical

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

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

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Course Code: BCSML0552	**Course Name: Deep Learning**	**L**	**T**	**P**	**C**
Course Offered in: AI/AIML		**0**	**0**	**6**	**3**

Pre-requisite: Python, Machine Learning

Course Objectives: To be able to learn unsupervised techniques and provide continuous improvement in accuracy and outcomes of various datasets with more reliable and concise analysis results.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Analyze ANN model and understand the ways of accuracy measurement	K4
CO2	Develop a convolutional neural network for multi-class classification in images	K6
CO3	Apply Deep Learning algorithm to detect and recognize an object	K3
CO4	Apply RNNs to Time Series Forecasting, NLP, Text and Image Classification	K4
CO5	Apply Lower-dimensional representation over higher-dimensional data for dimensionality reduction and capture the important features of an object.	K3

Course Contents / Syllabus

Module 1	**Introduction**	**14 hours**

Model Improvement and Performance: Curse of Dimensionality, Bias and Variance Trade off, Overfitting and underfitting, Regression - MAE, MSE, RMSE, R Squared, Adjusted R Squared, p-Value, Classification - Precision, Recall, F1, Other topics, K-Fold Cross validation, RoC curve, Hyper-Parameter Tuning Introduction – Grid search, random search, Introduction to Deep Learning. Artificial Neural Network: Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: Single layer and Multilayer feed forward networks, recurrent networks. Various learning techniques; Perception and Convergence rule, Hebb Learning. Perceptron's, Multilayer perceptron, Gradient descent and the Delta rule, Multilayer networks, Derivation of Backpropagation Algorithm

Module 2	**CONVOLUTION NEURAL NETWORK**	**14 hours**

What is computer vision? Why Convolutions (CNN)? Introduction to CNN, Train a simple convolutional neural net, Explore the design space for convolutional nets, Pooling layer motivation in CNN, Design a convolutional layered application, Understanding and visualizing a CNN, Transfer learning and fine-tuning CNN, Image classification, Text classification, Image classification and hyper-parameter tuning, Emerging NN architectures.

Module 3	**DETECTION & RECOGNITION**	**14 hours**

Padding & Edge Detection, Strided Convolutions, Networks in Networks and 1x1Convolutions, Inception Network Motivation, Object Detection, YOLO Algorithm.

Module 4	**RECURRENT NEURAL NETWORKS**	**15 hours**

Why use sequence models? Recurrent Neural Network Model, Notation, Back-propagation through time (BTT), Different types of RNNs, Language model and sequence generation, Sampling novel sequences, Vanishing gradients with RNNs, Gated Recurrent Unit (GRU), Long Short-Term Memory (LSTM), Bidirectional RNN, Deep RNNs

Module 5	**AUTO ENCODERS IN DEEP LEARNING**	**15 hours**

Auto-encoders and unsupervised learning, Stacked auto-encoders and semi-supervised learning, Regularization - Dropout and Batch normalization.

Total Lecture Hours	**72 hours**

Textbook:

S.No	**Book Title**	**Author**
1.	Deep Learning: An MIT Press Book	Ian Goodfellow and Yoshua Bengio Aaron Courville.
2.	Neural Networks and Deep Learning, Determination Press,2015.	Michael Nielson

3.	Neural networks: A classroom Approach, Tata McGraw-Hill Education, 2004.	Satish Kumar

Reference Books:

S.No	Book Title	Author
1.	Deep Learning with Python, Manning publications, 2018	Francois Chollet
2.	Advanced Deep Learning with Keras, PACKT Publications, 2018	Rowel Atienza

NPTEL/ Youtube/ Faculty Video Link:

Module 1	https://www.youtube.com/watch?v=aircAruvnKk
Module 2	https://www.youtube.com/watch?v=YRhxdVk_sIs
Module 3	https://www.youtube.com/watch?v=6niqTuYFZl0
Module 4	https://www.youtube.com/watch?v=8L11aMN5KY8
Module 5	https://www.youtube.com/watch?v=8L11aMN5KY8

Mode of Evaluation

CIE	ESE	Total
PS		
50	**100**	**150**

List Of Practical's (Indicative & Not Limited To)

S.NO.	PRACTICAL (Suggestive List of Practical)	CO
1.	Implement MAE, MSE, RMSE, R^2, Adjusted R^2 on a regression dataset **(e.g., Boston Housing).**	CO1
2.	Implement Precision, Recall, F1 Score for a classification task **using confusion matrix.**	CO1
3.	Perform K-Fold Cross Validation on a machine learning model.	CO1
4.	Perform Hyperparameter Tuning using Grid Search and Random Search.	CO1
5.	Build and train an Artificial Neural Network using a custom dataset (e.g., digit or medical classification).	CO1
6.	Demonstrate gradient descent and delta rule using a simple MLP.	CO1
7.	Train a CNN on image data (e.g., CIFAR-10 or MNIST) and evaluate performance.	CO2
8.	Visualize intermediate CNN layers and understand feature extraction.	CO2
9.	Apply Transfer Learning using pre-trained models like VGG16 or ResNet on a custom dataset.	CO2
10.	Perform hyperparameter tuning (batch size, learning rate, filters) on a CNN	CO2
11.	Implement Edge Detection and Strided Convolutions using OpenCV and compare results.	CO2
12.	Design a simple object detection model using YOLOv5 on sample images.	CO3
13.	Implement a basic RNN for text generation or sequence prediction.	CO2
14.	Build LSTM/GRU-based language model (e.g., sentiment analysis or next-word prediction).	CO2
15.	Implement an Autoencoder on MNIST to reconstruct images.	CO3
16.	Implement a Denoising Autoencoder.	CO3
17.	Demonstrate dropout and batch normalization in training a deep network.	CO3
18.	Write a program to Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.	CO1
19.	Write a program to understand the mechanism of practically training a binary classifier.	CO1
20.	Write a program to build a simple autoencoder based on a fully-connected layer in Keras.	CO3

21.	Implement Long Short-Term Memory Networks using sample data.	CO3
22.	Classify fruits as either apple or banana based on their diameter (in cm) and weight (in grams) using a binary classification model.	CO1
23.	Predict the exam score of a student based on the number of study hours using a linear regression model. Given a dataset of study hours and corresponding exam scores, the goal is to train a model and make predictions for a specified number of study hours.	CO1
24.	Visualize the behavior of different activation functions (sigmoid, softmax, ReLU, leaky ReLU, ELU, and tanh). Compare their outputs by plotting how each activation function transforms input values.	CO2
25.	Create a program that allows the user to select a logical gate (AND, OR, XOR, NAND, or NOR), input values for three variables (x1, x2, x3), and calculate the result using the s selected gate's activation function. The program should display the result based on the weighted sum of the inputs and the chosen gate.	CO1
26.	Classify the model's predictions into "Churn" or "Stay" based on a threshold of 0.5. If the predicted probability is greater than 0.5, label the result as "Churn"; otherwise, label it as "Stay."	CO1
27.	Apply different types of padding over an image and visualize their effect.	CO2
28.	Implement a Variational Autoencoder (VAE) on the MNIST dataset for image generation	CO3
29.	Fine-tune a pre-trained CNN (like MobileNetV2) for flower classification using transfer learning	CO3
30.	Train a Multilayer Perceptron (MLP) using the MNIST dataset for digit classification	CO1

NIET Greater Noida	**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	**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 Understanding of Web Development: Familiarity with web development concepts, such as client-server architecture, HTTP, and URLs.

Course Contents / Syllabus

UNIT-I	Introduction to HTML & CSS	**14 Hours**

HTML Basics, Tables, List, Working with Links, Image Handling, Frames, HTML Forms for User Input and New Form Elements

CSS3: What CSS can do, CSS Syntax ,Types of CSS, Working with Text and Fonts-Text Formatting, Text Effects, Fonts, CSS Selectors- Type Selector, Universal Selector, ID Selector, Class selector, Colors and Borders, Implementing CSS3 in the "Real World", Modernizr, HTML5 Shims, SASS, and Other CSS Preprocessors, CSS Grid Systems, CSS Frameworks

UNIT-II	Responsive Websites with Bootstrap	**14 Hours**

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Setting The Viewport, Responsive Images, Responsive Text Size, Media Queries, Responsive Web Page (Full). Introduction, Getting Started with Bootstrap, Bootstrap Basics- Bootstrap grid system, Bootstrap Basic Components, Bootstrap Components: Page Header, Breadcrumb, Button Groups, Dropdown, Nav & Navbars

UNIT-III	Introduction to JavaScript and ES6	**15 Hours**

JavaScript Essentials: Introduction to Java Script , Javascript Types :Implementation of Java Script Types

Var, Let and Const Keywords: Implementation of var, let and const keywords Operators in JS, Conditions Statements, Java Script Loops, Implementation of JS Operators and Control Statement JS Popup Boxes: Implementation of Popup Boxes JS Events,

Implementation of Java Script Event JS Arrays, Working with Arrays: Implementation of Java script Array. Error Handling by using try/catch block

Validation of Forms, implementing validation of forms Arrow functions and default arguments: Implementing arrow function and default argument. Implementation of de-structuring Spread and Rest Operator Implementing Spread and Rest Operator

Typescript fundamentals: Typescript OOPs- Classes, Interfaces, Constructor, Implementation of Typescript OOPs concepts.

Decorator and Spread Operator: Implementation of Decorator and Spread Operator, Difference == & ===, Asynchronous Programming in ES6, Promise Constructor, Promise with Chain, Promise Race: Implementation of Asynchronous Programming in ES6 Implementation of Promise constructor, Implementation of Promise with Chain and Promise Race		
UNIT-IV	Introduction to XML and JSON	**14 Hours**
XML DTD and Schema. Well-formed XML, Using XML Application: Implementing Well-formed XML, XML with application Introduction to XSL, XML transformed with simple example, XSL elements, transforming with XSLT: Implementing XSL and XSLT Introduction, Object, Array, Comments, Compare, Server, PHP JSON		
UNIT-V	Introduction to PHP	**15 Hours**
Introduction to PHP, Basic Syntax, Variables & Constants: Implementation of Basic Syntax, variable and constants Data Type: Implementation of Data Types, Operator & Expressions, Control flow and Decision making statements: Implementation of control flow and decision making statement ,Functions, Strings, Arrays, Implementation of Functions String and Array. 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. Implementing on Working with files and directories Session & Cookies: Introduction to Session Control, Session Functionality, Cookie, Setting Cookies with PHP. Introduction to MySql Database and its Connectivity with PHP		
Course outcome: After completion of this course students will be able to		
CO 1	Understand various HTML5 elements and construct web pages using HTML5 and CSS3	K3
CO 2	. Develop responsive web pages using Bootstrap framework	K4
CO 3	Understand and apply JavaScript and ES6 features to create user-interactive web pages	K6
CO 4	Analyze and implement concepts of XML and JSON.	K5
CO 5	Design and develop dynamic web pages using PHP as a server-side scripting language	K6
Text books:		
Web Technology and Design", 1nd Edition 2003, New Age International.		
Internet and Web Technologies", 2nd Edition 2017,Mc Graw Hill Education.		
Beginning PHP Laravel",2nd Edition 2020, kindle Publication.		

Reference Books	
Sr. No.	**Book Details**
1	Collaborative Web Development" 5th Edition 1999, Addison Wesley
2	Fundamentals of Web Development",3rd Edition 2016,
3	Introduction to Web Development with HTML,CSS, JavaScript.

Links: NPTEL/You Tube/Web Link	
Unit 1	https://www.youtube.com/watch?v=x3c1ih2NJEg
Unit 2	https://www.youtube.com/watch?v=x3c1ih2NJEg
Unit 3	https://www.youtube.com/watch?v=PMsVM7rjupU&list=PL6n9fhu94yhUA99nOsJkKXBqokT3MBK0b
Unit 4	https://www.youtube.com/watch?v=uDwSnnhl1Ng&list=PLsyeobzWxl7qtP8Lo9TReqUMkiOp446cV
Unit 5	https://www.techradar.com/in/web-hosting/what-are-the-different-types-of-web-hosting

List of Practical		
Sr. No.	**Program Title**	**CO Mapping**
1	Implementation of various html tags.	CO1
2	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.	CO1
3	Create a webpage with HTML describing your department use paragraph and list tags	CO1
4	Create links on the words e.g. —Wi-Fi and —LAN to link them to Wikipedia pages.	CO1
5	Insert an image and create a link such that clicking on image takes user to other page.	CO1
6	Change the background color of the page; At the bottom create a link to take user to the top of the page.	CO1
7	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.	CO1
8	Design a HTML registration form that takes user name, user password and mobile number with submit button control	CO1
9	Design a HTML5 document that implement of date, number, range, email, search and data list.	CO1
10	Create a simple form to submit user input like his name, age, address and favourite subject, movie and singer.	CO1
11	Add few form elements such as radio buttons, check boxes and password field. Add a submit button at last.	CO1
12	Add CSS property assign a style or behavior to an HTML element such as: color, border, margin and font-style	CO1
13	Add To Style Text Elements with Font, Size, and Color in CSS	CO1
14	Applying a block element in CSS acquires up the full width available for that content.	CO1
15	Resize an image to fit its content box, and position the image 5px from the left and 10% from the top inside the content boxes	CO1
16	Applying CSS Table: Styling even and odd cells	CO1
17	Applying list-style-type property in CSS with example	CO1
18	Design a web page by applying css id and class selectors	CO1
19	Demonstrating the CSS Box model with consists of: borders, padding, margins, and the actual content.	CO1
20	Design a web page by applying CSS grouping and dimensions property.	CO1
21	Design a web page by applying CSS Display and Positioning property	CO1

22	Design a web page by applying CSS Display and Positioning property.	CO1
23	Design a web page by applying CSS pseudo classes.	CO1
24	Design a web page by applying CSS Navigation Bar.	CO1
25	Design a web page such as home page, contact us, about us etc. by using 3 ways of CSS layout	CO1
26	Design a basic structure of Bootstrap Grid system.	CO2
27	Design All Bootstrap Components with example.	CO2
28	Design a responsive web page by using setting viewport, image and media control.	CO2
29	Create an image gallery where users can click on an image thumbnail to view the full-sized image with interactive features like zooming or sliding.	CO3
30	Utilize the HTML5 canvas element and JavaScript to create dynamic animations, such as a bouncing ball, a moving character, or a visual representation of a physics concept.	CO3
31	Use JavaScript and the HTML5 canvas element to apply various image manipulation techniques like filters, cropping, resizing, or adding text overlays.	CO3
32	Implement a text-to-speech feature on a webpage using JavaScript and the Web Speech API, allowing users to have the text read aloud to them..	CO3
33	Creating a Java Script program to implement Dialog, Confirm and Alert Popup Boxes.	CO3
34	Design a HTML form validation using Java Script.	CO3
35	Write a program to implement Arrow function with default argument in ES6	CO3
36	Implementing a program in ES6 to implement Template string concepts	CO3
37	Implementing a program in ES6 to implement all string methods	CO3
38	Implementing a program to implement call back functions in ES6.	CO3
39	Implementing a program for de-structuring of an array in ES6	CO3
40	Javascript code that should compile by Typescript compiler as'tsc'	CO3
41	Javascript code to implement object and class concepts in Typescript.	CO3
42	Write a Typescript program that implement interface and constructor.	CO3
43	Write a code in typescript that implement decorator and spread operator	CO3
44	Write a code in typescript that implement Asynchronous Programming concepts.	CO3
45	Write a program in Typescript that implement promise constructor	CO3
46	Implementing promise and chain concepts in Typescript	CO3
47	Write a code in typescript that implement Promise.race() static method.	CO3
48	Creating a XML document that defines the self-descriptive tags	CO4
49	Designing XML document that store various book data such as: book category, title, author, year and price	CO4
50	To Describe the various types of XML key components	CO4
51	Design XML DTD to define the structure and legal element and attribute of XML document	CO4
52	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	CO4
53	Create a XSL/XSLT document.	CO4

54	Show how Parsing, Implementing and Modification of JSON Data is done.	CO4
55	Create a constant by using define() function with its proper syntax	CO5
56	Creating PHP script that return any data types whatever you use.	CO5
57	Crating a program that implement control flow and decision making statement.	CO5
58	Creating PHP to implements parameterized function	CO5
59	Creating program in PHP to store multiple string and concatenate these string and print it.	CO5
60	Implements single dimension array in PHP	CO5
61	Write a PHP code to open and close a file in a proper manner	CO5
62	Write a PHP script to copying, renaming and deleting a file.	CO5
63	Write a PHP script to create and delete directory structure	CO5
64	Program to upload and download a file in PHP	CO5
65	PHP program to create and destroy a session.	CO5
66	PHP program to set and delete a cookie.	CO5
67	PHP program to manually register and destroy the session variable	CO5
68	PHP program to create databse and show mysql database connectivity	CO5
69	PHP program to insert record into a table.	CO5
70	PHP program delete record from a table	CO5
71	PHP program to update a record into MYSQL. database	CO5
72	PHP program restore the session the session	CO5
73	PHP program to show all records from database.	CO5
74	PHP program to manually set the session variable and destroy it.	CO5

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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)

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Course Code: BCSAI0601	**Course Name: Natural Language Processing**	**L**	**T**	**P**	**C**
Course Offered in: AI & AIML		**0**	**0**	**6**	**3**

Pre-requisite: Machine learning, formal languages, Data Structures, Algorithms Probability and Statistics

Course Objectives: The goal of natural language processing (NLP) is to design and build computer systems that are able to analyze natural languages like English, and that generate their outputs in a natural language.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Understand and explain the fundamentals of Natural Language Processing	K2
CO2	Apply text vectorization and similarity techniques	K3
CO3	Analyze text analytics methods	K4
CO4	Demonstrate knowledge of sequential models and transformer architectures	K3
CO5	Evaluate real-world NLP applications	K5

Course Contents / Syllabus

Module 1	**Introduction to Natural Language Processing**	**14 hours**

Definition, Applications and emerging trends in NLP, Challenges. Ambiguity. NLP tasks using NLTK: Tokenization, stemming, lemmatization, stop-word removal, POS tagging, Parsing, Named Entity Recognition, coreference resolution.

Module 2	**Text Vectorization and Similarity**	**14 hours**

Text Vectorization: Bag-of-Words model, N-Gram Models and vector space models, Term Presence, TF-IDF
Textual Similarity: Cosine similarity, Word Mover's distance, Word embeddings: Word2Vec, GloVe.

Module 3	**Text Analytics**	**14 hours**

Text classification, Sentiment Analysis, Topic modelling, LSA, LDA, Opinion Mining, Information Extraction, Information Retrieval.

Module 4	**Sequential Modelling and Transformers**	**15 hours**

Sequential data, Introduction to sequence models - RNN and LSTM, Attention Mechanism, Transformer, Transformer-based models: BERT, FastText, Elmo, GPT, T5, Introduction to Hugging Face Transformers.

Module 5	**Applications and Case Studies**	**15 hours**

NLP applications: Machine translation: Rule-based and statistical approaches, Text summarization Dialog systems, conversational agents and chatbots.

Automatic Document Separation: A Combination of Probabilistic Classification and Finite-State Sequence Modelling: Introduction, Related Work, Data Preparation, Document Separation as a Sequence Mapping Problem, Results.

Total Lecture Hours	**72 hours**

Textbook:

S.No	**Book Title**	**Author**
1.	Speech and Language Processing, 3rd Edition, Pearson Education, 2008	Daniel Jurafsky, James H.Martin
2.	Deep Learning for Natural Language Processing, 1st Edition, Apress, 2018	Palash Goyal, Sumit Pandey, Karan Jain

Reference Books:

S.No	**Book Title**	**Author**
1.	Natural Language Understanding, 2nd Edition, Pearson, 1995	James Allen

2.	Neural Network Methods for Natural Language Processing, 1st Edition, Morgan & Claypool Publishers, 2017	Yaov Goldeberg

NPTEL/ Youtube/ Faculty Video Link:

1.	https://www.youtube.com/watch?v=02QWRAhGc7g&list=PLJJzI13YAXCHxbVgiFaSI88hj-mRSoMtI&ab_channel=NaturalLanguageProcessing
2.	https://www.youtube.com/watch?v=02QWRAhGc7g&list=PLJJzI13YAXCHxbVgiFaSI88hj-mRSoMtI&ab_channel=NaturalLanguageProcessing
3.	https://www.youtube.com/watch?v=02QWRAhGc7g&list=PLJJzI13YAXCHxbVgiFaSI88hj-mRSoMtI&ab_channel=NaturalLanguageProcessing
4.	https://www.youtube.com/watch?v=02QWRAhGc7g&list=PLJJzI13YAXCHxbVgiFaSI88hj-mRSoMtI&ab_channel=NaturalLanguageProcessing
5.	https://www.youtube.com/watch?v=02QWRAhGc7g&list=PLJJzI13YAXCHxbVgiFaSI88hj-mRSoMtI&ab_channel=NaturalLanguageProcessing

Mode of Evaluation

CIE	**ESE**	**Total**
PS		
50	**100**	**150**

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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

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

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

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

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

CO 1	Implement the working concept of variables	K1, K2

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

Textbooks	
Sr. No.	**Book Details**
1.	Alok Kumar Rai : Customer Relationship Management : Concepts and Cases(Second Edition), PHI Learning, 2018
2	Bhasin- Customer Relationship Management (Wiley Dreamtech),2019
3	Salesforce for beginners by Shaarif Sahaalane book by Amazon(Online Edition)
Reference Books	
Sr. No.	**Book Details**
1	Salesforce : A quick Study laminated Reference Guide by Christopher Mathew Spencer eBook by Amazon(Online)
2	Salesforce Platform Developer By Vandevelde Jain Edition Ist 2018
3	Learning Salesforce Development By Paul Battisson E-book (Online)
Links	
	www. Trailhead.salesforce.com
	www.mindmajix.com/salesforce-tutorial
	www,youtube.com/watch?v=7K42geizQCI

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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

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	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- III)

Course Code	**BCSAI0614**	**L T P**	**Credits**
Course Title	**DEVELOPMENT IN SWIFT EXPLORATIONS AND DATA COLLECTIONS**	**3 0 0**	**3**

Course objective: The objective of this course is to provide the ability to design and develop iOS Apps managing static as well as dynamic data. Also, this course is designed to understand the mindset of developers through app design process: brainstorming, planning, prototyping, and evaluating an app of their own.

Pre-requisites: Basic understanding of Swift and Project Development

Course Contents / Syllabus

UNIT-I	**TABLES AND PERSISTENCE**	**8 Hours**
Protocols, App Anatomy and Life Cycle, Model-View-Controller, Scroll Views, Table Views, Intermediate Table Views, Saving Data, System View Controllers, Complex Input Screens		
UNIT-II	**WORKING WITH THE WEB**	**8 Hours**
Closures, Extensions, Practical Animation, Working with the web: HTTP and URL session; decoding JSON; Concurrency.		
UNIT-III	**ADVANCED-DATA DISPLAY**	**8 Hours**
Collection Views, Swift Generics, Dynamic Data, Compositional Layout, Advanced Compositional Layout.		
UNIT-IV	**THE DESIGN LIFE CYCLE**	**8 Hours**
Brainstorm, Plan: define the problem; Create the persona; Create Feature Set, Prototype: Formalize the prototype, Evaluate, Iterate, Create Higher Quality Prototype.		
UNIT-V	**GUIDED PROJECTS**	**8 Hours**
BouncyBall App, ChatBot, Rock-Paper-Scissors, MemeMaker.		

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

CO 1	Expand on the knowledge and skills they developed in Fundamentals by extending their work in iOS app development and create more complex and capable apps.	K1
CO 2	Work with data from a server and analyze new iOS APIs that allow for much richer app experiences.	K4
CO 3	Learn to display large collections of data in multiple formats.	K1
CO 4	Learn how to turn an idea into a concrete app design through brainstorming, planning, iterative prototyping, and user interviews	K1
CO 5	Apply tsshe advanced concepts of Swift and XCode to build the projects	K3

Textbooks:

1) Develop in Swift Data Collections, XCode 12 or Higher, Apple Inc.

2) Develop in Swift Explorations, XCode 12 or Higher, Apple Inc.

Reference Books:

1) Develop in Swift Data Collections, XCode 12 or Higher, Apple Inc.

2) Develop in Swift Explorations, XCode 12 or Higher, Apple Inc.

Links: NPTEL/ Youtube/ Faculty Video Link:

https://youtu.be/g0kOJk4hTnY

https://youtu.be/WK5vrOD1zCQ

https://developer.apple.com/videos/play/wwdc2021/10134/

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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
CO 2	Demonstrate proficiency in handling several types of variables inside a workflow and data manipulation techniques	K3
CO 3	Gain insights into Desktop, Web, Citrix, Email Automation and exception handling.	K2
CO 4	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**

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**

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**

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**

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**

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
CO 2	Demonstrate web application framework i.e., Express is to design and implement typical dynamic web pages and interactive web based applications.	K3, K6

CO 3	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
CO 4	Analyze build and develop single page application using client-side programming i.e. angular js and also develop a static web application.	K3, K4
CO 5	Understand the impact of web designing by database connectivity with Mongodb in the current market place where everyone use to prefer electronic medium for shoping, commerce, and even social life also.	K2, K3

Text books:

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

Reference Books:

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

NPTEL/ YouTube/ Faculty Video Link:

Unit-1	https://youtu.be/BLl32FvcdVM https://youtu.be/fCACk9ziarQ https://youtu.be/YSyFSnisip0 https://youtu.be/mGVFltBxLKU https://youtu.be/bWaucYA1YRI
Unit-2	https://youtu.be/7H_QH9nipNs https://youtu.be/AX1AP83CuK4 https://youtu.be/SccSCuHhOw0 https://youtu.be/lY6icfhap2o https://youtu.be/z7ikpQCWbtQ
Unit-3	https://youtu.be/0LhBvp8qpro https://youtu.be/k5E2AVpwsko https://youtu.be/SQJkj0WYWOE?list=PLvQjNLQMdagP3OzoBMfBT48uJ-SPfSsWj https://youtu.be/0eWrpsCLMJQ?list=PLC3y8-rFHvwhBRAgFinJR8KHIrCdTkZcZ https://youtu.be/ZSB4JcLLrIo
Unit-4	https://youtu.be/0LhBvp8qpro

	https://youtu.be/k5E2AVpwsko https://youtu.be/SQJkj0WYWOE?list=PLvQjNLQMdagP3OzoBMfBT48uJ-SPfSsWj https://youtu.be/0eWrpsCLMJQ?list=PLC3y8-rFHvwhBRAgFinJR8KHIrCdTkZcZ https://youtu.be/ZSB4JcLLrIo
Unit-5	https://youtu.be/Kvb0cHWFkdc

B. TECH THIRD YEAR (ELECTIVE-IV)			
Course code	**BCSAI0620**	**L T P**	**Credits**
Course title	**AUGMENTED REALITY AND VIRTUAL REALITY**	**3 0 0**	**3**

Course objective: The objective of this course is to understand the basics of AR and VR. It will focus on understanding Unreal Engine. The course will cover the top platform for game development and the creation of cutting-edge real-time 3D environments. It will explore the understanding of essential tools driving important fields like VR/AR, training, and architectural visualization.

Pre-requisites: None

Course Contents / Syllabus

UNIT-I	**INTRODUCTION TO VIRTUAL REALITY & AUGMENTED REALITY**	**8 Hours**

Introduction to Virtual Reality & Augmented Reality. Difference between VR and AR, History of VR.

Learn the basics - The differences between VR&AVR. Why are these technologies so popular now?, key players in this space, Popular VR & AR Devices? How do we create VR/AR experiences, Benefits of VR-AR, Challenges in VR, AR, and Careers related to VR, AR.

Platforms and Paradigms**:** VR-AR Developer Platforms -Demystifying the jargons- FOV- Degrees of freedom VR, Sensors required for VR devices, Evolution of VR-AR, Learn about the Multidisciplinary stream that combines various techniques to create VR-AR experiences, World of 360º videos.

UNIT-II	**VR-AR TECHNOLOGY COMPONENTS, APPLICATIONS**	**8 Hours**

Principles of AR/VR - Immersion, Teleportation, Interaction, Sensors, Haptics, 360-degree view, Motion & Orientation, Accelerometer, Gyroscope, Magnetometer, Depth sensing, Azure Kinect; Challenges – Realistic sense, Nausea, Depth, Non interfering sensors, Ergonomics.

Introduction to Headsets and SW tools required to create VR-AR applications. Basic steps required to create VR-AR experience.

AR, VR Applications, Platforms, Devices – HMD, Smart Glasses, Smart Phone based systems; Intro to Vuforia ; Examples - Gaming, Manufacturing, Oil & Gas, E-Commerce, Entertainment, Facebook, Snapchat, Instagram filters and much more, Education, Training (VMT, Disti), Medical, Fundamental surgery, Military

UNIT-III	UNREAL BASICS, MESH TYPES, INPUTS AND COLLISIONS IN UNREAL ENGINE	**8 Hours**

Installing Unreal Engine & Account Setup, Unreal Engine Overview and Resources, Editor Interface Overview, Templates & Creating Your First Project, View Modes & Navigation Basics.

Mesh Types, Inputs, and Collisions in Unreal Engine: Importing Meshes Collisions, Mesh Editor & Mesh Types, Greyboxing, Static Mesh vs. Skeletal Meshes and Other Mesh Import Types, Brief Blueprint Basics, View Modes, Snapping, and Hotkeys, Skydomes, Lights (Overview) & Rendering Quality, Rendering & Performance Basics.

UNIT-IV	**Lighting** and Materials in Unreal	**8 Hours**

Lighting Overview: Science, Optimization & Measurement, Lighting Design & Terminology, Setting Up Your Scene to Light, Light Types, Use Cases: Static, Stationary & Moveable, Lights Baking Lighting & Lightmap Resolution, Real Time Lighting & Shadows, Lighting Effects: IES / Light Rays / Volumetrics. External: Sun & Sky Actor Location & Time of Day. The Road to Real-Time Raytracing.

Materials in Unreal: Materials Overview, Creating Your First Material, Shading Models, Masks Material Expressions Textures: Texture Map Types. Instances & Master Materials. Material: Parameters & Blueprints, Non-UV Based Material Tools External: Quixel, Substance Designer Workflows. Profiling & Baking Down.

UNIT-V	Physics, Rigid Simulation and Post-Process Volumes	**8 Hours**

Physics Content Examples. Physics Bodies: Mass, Gravity. Physics Forces: Motors, Forces, Constraints. Physics Volumes Collisions &Complexity. Introduction to Skeletal Physics & Rag Dolls. PPVs Key Settings, Lens & Film Effects, Tone Mapping, LUTs, Materials for UI, Rendering & Stylization. Visual FX Use Cases & Visual Warping Example.

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

CO 1	Analyze various requirements and capabilities of modern augmented and virtual reality systems.	K4
CO 2	Describe augmented and virtual reality applications to suit a wide variety of needs.	K2
CO 3	Describe the capabilities and limitations of the techniques that make virtual and augmented reality possible.	K2
CO4	Identify audit and logging needs in application development, Describe the background of augmented and virtual reality and apply counter measures.	K1
CO 5	Demonstrate and use emerging technologies and tools for Augmented and Virtual reality analysis to provide the best Application.	K3

Textbooks:

1. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.
2. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.

Reference Books:

1. Jason Jerald. *The VR Book: Human-Centered Design for Virtual Reality*.Morgan& Claypool:2015
2. Jack Donovan. *Mastering Oculus Rift Development*. Packt Publishing:2017
3. Michael Wohl. *A 360 Video Handbook - A step by step guide to creating video for VR*.Michael Wohl:2017

Links:

Unreal Online Learning Courses Introducing Unreal Engine Introducing Unreal Engine (https://www.unrealengine.com/en-US/onlinelearning-courses/introducing-unreal-engine)
Lighting in Unreal Engine Lighting Essential Concepts and Effects (https://dev.epicgames.com/community/learning/courses/Xwp/lighting-essential-concepts-and-effects/0ax/lighting-essential-concepts-and-effects-introduction)
Materials Unreal Editor Fundamentals - Materials (https://dev.epicgames.com/community/learning/courses/pm/material-editor-fundamentals-for-game-development/V1X/introduction-to-the-course

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	**BCSAI0551**	**L T P**	**Credit**
Course Title	**Natural Language Processing Lab**	**0 0 4**	**2**
List of Experiments			
Sr. No.	**Name of Experiment**		**CO**
1.	**1. Introduction to NLP** • Tokenization of Sentences and Words using NLTK and spaCy • Stemming and Lemmatization on sample text • Stop-word Removal from a document • Part-of-Speech (POS) Tagging of a given sentence • Parsing and Chunking using regex and spaCy • Named Entity Recognition (NER) using spaCy • Coreference Resolution using neuralcoref (or similar)		
2.	**2. Text Vectorization and Similarity** • Bag-of-Words (BoW) vectorization and representation • TF-IDF Implementation and comparison with BoW • N-Gram Model (uni-, bi-, tri-gram) generation from corpus • Cosine Similarity computation between text documents • Word2Vec word embeddings using gensim on a custom corpus • GloVe Embeddings loading and vector representation • Text Similarity using Word Mover's Distance (WMD)		
3.	**3. Text Analytics** • Text Classification using Naïve Bayes/SVM with TF-IDF • Sentiment Analysis using TextBlob and VADER • Topic Modeling using Latent Dirichlet Allocation (LDA) • Topic Modeling using Latent Semantic Analysis (LSA) • Opinion Mining on product/service reviews dataset • Information Extraction (IE) from structured/unstructured documents • Information Retrieval system with ranking using TF-IDF		
4.	**4. Sequential Modeling and Transformers** • Sequence Classification using RNN/LSTM (Keras/TensorFlow) • Implementing Attention Mechanism (Basic custom model) • Fine-Tuning BERT for text classification using Hugging Face • Sentence Embeddings using BERT and GPT-2 • Text Generation using GPT-2 on a custom dataset • Named Entity Recognition using Transformers (BERT)		
5.	**5. Applications and Case Studies** • Machine Translation using MarianMT or T5 (Hugging Face) • Text Summarization using BART or T5 • Chatbot Development using pre-trained transformer (DialoGPT/ChatGPT-style) • Automatic Document Classification and Separation using ML		

- Hybrid Probabilistic + FSM-Based Sequence Modeling for document boundary detection

Course Code: BCSAI0652	Course Name: Generative AI	L	T	P	C
Course Offered in: CSE(AI)/CSE(AIML)		0	0	6	3

Pre-requisite: Statistics, Machine Learning, Deep Learning

Course Objectives: To equip students with the knowledge and skills to build and fine-tune generative AI models—including autoencoders, GANs, transformers, and diffusion models—and apply them ethically in real-world domains such as image synthesis, text generation, and healthcare.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Apply the concepts of discriminative vs. generative models.	K3
CO2	Describe GMMs and HMMs via Expectation-Maximization.	K2
CO3	Analyze VAEs with a focus on the reparameterization trick.	K4
CO4	Design GANs for realistic image generation and training challenges.	K3
CO5	Develop Autoencoders for dimensionality reduction and image reconstruction.	K4

Course Contents / Syllabus

Module 1	**Foundations of Generative Model**	**14 hours**

Introduction to Generative vs. Discriminative Models, Probabilistic Foundations: Joint, Marginal, and Conditional Distributions, Maximum Likelihood Estimation (MLE) and KL Divergence, Latent Variable Models: GMM, HMM, Use Cases of Generative AI: Image synthesis, Text generation, Healthcare

Module 2	**Classical Models & Autoencoders**	**14 hours**

Gaussian Mixture Models (GMM), Expectation-Maximization, Hidden Markov Models (HMMs)
Autoencoders (AE): Undercomplete, Denoising, Sparse Autoencoders, Variational Autoencoders (VAE): ELBO, Reparameterization Trick, Applications: Image reconstruction, Denoising, Latent Space Interpolation.

Module 3	**Generative Adversarial Networks (GANs)**	**14 hours**

GAN Architecture: Generator and Discriminator, Training Challenges: Mode Collapse, Vanishing Gradients, GAN Variants: DCGAN, cGAN, CycleGAN, StyleGAN2, BigGAN, Evaluation Metrics: FID, IS, PR Curves, Applications: Image synthesis, Super-resolution, Image translation, etc.

Module 4	**Attention Mechanism, Transformers & Large Language Models**	**15 hours**

Self-Attention, RNN vs. Attention, Multi-Head Attention, Transformer Architecture: Encoder-Decoder, Positional Encoding, Generative Transformers: GPT (Generative Pretrained Transformer), BERT (Masked Language Model), Fine-Tuning Pretrained Models: GPT-3, T5, BERT, and specialized applications like Text Summarization, Question Answering, LLMs in Action: GPT-3, GPT-4, LLaMA, Prompt Engineering: Understanding and crafting prompts to guide LLM outputs, Applications: Text Generation, Code generation, Conversational AI

Module 5	**Advanced Generative Models & Fine-Tuning**	**15 hours**

Diffusion Models: Forward and Reverse Process, Denoising Diffusion Probabilistic Models (DDPM)
Flow-Based Models: NICE, RealNVP, Glow, Fine-Tuning Pretrained Models: GPT-2, Stable Diffusion
Multimodal Models: CLIP, DALL·E, Flamingo, GPT-4 + Multimodal Inputs, Ethical Issues: Deepfakes, AI Bias, Copyright, Content Authenticity, and Responsible AI

Total Lecture Hours	**72 hours**

Textbook:

S. No	Book Title	Author
1.	Probabilistic Machine Learning: From Algorithms to Applications	Kevin P. Murphy

2.	Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play	David Foster
3.	Hands-On Generative AI with Transformers and Diffusion Models	Omar Sanseviero

Reference Book:

S. No	Book Title	Author
1.	Machine Learning: From the Classics to Deep Networks, Transformers, and Diffusion Models.	Sergios Theodoridis
2.	Essentials of Generative AI	Takeshi Okadome (Springer)

NPTEL/ YouTube/ Faculty Video Link:

Module 1	https://www.youtube.com/watch?v=hjsZSmL67Ck
Module 2	https://www.youtube.com/watch?v=rVfZHWTwXSA
Module 3	https://www.youtube.com/watch?v=qJeaCHQ1k2w
Module 4	https://www.youtube.com/watch?v=AALBGpLbj6Q
Module 5	https://www.youtube.com/watch?v=M1pF0QGDQyU

Mode of Evaluation

CIE	ESE	Total
PS		
50	**100**	**150**

List Of Practical's (Indicative & Not Limited To)

S.NO.	PRACTICAL (Suggestive List of Practical)	CO
1.	Implement and visualize Joint, Marginal, and Conditional Distributions using synthetic data	CO1
2.	Perform Maximum Likelihood Estimation and compute KL Divergence for simple distributions	CO1
3.	Build and evaluate a Gaussian Mixture Model (GMM) using Expectation-Maximization on real-world data	CO1
4.	Implement a simple Hidden Markov Model (HMM) for weather prediction or POS tagging	CO1
5.	Implement an Undercomplete Autoencoder for image compression using MNIST	CO1
6.	Build and compare Denoising and Sparse Autoencoders for noisy image reconstruction	CO1
7.	Implement a Variational Autoencoder (VAE) and visualize latent space interpolation	CO2
8.	Implement a basic GAN for image generation using synthetic data	CO2
9.	Build and compare DCGAN and cGAN on image dataset (e.g., CelebA or FashionMNIST)	CO2
10.	Implement and demonstrate CycleGAN for style transfer	CO2
11.	Evaluate GAN performance using FID and Inception Score	CO2
12.	Implement self-attention and multi-head attention mechanisms	CO2
13.	Build a transformer encoder-decoder model for text summarization	CO2
14.	Use a pre-trained GPT model (e.g., GPT-2 or GPT-3) for text generation and prompt engineering	CO3
15.	Fine-tune a pre-trained BERT model for question answering or sentiment analysis	CO3
16.	Implement and visualize denoising diffusion probabilistic models (DDPM) for image synthesis	CO3
17.	Build a simple Flow-Based generative model using RealNVP or Glow	CO3
18.	Use CLIP or DALL·E to generate images from text prompts	CO3

19.	Demonstrate multimodal capabilities using Flamingo or GPT-4 with image and text inputs	CO3
20.	Case study: Analyze ethical concerns in generative AI with examples (deepfakes, bias, and responsible AI frameworks)	CO3

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

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

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

Course Contents / Syllabus

UNIT-I	Introduction and development models	**16 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	**16 Hours**

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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	**16 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	**16 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	**16 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

CO 1	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	

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	CO4

	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	
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

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B. TECH. THIRD YEAR 5th/ 6th

Course code	BNC0601/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