

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
(An Autonomous Institute)



Affiliated to

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



Evaluation Scheme & Syllabus

For

B.Tech in Computer Science & Engineering (CSE)

Third Year

(Effective from the Session: 2026-27)

NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute)

B. TECH (CSE)
Evaluation Scheme
SEMESTER V

Sl. No.	Subject Codes	Subject Name	Type of Subject	Periods			Evaluation Schemes				End Semester		Total	Credit
				L	T	P	CT	TA	TOTAL	PS	TE	PE		
COMPULSORY INDUCTION PROGRAM														
1	BCSE0502A	Computer Networks	Mandatory	3	1	0	30	20	50		100		150	4
2	BCSML0501A	Machine Learning Techniques	Mandatory	3	1	0	30	20	50		100		150	4
3		Departmental Elective-II	Deptmtal Elective	3	0	0	30	20	50		100		150	3
4		Departmental Elective-III	Deptmtal Elective	3	0	0	30	20	50		100		150	3
5	BCSE0552A	Computer Networks Lab	Mandatory	0	0	4				50		50	100	2
6	BCSML0551A	Machine Learning Techniques Lab	Mandatory	0	0	2				50		50	100	1
7		Departmental Elective Lab	Deptmtal Elective	0	0	2				25		25	50	1
8	BCSE0556	Advanced Java Programming	Mandatory	0	0	6				50		100	150	3
9	BCSCC0501Y	Design Thinking-II	Mandatory	2	0	0	60	40	100				100	2
10	BCSCC0552	Research Methodology, Ethics And Writing	Mandatory	0	0	2				50			50	1
11	BEC0559X	Internship-II	Mandatory	0	0	2				50			50	1
12	BVAC0551	Professional Practice And Employability-I	Compulsory Audit	0	0	6								NA
13		MOOCs (For B.Tech. Hons. Degree)	*MOOCs											
			TOTAL	14	2	24	180	120	300	275	400	225	1200	25

*** List of MOOCs Based Recommended Courses for Third year B. Tech Students**

S. No.	Subject Code	Course Name	University/ Industry Partner Name	N. of Hours	Credits
1.	BMC0078	Explore Machine Learning using Python	Infosys Wingspan (Infosys Springboard)	17h	1
2.	BMC0027	Network Fundamentals	Infosys Wingspan (Infosys Springboard)	37h 57m	3
3.	BMC0086	Java Programming Fundamentals	Infosys Wingspan (Infosys Springboard)	36h 10m	3
4.	BMC0117	An Introduction to world of AI with Machine Learning	NASSCOM	30hr	2

PLEASE NOTE: -

- A 3-4 weeks Internship shall be conducted during summer break after semester-IV and will be assessed during semester-V.
- **Compulsory Audit (CA) Courses (Non-Credit - BVAC0551)**
 - All Compulsory Audit Courses (a qualifying exam) do not require any credit.
 - The Total and obtained marks are not added in the Grand Total.

Abbreviation Used:

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

NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA

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B. TECH (CSE)

Evaluation Scheme

SEMESTER VI

Sl. No.	Subject Codes	Subject Name	Types of Subject	Periods			Evaluation Schemes				End Semester		Total	Credit
				L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	BCSE0604	Computer Vision	Mandatory	3	1	0	30	20	50		100		150	4
2	BCSE0603	Software Engineering And Design	Mandatory	3	1	0	30	20	50		100		150	4
3		Departmental Elective-IV	Deptntmental Elective	3	0	0	30	20	50		100		150	3
4		Departmental Elective-V	Deptntmental Elective	3	0	0	30	20	50		100		150	3
5		Open Elective- I	Open Elective	2	0	0	30	20	50		50		100	2
6	BCSE0654	Computer Vision Lab	Mandatory	0	0	4				50		50	100	2
7	BCSE0653Y	Software Engineering And Design Lab	Mandatory	0	0	4				50		50	100	2
8		Departmental Elective-IV Lab	Deptntmental Elective	0	0	2				25		25	50	1
9	BCSE0655	Data Analytics	Mandatory	0	0	6				50		100	150	3
10	BCSE0659X	Applied Research With Mini Project	Mandatory	0	0	2				50			50	1
11	BVAC0651	Professional Practice & Employability – II	Compulsory Audit	0	0	6								NA
12		MOOCs (For B.Tech. Hons. Degree)	*MOOCs											
			TOTAL	14	2	24	150	100	250	225	450	225	1150	25

*** List of MOOCs Based Recommended Courses for Third year B. Tech Students**

S. No.	Subject Code	Course Name	University/ Industry Partner Name	N. of Hours	Credits
1.	BMC0129	Data Science for Beginners	NASSCOM	30h	2
2.	BMC0074	Data Analysis with Pandas and Python	Infosys Wingspan (Infosys Springboard)	19h 49m	1.5
3.	BMC0113	Certificate Program in Deep Learning/NLP/Artificial Intelligence	NASSCOM	30h	2
4.	BMC0130	Agile Scrum Certification	Infosys Wingspan (Infosys Springboard)	32h 44m	2.5

PLEASE NOTE: -

- A 3-4 weeks Internship shall be conducted during summer break after semester-VI and will be assessed during Semester-VII
- **Compulsory Audit (CA) Courses (Non-Credit - BVAC0651)**
 - All Compulsory Audit Courses (a qualifying exam) do not require any credit.
 - The Total and obtained marks are not added in the Grand Total.

Abbreviation Used:

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

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List of Department Elective (if any):-

S.No .	Subject Code	Subject Name	Types of Subjects	Bucket Name	Branch	Semester
1	BCSE0515	Web Development Using Mean Stack	DE II	Fullstack Bucket	CSE	5
2	BCSE0515P	Web Development Using Mean Stack Lab	DE II	Fullstack Bucket	CSE	5
3	BCSE0514	Design Pattern	DE III	Fullstack Bucket	CSE	5
4	BCSML0511	Deep Learning	DE II	AIML	CSE	5
5	BCSML0511P	Deep Learning Lab	DE II	AIML	CSE	5
6	BCSML0512	Natural Language Processing	DE III	AIML	CSE	5
7	BCSAI0520	Cloud Virtualization	DE II	Cloud Computing	CSE	5
8	BCSAI0520P	Cloud Virtualization Lab	DE II	Cloud Computing	CSE	5
9	BCSAI0523	Big Data	DE III	Cloud Computing	CSE	5
10	BCSE0615	Web Development Using Mern Stack With Devops	DE IV	Fullstack Bucket	CSE	6
11	BCSE0615P	Web Development Using Mern Stack With Devops Lab	DE IV	Fullstack Bucket	CSE	6
12	BCSE0612	Full-Stack Web Development Using Laravel With Vue.js	DE V	Fullstack Bucket	CSE	6
13	BCSML0612	Generative AI	DE IV	AIML	CSE	6
14	BCSML0612P	Generative AI Lab	DE IV	AIML	CSE	6
15	BCSML0613	Digital Image Processing	DE V	AIML	CSE	6
16	BCSAI0611	Cloud Storage Management	DE IV	Cloud Computing	CSE	6
17	BCSAI0611P	Cloud Storage Management Lab	DE IV	Cloud Computing	CSE	6
18	BCSAI0613	Cloud Security	DE V	Cloud Computing	CSE	6

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AICTE Guidelines in Model Curriculum:

A student will be eligible to get Under Graduate degree with Honours only, if he/she completes the additional MOOCs courses such as Infosys Springboard/NASSCOM/CISCO (as applicable) 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 to 18 =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 Infosys Springboard/NASSCOM/CISCO (as applicable) registration details as per the assigned login and password by the Institute these courses may be cleared during the B. Tech degree program (as per the list provided). After successful completion of these MOOCs courses, the students shall provide their successful completion status/certificates to the Controller of Examination (COE) of the Institute through their coordinators/Mentors only.

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

- i. If he / she secures 7.50 as above CGPA.
- ii. Passed each subject of that degree program in the single attempt without any grace.
- iii. Successful completion of MOOCs based 20 credits

	NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306 (An Autonomous Institute) School of Computer Science & Information Technology
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Course Code: BCSE0502A	Course Name: Computer Networks	L	T	P	C
Course Offered in B. Tech: CSE/CS/IT /CSE(AI)/CSE(AIML)/ CSE(DS)/ CSE(CYS)/MCT /ECE Fifth Semester	3	1	0	4	

Pre-requisite: Knowledge of basic computing

Course Objectives:

The course aims to provide students with a comprehensive understanding of computer network fundamentals, protocol architectures, addressing and routing mechanisms, transport and application layer services, and network security concepts. It also enables students to analyze, design, configure, and evaluate network systems and protocols to support efficient and secure data communication in modern computer networks.

Course Outcome: After completion of the course, the student will be able to

Bloom's Knowledge Level (KL)

CO1	Understand fundamentals of computer networks, components, performance metrics, multiplexing, topologies, and compare OSI and TCP/IP models with layer-wise responsibilities.	K2
CO2	Analyze data link layer mechanisms, MAC protocols, switching, VLANs, trunking, DTP, VTP, and STP operation for loop prevention and port state transitions.	K4
CO3	Model IPv4 and IPv6 networks, addressing schemes and configure routing protocols, while evaluating routing metrics, administrative distance, and loop prevention mechanisms.	K4
CO4	Analyze TCP and UDP behavior, congestion control, traffic shaping, and their impact on QoS, including connection management, flow control, and port usage.	K4
CO5	Apply application-layer and security solutions using core network services, NAT/PAT, cryptography, firewalls, ACLs, and threat mitigation techniques.	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	-	-	-	-	-	1	-	1	1	2	1
CO2	2	2	2	2	3	-	-	-	1	1	1	2	2	2	2
CO3	3	3	3	1	2	-	-	-	1	1	1	2	1	2	2
CO4	2	2	1	1	2	-	-	1	1	1	1	2	1	2	2
CO5	2	2	2	1	2	1	1	2	1	1	1	3	1	2	3

Course Contents / Syllabus

Unit 1	Introduction to Networks and Data Communication	8 hours
Introduction to Computer Networks: Definition, evolution, goals, advantages, disadvantages, Client-server, peer-to-peer networks, modes of communications. Types of networks: PAN, LAN, WAN, MAN. Network components: End devices (PCs, servers, printers), Intermediary devices (gateways, routers, switches, APs), NICs. Network media: Wired and Wireless media, along with performance metrics bandwidth, latency, throughput, and jitter. Multiplexing Techniques: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM). Network representations: Topology diagrams including Bus, Ring, Star, Mesh, Hybrid, Physical vs. Logical Topologies. Network Communication Model: ISO/OSI and TCP/IP protocol suite with responsibilities of each layer, comparison between models, PDU at each layer.		
Unit 2	Data Link Layer, Ethernet Switching, VLANs & STP	9 hours
Data Link Layer: Framing, Error Detection and Correction, Flow control (Elementary Data Link Protocols, Sliding Window protocols).		
Medium Access Control and Local Area Networks: Channel allocation, Multiple access protocols (ALOHA, Slotted ALOHA,		

CSMA/CD, CSMA/CA, Binary-backoff algorithm, LAN standards, Protocols and frame formats. Switching and Techniques: Circuit, Message and Packet switching techniques. Virtual Local Area Networks (LAN): VLAN concepts, VLAN types, VLAN configuration, 802.1Q trunking: VLAN tagging, native VLAN on trunk, Dynamic Trunking Protocol (DTP), VLAN Trunking Protocol (VTP), Static vs Dynamic VLANs. STP (IEEE 802.1D): BPDU, root bridge election, port roles (Root, Designated, Non-Designated), port states (Blocking, Listening, Learning, Forwarding, Disabled). Wireless Networking: WLAN standards, Wireless security standards, CSMA/CA: Hidden/exposed terminal problem, RTS/CTS mechanism, Wireless Security, Bluetooth.		
Unit 3	Network Layer: IP Addressing, Subnetting & Routing	9 hours
Role of the Network Layer: Logical addressing, Path determination, Packet encapsulation. IP Addressing: Need of IP address, Classification of IP addresses. IPv4 Address: Notation, IPv4 classes, Public vs. Private address, Classes of IPv4 addresses, Loop back address, IPv4 Header format, ICMPv4. Subnetting and VLSM: Need of subnetting, Subnet mask, Classless Inter-Domain Routing (CIDR), Variable Length Subnet Masking (VLSM). IPv6 Addressing: Need of IPv6, difference between IPv4 and IPv6, unicast, multicast, anycast, IPv6 Header format, ICMPv6. IPv4-to-IPv6 transition: Dual-stack, tunneling techniques (6-to-4, Intra-Site Automatic Tunnel Addressing Protocol (ISATAP), Teredo). Routing Concepts: Router functions, Routing protocol metrics, Routing table structure, Split Horizon, Route Poisoning, Holddown Timers, Triggered Updates Distance vector vs Link state routing and its examples, Static Routing and its Configuration, Route types, Default route, Administrative Distance, Dynamic Routing Protocols, RIPv1, RIPv2, OSPF, EIGRP, BGP, IS-IS, Packet Forwarding methods.		
Unit 4	Transport Layer	10 hours
Role of the Transport Layer: End-to-end communication, multiplexing/demultiplexing. Transmission Control Protocol (TCP): Key Characteristics, packet format, flow control (window size), error recovery, Application areas, Handshaking Techniques: TCP 3-Way Handshaking, four-way Teardown. User Datagram Protocol (UDP): Key Characteristics, packet format, working, Application areas. Port numbers: Well-known ports, Registered ports, Dynamic/Private ports. TCP Socket: Life cycle, Socket programming basics, port scanning & enumeration, banner grabbing, socket-based attacks, man-in-the-middle attacks, packet sniffing, SSL/TLS, socket/session hijacking, firewall & socket filtering, intrusion detection systems, reverse shells & backdoors, Netcat usage, secure socket coding, encryption in socket communication, DoS/DDoS attacks. Congestion Control Techniques: Open Loop and Closed Loop. Traffic Shaping: Leaky Bucket Algorithm, Token Bucket Algorithm, Traffic shaping in Quality of Service (QoS).		
Unit 5	Application Layer and Security	9 hours
Application Layer Protocols: DNS, DHCP, HTTP/HTTPS: request/response model, methods (GET, POST, PUT, DELETE), status codes, TLS/SSL, FTP (active/passive modes), SFTP, TFTP. Email and its protocols: User Agent (UA), Message Transfer Agent (MTA), Message Access Agent (MAA), SMTP, POP3, IMAP. Network management: SNMP (v1/v2c/v3). NAT and PAT concepts: Static NAT and its configuration, Dynamic NAT and its configuration, PAT and its configuration Security: Network threats: DoS/DDoS, reconnaissance, access attacks, MITM, social engineering, phishing, IPSec, Introduction to Cryptography: Definition and goals of cryptography; Security services: Confidentiality, Integrity, Authentication, Non-repudiation; Types of attacks (passive vs active); Basic terminology: plaintext, ciphertext, key, encryption, decryption; Substitution techniques, Transposition techniques; Symmetric Key Cryptography: Concepts of symmetric encryption, Block ciphers and stream ciphers, Data Encryption Standard (DES); Asymmetric Key Cryptography: Public key cryptography concepts; RSA algorithm; Digital Signature. Firewall: Types of Firewalls, Packet filtering concepts, Stateful vs stateless inspection, Firewall policies and rules; Access Control List (ACL): Purpose, packet filtering, traffic classification, QoS marking, Standard ACL, Extended ACL, Named ACLs, ACL wildcard masks, IPv6 ACLs: differences from IPv4 ACLs; implicit deny and permit ICMPv6.		
Total Lecture Hours		45 hours
Textbook		
S NO.	Book Title	Author
1.	Data Communications and Networking, 4th Edition, McGraw-Hill Education	Behrouz A Forouzan.
2.	Computer Networking: A Top-Down Approach, 7 th Edition, Pearson Education.	Hoboken

3.	Introduction to Networks Companion Guide (CCNAv7), 1 st Edition, Cisco Press / Pearson Education, 2020.	Cisco Networking Academy
4.	Switching, Routing, and Wireless Essentials (SRWE), (CCNAv7), 1 st Edition, Cisco Press / Pearson Education, 2020.	Cisco Networking Academy , Allan Johnson

Reference Books:

1. Data and Computer Communications, Eighth Edition

Self-Study Content Links:		Duration
MOOCs	1. CCNA: Introduction to Networks 2. CCNA: Switching, Routing, and Wireless Essentials (SRWE) Supplemental Module 3. CCNA: Enterprise Networking, Security, and Automation (ENSA)	70 Hours each
Video Lectures	1. Complete CN Computer Networks in one shot Semester Exam Hindi 2. https://www.youtube.com/watch?v=1_OPR2yh2co&list=PLh94XVT4dq02frQRRZBHvzj2hwuhzSByN&index=2 3. Lec-1: Computer Networks and Security Full Syllabus for GATE, UGC NET, DSSSB, NIELIT & University exam	1. 6Hrs 18Min 2. 11Hrs 54Min 3. 24 Hrs 58Min
Web References	1. https://www.geeksforgeeks.org/computer-networks/computer-network-tutorials/ 2. https://www.geeksforgeeks.org/computer-networks/basics-computer-networking/ 3. https://www.geeksforgeeks.org/computer-networks/ccna-tutorial-for-beginners/	-

CIE							End Sem	Total	
ST1	ST2	ST3	TA1 10	TA2 10	TA3 10	Attendance 10			
30			20				100	150	

	NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306 (An Autonomous Institute) School of Computer Science & Information Technology
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Course Code: BCSML0501A				Course Name: Machine Learning Techniques								L	T	P	C
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)												3	1	0	4
Pre-requisite: Basic knowledge of python programming															
Course Objectives: The course objective is to apply foundational machine learning concepts, including data preprocessing, supervised and unsupervised learning algorithms and ensemble methods, to address real-world problems															
Course Outcome: After completion of the course, the student will be able to												Bloom's Knowledge Level (KL)			
CO1	Explain fundamental concepts of machine learning including learning paradigms, feature engineering, preprocessing techniques, model building, bias-variance tradeoff, and activation functions.											K2			
CO2	Apply classification algorithms such as Decision Trees, Support Vector Machines, and K-Nearest Neighbors to solve binary and multiclass classification problems and evaluate model performance using appropriate metrics.											K3			
CO3	Analyze regression models including linear and logistic regression, evaluate error measures, and implement optimization techniques such as gradient descent for predictive modeling.											K4			
CO4	Demonstrate probabilistic learning, ensemble methods, clustering techniques, and reinforcement learning approaches for solving supervised and unsupervised learning problems.											K3			
CO5	Develop Artificial Neural Network models including Perceptron, Multilayer Perceptron, CNN, and RNN architectures for applications such as image classification, text classification, healthcare, e-commerce, and smart city systems.											K4			
CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	2	–	–	–	–	–	2	3	–	2	1
CO2	3	3	2	2	3	–	–	–	–	–	2	3	–	2	2
CO3	3	3	2	2	3	–	–	–	–	–	2	3	–	2	2
CO4	3	3	2	2	3	–	–	–	–	–	3	3	–	3	2
CO5	3	3	3	2	3	1	1	–	–	–	3	3	1	3	2

Course Contents / Syllabus

Module 1	INTRODUCTION TO MACHINE LEARNING	8 hours
Learning, Types of Learning, well defined learning problems, designing a Learning System, History of ML, Introduction of Machine Learning Approaches, Features and their types, handling missing data, Dealing with categorical features, Feature Scaling, Feature selection, outlier detection and removal. Introduction to Model Building, Sensitivity Analysis, Underfitting and Overfitting, Bias and Variance, Activation Functions, Data Science Vs Machine Learning.		
Module 2	CLASSIFICATION	9 hours
Classification: Classification problem, Binary and Multiclass Classification, Decision Boundary Measuring Performance of Classification Model: Accuracy, Precision, Recall, F1-Score, ROC-AUC curve, Confusion matrix. Decision Trees: Decision Tree Classification Algorithm, Attribute Selection Measures, Variants of Decision Trees. Large Margin Classifier: Support Vector Machines, Instance Based Learning: K Nearest Neighbor Algorithm.		
Module 3	REGRESSION	9 hours

Logistic regression model for binary classification, Cost function of logistic regression model, Regularized logistic regression, One Vs. All strategy for multiclass classification using logistic regression. **Introduction to Regression:** Regression Problem, Linear regression model (Simple, Multiple and Polynomial), **Errors Measures:** Mean Squared Error (MSE), Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), **Cost function:** Formula, intuition and visualization, Bias and Variance, Overfitting and Underfitting, **Gradient Descent:** Algorithm, intuition, learning rate and Gradient Descent for linear regression.

Module 4	PROBABILISTIC & CLUSTERING TECHNIQUES	10 hours
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Probabilistic Methods for Classification: Bayesian Learning, Naive Bayes Classifier, Bayesian belief networks. **Tree Ensembles:** Using multiple decision trees, Bagging Vs. Boosting, Sampling with replacement, Random Forest Algorithm, Adda boost, Gradient Boosting, Xgboost Algorithm.

Unsupervised Learning & Clustering: The problem of Feed, Distance measures

Partition Based Methods: K-Means Clustering (Intuition, Algorithm, Optimization objective, Initializing K-Means, Choosing number of clusters) K-Medoids and K-Mode clustering algorithms.

Hierarchical Clustering (Single Linkage, Complete Linkage, AGNES (Agglomerative Nesting), DIANA (Divisive Analysis). Reinforcement Learning

Module 5	ARTIFICIAL NEURAL NETWORKS	9 hours
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Neural Networks: Introduction, Perceptron, Multilayer Perceptron, Feed Forward Networks, Back Propagation Networks, Back-propagation through time (BTT), Different types of RNNs. Recurrent Neural Network Model, Notation, hyper-parameter tuning, Image classification, Text classification, Image classification. Understanding and visualizing a CNN.

Case Study: Health Care, E Commerce, Smart Cities.

Total Lecture Hours	45 hours
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Textbook:

S.No	Book Title	Author
1.	Machine Learning: A Constraint-Based Approach, Morgan Kaufmann. 2017	Marco Gori
2.	Machine Learning: The New AI, MIT Press-2016	Ethem Alpaydin
3.	Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995.	Bishop, Christopher
4.	“Machine Learning”, McGraw-Hill, 2010	Tom M. Mitchell

Reference Books:

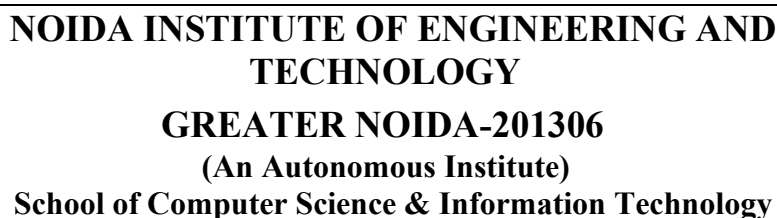
S.No	Book Title	Author
1.	Machine Learning: An Artificial Intelligence Approach, Volume 1, Elsevier. 2014	Ryszard, S., Michalski, J. G. Carbonell and Tom M. Mitchell,
2.	Machine Learning: An Algorithmic Perspective	Stephen Marsland
3.	“Introduction to Machine Learning (Adaptive Computation and Machine Learning)”, Taylor & Francis 2009, The MIT Press	Ethem Alpaydin, (2004)
4.	Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies 1st Edition	John D. Kelleher

Self Study Content Link:

		Duration
MOOCs	1. https://nptel.ac.in/courses/106106139? 2. https://www.coursera.org/learn/machine-learning?	40 Hrs 60 Hrs
Video Lectures	1. https://www.youtube.com/watch?v=9_LY0LiFqRQ 2. https://www.youtube.com/watch?v=EYcF2e2IKEo 3. https://www.youtube.com/watch?v=wTF6vzS9fy4 4. https://www.youtube.com/watch?v=7enWesSofhg	5 Hrs
Web Reference	1. https://www.tensorflow.org/tutorials? 2. https://scikit-learn.org/stable/?	2 Hrs 2 Hrs

Mode of Evaluation

CIE							End Sem	Total
ST1	ST2	ST3	TA1 10	TA2 10	TA3 10	Attendance 10		
30			20				100	150



LAB Course Code: BCSE0552A						LAB Course Name: Computer Networks Lab						L	T	P	C
Course Offered in: CSE/CS/IT /CSE(AI)/CSE(AIML)/ CSE(DS)/ CSE(CYS)/MCT /ECE												0	0	4	2
Pre-requisite: Fundamental of Computers.															
Course Objectives:															
Understand and configure basic networking concepts using CISCO Packet Tracer and device. Develop practical skills in IP addressing, Subnetting, V LAN, Routing, Switching and wireless networking. Learn to configure and manage network services such as DHCP, NAT, ACLs, and inter VLAN Routing. Perform network testing, Troubleshooting and connectivity verification using CISCO IOS CLI commands and diagnostic tools. Prepare students for industry-oriented networking rules and certification such as CISCO CCNA by providing hands-on networking experience.															
Course Outcome: After completion of the course, the student will be able to												Bloom's Knowledge Level (KL)			
CO1	Model computer network through cabling, assigning IP addresses along with subnetting using CISCO packet tracer.											K4			
CO2	Analyse Layer 2 and Layer 3 networking features including switching, VLANs, trunking, inter-VLAN routing, STP, EtherChannel, static routing, and basic dynamic routing.											K4			
CO3	Demonstrate core network services and security features such as wireless connectivity, DHCP, NAT/PAT, ACLs, transport/application layer protocols, and connectivity verification using network diagnostic tools.											K4			
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)															
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3	-	-	-	2	2	1	-	2	2	3
CO2	3	3	3	2	3	1	-	-	2	2	1	-	2	3	3
CO3	3	3	2	3	3	1	-	1	2	2	1	1	2	3	3
List Of Practical's (Indicative & Not Limited To)															CO
1. Explore the CISCO Packet Tracer.															CO1
2.Explore Network Devices and Cabling: Identify different network devices (router, switch, PC) and understand cable types (straight-through, crossover, fiber).															CO1
3.Basic Switch and End Device Configuration: Configure hostname, passwords, and basic security settings on switches and PCs.															CO1
4.Build a Simple Network Using Packet Tracer: Create a small network and verify connectivity using ping and traceroute.															CO1
5.Configure IPv4 Addressing: Assign IP addresses manually and test communication between devices.															CO1
6.Subnetting and Address Calculation: Apply subnetting techniques to divide networks efficiently.															CO1
7.Configure IPv6 Addressing: Assign IPv6 addresses and test connectivity.															CO1
8.Access Cisco IOS and CLI Navigation: Use CLI commands to configure and manage network devices.															CO1

9.MAC Address and ARP Analysis: Understand how MAC addresses and ARP work in local communication.	CO1
10.Basic Switch Configuration Configure switch settings, ports, and management IP.	
11.VLAN Configuration: Create VLANs and assign ports to segment network traffic.	CO2
12.Inter-VLAN Routing: Enable communication between VLANs using router or Layer 3 switch.	CO2
13.Trunking Configuration (802.1Q): Configure trunk links to allow multiple VLAN traffic.	CO2
14.Spanning Tree Protocol (STP): Understand STP operation and prevent switching loops.	CO2
15.Static Routing Configuration: Configure static routes and verify packet forwarding.	CO2
16.Default and Dynamic Routing (RIP): Implement basic dynamic routing and default routes.	CO2
17.Wireless Network Configuration: Configure a wireless router and connect wireless clients.	CO3
18.NAT (Network Address Translation): Configure NAT/PAT for internet access.	CO3
19.Network Troubleshooting: Identify and resolve connectivity issues using commands like ping, traceroute, and show.	CO3
Total Hours: 60 hrs.	

	NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306 (An Autonomous Institute) School of Computer Science & Information Technology
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Course Code: BCSML0551A	Course Name: Machine Learning Techniques Lab	L	T	P	C
Course Offered in: CSE/CSE(R)/IT/M.Tech Int.(CSE)		0	0	2	1

Pre-requisite: Python

Course Objectives:

- 1 To provide practical knowledge of data preprocessing, exploratory data analysis, feature engineering, and model validation techniques for machine learning applications.
2. To develop skills in implementing, evaluating, and optimizing supervised machine learning algorithms for regression and classification problems using modern tools and frameworks.
- 3.To enable students to design and apply advanced machine learning techniques including ensemble learning, clustering, neural networks, probabilistic reasoning, and reinforcement learning for solving real-world problems.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Apply data preprocessing, feature engineering, exploratory data analysis, and model validation techniques to prepare datasets and analyze machine learning performance.	K3
CO2	Design, implement, evaluate, and optimize supervised machine learning models for regression and classification tasks using appropriate algorithms and performance measures.	K5
CO3	Examine advanced machine learning solutions using ensemble methods, clustering algorithms, neural networks, Bayesian models, and reinforcement learning techniques for real-world applications.	K4

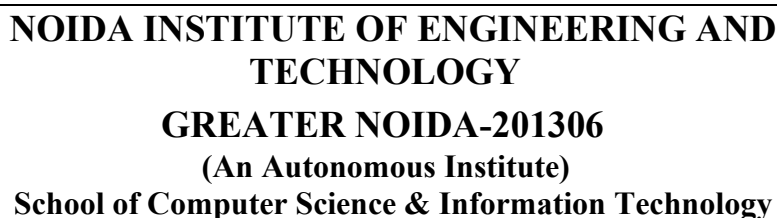
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	-	-	-	-	-	-	2	3	-	2	3
CO2	3	3	3	2	3	-	-	-	-	-	-	2	3	-	2	3
CO3	3	3	3	3	3	-	-	-	2	-	-	2	3	1	3	2

List of Experiments

Sr. No.	Name of Experiment	CO
1	Perform data preprocessing, feature scaling, missing value handling, and feature selection on the Titanic dataset using Python libraries.	CO1
2	Perform exploratory data analysis (EDA) and visualization using Python libraries to understand dataset characteristics and patterns.	CO1
3	Analyze underfitting, overfitting, bias, and variance problems in machine learning models using validation techniques.	CO1
4	Perform sensitivity analysis and compare machine learning models using different train-test split ratios.	CO1
5	Implement Simple, Multiple, and Polynomial Linear Regression models and evaluate their performance using regression metrics.	CO2

6	Implement Logistic Regression for binary and multiclass classification and evaluate performance using confusion matrix and ROC curve.	CO2
7	Implement Decision Tree classifiers using ID3 and CART algorithms and perform hyperparameter tuning for improved accuracy.	CO2
8	Apply Support Vector Machine (SVM) algorithms for classification and regression using linear and RBF kernels.	CO2
9	Implement K-Nearest Neighbor (K-NN) classification using different values of k and distance metrics.	CO2
10	Implement regularized regression techniques such as Ridge and Lasso Regression for reducing overfitting.	CO2
11	Compare the performance of different supervised learning algorithms on the same dataset using cross-validation.	CO2
12	Implement Naïve Bayes classifiers for probabilistic learning and compare Gaussian, Multinomial, and Bernoulli models.	CO2
13	Perform hyperparameter tuning of machine learning models using GridSearchCV and RandomizedSearchCV techniques.	CO2
14	Implement ensemble learning methods including Random Forest, AdaBoost, Gradient Boosting, and XGBoost algorithms.	CO3
15	Perform clustering using K-Means, K-Medoids, and Hierarchical Clustering algorithms for unsupervised learning tasks.	CO3
16	Develop Artificial Neural Network models using Perceptron and Multilayer Perceptron techniques.	CO3
17	Implement Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNN) for image and text classification tasks.	CO3
18	Develop machine learning applications and case studies for Healthcare, E-Commerce, and Smart City systems.	CO3
19	Implement Bayesian Belief Networks for probabilistic reasoning and prediction on small datasets.	CO3
20	Perform clustering optimization using Elbow Method and Silhouette Analysis for selecting optimal clusters.	CO3
21	Implement Reinforcement Learning using Q-Learning algorithm for solving grid-world navigation problems.	CO3
Total Hours: 30 hrs		



Module 2	JSP	14 hours
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JSP: Introduction, Life Cycle of JSP, JSP to Servlet Conversion, JSP Scripting Elements, JSP Implicit Objects, JSP Directives, Expression Language, Exception Handling in JSP, Servlet-JSP-JDBC Integration, Login and registration system using JSP and Servlet.		
Module 3	Spring Framework	14 hours
Spring: Overview of Spring Ecosystem, Spring Modules, IOC container, Spring Project Setup using Maven, Types of Dependency Injection (DI): Constructor Injection Setter Injection, Field Injection, Configuration Approaches: Java-based Configuration, Component Scanning, Annotation-based Configuration, Spring JDBC.		
Module 4	Spring MVC & Spring Boot	15 hours
Spring MVC: Overview of Spring MVC architecture, Controllers in Spring MVC, Passing Data Between Controller and View, JSP in Spring MVC, Integration with Spring JDBC.		
Spring Boot: Introduction, Creating a Spring Boot project using Spring Initializer, Spring Boot Annotations & Auto Configuration, Spring Data JPA and H2 setup, Serving HTML pages and static content, Handling HTTP methods, Project Lombok		
Module 5	JPA	15 hours
JPA: Introduction to ORM & JPA, JPA Annotations, JPA Relationships, RESTful API, CRUD with Spring Data JPA, Repository Interfaces: JpaRepository, CrudRepository, Exception Handling in REST APIs, HTTP Status Code Management, API Versioning Techniques, JSON/XML handling, Postman testing and deployment, Swagger Open API design and documentation tool.		
Total Lecture Hours		72 hours
Textbook:		
S.No	Book Title	Author
1	Head First Servlets and JSP, 2nd ed. Sebastopol, CA, USA: O'Reilly Media, 2008.	B. Basham, K. Sierra, and B. Bates
2	Java Server Pages, 3rd ed. Sebastopol, CA, USA: O'Reilly Media, 2003.	H. Bergsten
3	Spring in Action, 6th ed. Shelter Island, NY, USA: Manning Publications, 2022.	C. Walls
4	Spring Boot in Action, 1st ed. Shelter Island, NY, USA: Manning Publications, 2016.	C. Walls
5	Spring Data: Modern Data Access for Enterprise Java, 1st ed. Sebastopol, CA, USA: O'Reilly Media, 2012.	M. Pollack and O. Gierke,
Reference Books:		
S.No	Book Title	Author
1	Core Servlets and JavaServer Pages, Volume 1: Core Technologies, 2nd ed. Upper Saddle River, NJ, USA: Prentice Hall, 2003.	M. Hall and L. Brown
2	Core Servlets and JavaServer Pages, Volume 2: Advanced Technologies, 2nd ed. Upper Saddle River, NJ, USA: Prentice Hall, 2004.	M. Hall and L. Brown,
3	Pro Spring 6, 1st ed. New York, NY, USA: Apress, 2023.	C. Ho, R. Harrop, and C. Schaefer,
4	Pro JPA 2 in Java EE 8, 3rd ed. New York, NY, USA: Apress, 2018.	M. Keith and M. Schincariol
Certifications:		
S.NO	Industry Aligned Certificate	
1	Oracle Academy Certification on JAVA and Database	
2	Wipro TalentNext Certification on Full Stack	
Self Study Content Link:		
MOOCs	1. https://nptel.ac.in/courses/106105191 2. https://www.coursera.org/specializations/spring-framework	12 Weeks 50 hrs

Video Lectures	1. https://www.youtube.com/playlist?list=PLlhM4lk2sEjVsbbZ_kiixY5CcR84IQUg	13 hrs
	2. https://www.youtube.com/playlist?list=PL-XjHn7CHrmQhMkVC6KCfmsPHdklvUIQr	1 hrs
	3. https://www.youtube.com/playlist?list=PL9ooVrP1hQOEfi91PCFQMawtBJrPpir7y	18 hrs
	4. https://www.youtube.com/playlist?list=PL-XjHn7CHrmQhMkVC6KCfmsPHdklvUIQr	50 Min
	5. https://www.youtube.com/playlist?list=PLGRDMO4rOGcNSBOJOlrgQqGpIgo6_VZgR	25 hrs
Web References	1. https://spring.io/guides 2. https://docs.oracle.com/javase/tutorial/	

List of Practicals

Sr. No.	Program Title	CO Mapping
1	Install a database (MySQL or Oracle). Program to illustrate JDBC connectivity. Program for maintaining database by sending queries.	CO1
2	Write program to create a demo table emp having fields is, name, city and insert two rows by using JDBC.	CO1
3	Write a Java program using Statement to create a table Students with fields id, name, age, and grade.	CO1
4	Write a Java program using Statement to insert multiple records into the Students table	CO1
5	Write a Java program to demonstrate a money transfer transaction between two bank accounts. Ensure that both debit and credit operations are either committed together or rolled back in case of an error.	CO1
6	Write a Java program using PreparedStatement to delete student records where grade is below a given threshold.	CO1
7	Write a Java program using PreparedStatement to insert multiple records efficiently using batch execution.	CO1
8	Write a Java program to call a stored procedure that calculates the total salary of employees in a given department.	CO1
9	Implement a java program using TCL statements commit(), rollback(), setAutoCommit(), setSavepoint(), and releaseSavepoint() method on Employee table.	CO1
10	Write a servlet program to select the details of an employee (emp id, empname, empadd, empphone) and display on browser in appropriate format.	CO1
11	Write a GenericServlet to handle employee registration. The servlet should: Accept employee details (name, email, designation, salary) via a form (POST request). Store the details in a database (use JDBC). Display a success message after successful insertion.	CO1
12	Implement a servlet program that receive two inputs Name and Password from HTML page and display on the browser.	CO1
13	Implement a servlet program that redirect a request to Google.com.	CO1

14	Implement session handling concept by using HttpSession object.	CO1
15	Implement session handling concept by using URL rewriting method.	CO1
16	Create a servlet Program which displays cookie id with the help of session handling concepts.	CO1
17	Implement a program that takes three input as: User Name, User Password and User Mobile from html form and access these data by using servlet also display these details on browser.	CO1
18	Implement a servlet program to select the details of an employee (emp id, empname, empadd, empphone) and display on browser in appropriate format.	CO1
19	Implement a program to add any data on cookies and also access these data from cookies.	CO1
20	Implement servlet a program to implement the redirection of any request to other resources such as an html file.	CO1
21	Create a table which should contain at least the following fields: name, password, email-id, phone number Implement a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.	CO1
22	Design and implement a simple servlet book query such as book_id, book_name, book_author and published date with the help of JDBC & SQL. Create on ODBC/latest driver link, Compile & Execute JAVA JDBC Socket.	CO1
23	Design a simple application program using Servlet and Database 1. Simple login form 2. Customer Feedback Form 3. Admission Form 4. Student Mark Sheet	CO1
24	Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Implement a servlet for doing the following. Create a Cookie and add these four-user id's and passwords to this Cookie.2. Read the user id and passwords entered in the Login form and authenticate with the values available in the cookies.	CO1
25	Implement all JSP scripting element (scriptlet, expression and declaration).	CO2
26	Implement all JSP directive element (page, include and taglib).	CO2
27	Implement JSP program that calculates factorial values for an integer number, while the input is taken from an HTML form	CO2
28	Implement a JSP program for displaying basic arithmetic functions that calculates Powers of 2 for integers in the range 0-10.	CO2
29	Implement a JSP (EmpBeanTest.jsp) page that illustrates how to access a JavaBean class by using all required action tags from a JSP page.	CO2
30	Implement a JSP program to display strings that shows a sample order form in restaurant.	CO2
31	Implement a JSP program to upload file into server.	CO2
32	Implement a JSP program to count no. of visitors once user clicks on submit button on webpage.	CO2

33	Implement a JSP program to illustrate session tracking for printing the string array (color) through index.jsp page and print the length of the selected color through another page print.jsp.	CO2
34	Implement a JSP program for arithmetic exception error handling by using html page, jsp page, and errorPage, isErrorPage directives.	CO2
35	Implement a JSP program to display current date & time of your system.	CO2
36	Implement a JSP page to retrieve data from HTML into JSP and display information on browser.	CO2
37	A company's recruitment portal requires candidates to register before applying for jobs. Design a JSP page for registration and a Servlet to store user details in a MySQL database using JDBC. How would you implement session management in a JSP-based web application to keep users logged in across multiple pages?	CO2
38	Implement a JSP program to validate username and password in sample order form.	CO2
39	Implement a JSP program to select record from database Employee.	CO2
40	Implement a JSP which insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user's name and password from the database. Design and implement a simple shopping cart example with session tracking API.	CO2
41	Create a simple Spring project using Maven that prints a welcome message using a Spring Bean.	CO3
42	Demonstrate the use of ApplicationContext as IOC container to load beans.	CO3
43	Define multiple Spring Beans and manage them using XML-based configuration.	CO3
44	Demonstrate Constructor-based DI in Spring using Injecting dependencies using constructor.	CO3
45	Implement Setter-based DI to inject a service bean into another.	CO3
46	Demonstrate Field Injection using @Autowired annotation.	CO3
47	Configure beans using Java-based configuration with @Configuration and @Bean.	CO3
48	Use Component Scanning and @Component, @Service, @Repository.	CO3
49	Demonstrate Annotation-based configuration with full @Configuration and @ComponentScan.	CO3
50	Create a simple JDBC DAO using Spring JDBC Template to fetch data from H2 database.	CO3
51	Implement Insert and Update operations using Spring JDBC.	CO3
52	Handle exceptions and use Row Mapper with Spring JDBC for object mapping.	CO3

53	Set up a Maven project structure for a Spring app and manage dependencies using pom.xml.	CO3
54	Integrate external dependency (like MySQL connector) and test project compilation.	CO3
55	Create a modular app with User Service, injected via constructor, and use annotations (@Component, @Autowired).	CO3
56	Develop a full Spring app managing user profiles with Component Scanning, Java-based Config, JDBC for persistence, tested via H2 DB.	CO3
57	Develop a Spring application utilizing Dependency Injection, component scanning, and annotation-based configuration within a Maven-based setup.	CO3
58	You are designing a web application for an online bookstore. Set up a basic Spring MVC structure with Dispatcher Servlet, controller, and view." Program Goal: Create a minimal Spring MVC app showing folder structure and web.xml setup.	CO4
59	Build a feedback page for a college portal. Create a Spring MVC controller that returns a welcome message on accessing /feedback." Program Goal: Implement a basic controller class using @Controller and map a simple GET request.	CO4
60	In a product catalog system, pass a product's name and price from the controller to the view for display." Program Goal: Use Model or ModelAndView in the controller to send data to JSP.	CO4
61	"Create a login form where the user inputs their username. Display a welcome message using data passed from the form." Program Goal: Use @RequestParam to capture form input and display it in JSP.	CO4
62	Build a registration form for students and bind form data to a Student object." Program Goal: Use @ModelAttribute to map form fields to a model bean.	CO4
63	In a tourism site, display a list of popular destinations in a JSP page returned from a controller." Program Goal: Configure JSP view resolution in spring-servlet.xml and use JSTL to display dynamic content.	CO4
64	Create a feedback form where name and message fields are mandatory. Validate the form input and show error messages." Program Goal: Use Spring Form tag library and BindingResult to perform simple validation.	CO4
65	Design a student records system that fetches student data from a MySQL database and displays it using Spring MVC." Program Goal: Connect Spring MVC to a database using Spring JDBC and show data in a JSP.	CO4
66	Case Study: "Your team is building a microservice for user registration. Initialize a basic Spring Boot application structure." Program Goal: Use @SpringBootApplication, run the app, and understand the auto-configured structure.	CO4
67	Case Study: "You want to quickly start a RESTful service for a contact book using Spring Initializer." Program Goal: Generate a Spring Boot project with Spring Web and Spring Boot DevTools.	CO4
68	Case Study: "In a university portal, configure a controller without any XML and rely on auto-configuration." Program Goal: Use @RestController, @RequestMapping, and rely on application.properties.	CO4
69	Case Study: "Build a student management module that stores data in an in-memory H2 database." Program Goal: Integrate Spring Data JPA with H2, create an entity, repository, and test data storage.	CO4
70	Case Study: "Your library website needs to show a homepage with contact info and a static banner." Program Goal: Serve HTML from /templates and static images/CSS from /static.	CO4

71	Case Study: "Create a contact form submission endpoint. Use GET to load the form and POST to save data." Program Goal: Implement separate methods for @GetMapping and @PostMapping.	CO4
72	Case Study: "You want to reduce boilerplate in your Book class (getters, setters, constructors)." Program Goal: Use @Data, @NoArgsConstructor, @AllArgsConstructor from Lombok.	CO4
73	Case Study: "Develop a course catalog system that allows adding, listing, updating, and deleting courses." Program Goal: Build full CRUD using Spring Boot, Spring Data JPA, H2, and REST endpoints.	CO4
74	You are designing a simple library system. Begin by creating an entity Book and use JPA to persist data to a relational database.	CO4
75	In a school database system, annotate an @Entity class Student with appropriate JPA annotations like @Id, @GeneratedValue, @Column.	CO4
76	In a hospital management system, create a one-to-one relationship between Patient and Medical Record using JPA	CO4
77	Implement CRUD operations on MYSQL database using spring data rest with POSTMAN client.	CO5
78	Implement CRUD operations on POSTGRESQL database using spring data rest with POSTMAN client.	CO5
79	Develop a system for online courses where one Instructor can have many Courses. Model this using JPA annotations.	CO5
80	Build a college management system where Students can enroll in multiple Courses. Implement many-to-many using JPA.	CO5
81	In a retail system, expose CRUD operations for Product entity using Spring Boot REST API.	CO5
82	Develop an employee management system that performs Create, Read, Update, and Delete operations using JpaRepository and exception handling. Document the RESTful APIs using Swagger Open API.	CO5
83	In a book store app, compare the use of CrudRepository vs. JpaRepository for managing Book entities. Document the RESTful APIs using Swagger Open API.	CO5
84	In a weather app, build an API that serves both JSON and XML responses using appropriate Spring annotations. Document the RESTful APIs using Swagger Open API.	CO5
85	After building a student API, demonstrate how to test CRUD endpoints using Postman including headers and body format. Also check how they handle exceptions. Document the RESTful APIs using Swagger Open API.	CO5
86	Once your API is ready, deploy the project on localhost using Spring Boot and test endpoints in a browser or Postman. Document the RESTful APIs using Swagger Open API.	CO5
87	Simulate a simplified Netflix system: design entities like User, Content, and Watch History using JPA relationships, and expose REST APIs for user registration and content tracking. Also show the api versioning techniques. Document the RESTful APIs using Swagger Open API.	CO5
88	You are designing a simple REST API for a library system. Begin by creating an OpenAPI specification to document a Book resource with endpoints to add, view, update, and delete books. Use the OpenAPI Specification to define request and response schemas.	CO5

Mode of Evaluation

CIE PS					ESE PE	Total
ST1	ST2	ST3	TA 10	Attendance 10		
30			20		100	150



**NOIDA INSTITUTE OF ENGINEERING AND
TECHNOLOGY**
GREATER NOIDA-201306
(An Autonomous Institute)
School of Computer Science & Information Technology

Course Code: BCSCC0501Y				Course Name: Design Thinking –II								L	T	P	C
Course Offered in: All computing branches												2	0	0	2
Pre-requisite: Student must complete Design Thinking-I course.															
Course Objectives: 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															
Course Outcome: After completion of the course, the student will be able to													Bloom’s Knowledge Level (KL)		
CO1	Learn sophisticated design tools to sharpen their problem-solving skills												K2		
CO2	Construct innovate ideas using design thinking tools and converge to feasible idea for breakthrough solution												K6		
CO3	Implement storytelling for persuasive articulation												K3		
CO4	Understanding the nature of leadership empowerment												K2		
CO5	Understand the role of a human being in ensuring harmony in society and nature												K2		
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)															
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	3	3	2	2	2	3	2	3	3	-	-	-
CO2	3	2	3	2	3	2	2	3	2	2	2	3	3	-	-
CO3	3	2	3	2	3	2	2	3	2	2	2	3	3	-	-
C04	3	2	3	2	3	2	2	3	2	2	2	3	3	-	-
CO5	3	2	3	3	3	2	2	3	3	2	3	3	3	-	-
Course Contents/ Syllabus															
Module 1				Introduct on							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.															
Module 2				Refinement and Prototyping							10 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.		
Module 3	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		
Module 4	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.		
Module 5	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.		
Total Lecture Hours		42 hours
Textbook:		
S. No	Book Title	Author
1.	UnMukt : Science & Art of Design Thinking, 2020, Polaris	Arun Jain
2.	Basics Design 08: Design Thinking, 2010, AVA Publishing SA	Gavin Ambrose and Paul Harris
3.	A Foundation Course in Human Values and Professional Ethics, First Edition, 2009, Excel Books: New Delhi	R R Gaur, R Sangal, G P Bagaria
Reference Books:		
S.No	Book Title	Author
1.	Solving Problems with Design Thinking – Ten Stories of What Works, 2013, Columbia Business School Publishing.	Jeanne Liedta, Andrew King and Kevin
2.	Universal Human Values and Professional Ethics, 2022, Katson Books.	Dr Ritu Soryan
3.	101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, 2013, John Wiley and Sons Inc, New Jersey.	Vijay Kumar

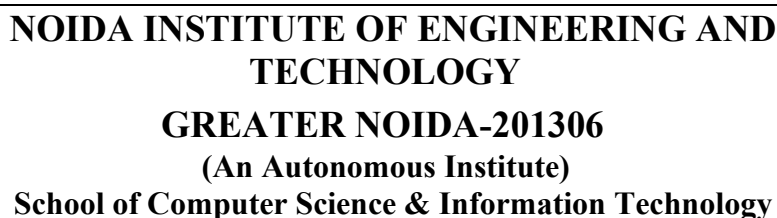
4.	Design of Business: Why Design Thinking is the Next Competitive Advantage, 2009, Harvard Business Press, Boston MA.	Roger L. Martin
5.	Change by Design, 2009, Harper Collins.	Tim Brown

Self Study Content Links:

MOOCs	1. https://www.coursera.org/specializations/design-thinking?utm_medium=sem&utm_source=gg&utm_campaign=b2c_india_x_multi_ftco_f_career-academy_cx_dr_bau_gg_pmax_gc_in_all_m_hyb_24-03_desktop&campaignid=21104989118&adgroupid=&device=c&keyword=&matchtype=&network=x&devicemodel=&creativeid=&assetgroupid=6544944776&targetid=&extensionid=&placement=&gad_source=1&gad_campaignid=21104990591&gbraid=0AAAADdKX6YJHt3GyzupmRYbPOgHkEeFp&gclid=Cj0KCQjw3K7RBhDJARIsAKRtP5RBjckHBvGEYiEnTRFA8EtXpl89ha-X8id2TOYd0e4Sf9WTvVnonK4aAmqrEALw_wcB	4 weeks
	2. https://www.coursera.org/learn/uva-darden-designbiz	6 hrs
Video Lectures	https://www.youtube.com/watch?v=6_mHCOAAEi8 https://nptel.ac.in/courses/110106124 https://designthinking.ideo.com/ https://www.youtube.com/watch?v=7enWesSofhg https://youtu.be/rthuFS5LSOo https://www.youtube.com/watch?v=kho6oANGU_A https://www.youtube.com/watch?v=9vMpHk44XXo&list=PL1xHD4vteKYVpaliy295pg6_SY5qznc77&index=6 Reinforcement Learning Tutorial Reinforcement Learning Example Using Python Edureka - YouTube Association Rule Mining – Solved Numerical Question on Apriori Algorithm(Hindi) - YouTube Q Learning Explained Reinforcement Learning Using Python Q Learning in AI Edureka - YouTube	7 hrs
Web References	https://blog.experiencepoint.com/how-mcdonalds-evolved-with-design-thinking	

Mode of Evaluation

CIE								Total
ST1	ST2	ST3	TA1 10	TA2 10	TA3 10	Attendance 10		
60			40					100



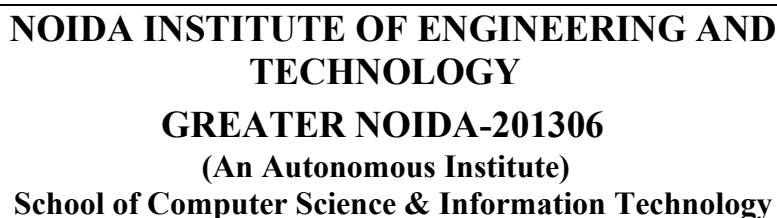
Course Code: BCSCC0552					Course Name: Research Methodology Ethics and Writing								L	T	P	C
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)													0	0	2	1
Pre-requisite: Basic communication skills, engineering fundamentals																
Course Objectives: This course equips students with fundamental research skills, including problem identification, literature review, data analysis, technical documentation, and ethical publication practices, while enhancing technical writing and scientific communication for academic and professional applications.																
Course Outcome: After completion of the course, the student will be able to													Bloom's Knowledge Level (KL)			
CO1	Analyze research methodologies, experimental design principles, and literature review techniques for identifying research gaps.												K3			
CO2	Apply quantitative and qualitative data acquisition, analytical methods, technical documentation, and scientific citation practices in research activities.												K4			
CO3	Develop technical reports, research manuscripts, and professional presentations using standard scientific writing and ethical communication practices.												K2			
CO-PO Mapping (Scale: 1: Low, 2: Medium, 3: High)																
CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	
CO1	3	2	–	2	1	–	–	2	–	1	–	1	–	2	3	
CO2	2	3	1	3	2	–	–	2	1	2	–	2	1	2	3	
CO3	2	3	2	3	2	–	–	3	2	3	1	1	–	1	3	
Course Contents / Syllabus																
Module 1			Fundamentals of Research Methodology and Literature Review									7 hours				
Definition of research, objectives of research, motivation and significance of research, types of research including fundamental, applied, qualitative, quantitative, and experimental research, stages of research process, research problem identification, formulation of research questions, identification of technical gaps, literature review methodologies, use of scientific databases such as Google Scholar, Scopus, Web of Science, IEEE Xplore, and ScienceDirect, keyword selection strategies, source reliability and credibility evaluation, annotated bibliography preparation, critical analysis of published research papers, and review writing techniques.																
Module 2			Data Collection, Analysis, and Technical Documentation									7 hours				
Primary and secondary data sources, data gathering methods, survey techniques, questionnaire design, experimental observations, data organization, structured sampling methods including random sampling, stratified sampling, and systematic sampling, basic statistical concepts including mean, median, standard deviation, graphical data representation, data analysis techniques, spreadsheet-based analysis, technical report preparation, scientific report structure including abstract, introduction, methodology, results, discussion, and conclusion, mini-project execution, research documentation, and technical documentation practices.																
Module 3			Citation Management, Publication Ethics, and Research Integrity									7 hours				
Ethical research practices, scholarly publishing standards, academic reference management, citation systems including IEEE, APA, and MLA, reference management software such as Mendeley and Zotero, plagiarism awareness, similarity detection tools, responsible citation practices, authorship ethics, predatory journals, peer review systems, journal indexing, impact factors, research integrity principles, publication misconduct, ethical compliance, professional publishing standards, citation formatting exercises, plagiarism analysis, journal quality evaluation, and ethical case studies.																
Module 4			Technical Writing and Research Documentation									9 hours				

Scientific and technical writing skills, engineering research documentation, professional documentation practices, technical report writing, project report preparation, review paper writing, conference paper drafting, research manuscript development, scientific writing styles, report organization, abstract preparation, introduction framing, methodology documentation, results presentation, discussion development, conclusion writing, proofreading, technical editing, document formatting, visual representation of technical data using tables, charts, and figures, documentation standards, formal technical presentations, dissemination of research findings, manuscript section drafting, technical document editing, and professional written communication.		
Total Lecture Hours		30 hours
Textbook:		
SNO	Book Title	Author
1.	Research Methodology: Methods and Techniques	C.R. Kothari & Gaurav Garg
2.	Research Methodology: A Step-by-Step Guide for Beginners	Ranjit Kumar
3.	The Craft of Scientific Writing	Michael Alley
4.	How to Write and Publish a Scientific Paper	Day & Gastel
5.	Research Methodology and Scientific Writing	George Thomas
Reference Materials		
SNO		
1.	IEEE Author Guidelines	
2.	Elsevier Researcher Academy Resources	
3.	Springer Author Academy	
4.	WIPO Resources for Research Documentation	
5.	University digital library resources	
Self Study Content Links:		
MOOCs Courses	1. https://www.coursera.org/learn/research-methods 2. https://researcheracademy.elsevier.com/	6 hrs 20 hrs
Video Lectures	1. https://www.youtube.com/watch?v=rz30rRfManE&list=PLdj5pVg1kHiOypKNUmO0NKOfvoIThAv4N 2. https://www.youtube.com/watch?v=HYj4Ghtl_qs 3. https://www.youtube.com/watch?v=N9tJCs-czOU&list=PLnIj1GYixjfrOheWQq_ANzLFDniGYZ_-Q 4. https://www.youtube.com/watch?v=NM53k7x_jjk	17 hrs
Web References	https://researcheracademy.elsevier.com https://authorservices.wiley.com	

				NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306 (An Autonomous Institute) School of Computer Science & Information Technology												
Course Code: BCSE0515				Course Name: WEB DEVELOPMENT USING MEAN STACK								L	T	P	C	
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)												3	0	0	3	
Pre-requisite: Basic knowledge of HTML, CSS and ES6 required.																
Course Objectives: 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.																
Course Outcome: After completion of the course, the student will be able to																
CO		Course Outcome												Bloom's Level		
CO1		Explain, analyze and apply the role of server-side scripting language like Nodejs in the workings of the web and web applications.												K3		
CO2		Demonstrate web application framework i.e., Express is to design and implement typical dynamic web pages and interactive web based applications.												K4		
CO3		Apply the knowledge of Typescript that are vital in understanding angular is, and analyze the concepts, principles and methods in current client-side technology to implement angular application over the web.												K3		
CO4		Analyze build and develop single page application using client-side programming i.e. angular js and also develop a static web application.												K4		
CO5		Understand the impact of web designing by database connectivity with Mongodb in the current market place where everyone use to prefer electronic medium for shopping, commerce, and even social life also.												K3		
CO-PO Mapping (Scale: 1: Low, 2: Medium, 3: High)																
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	3	1	3	-	-	1	3	-	3	2	2	3	1	
CO2	2	2	3	1	3	-	-	1	-	-	2	2	2	3		
CO3	2	2	2	2	2	-	-	-	2	-	2	2	2	2	2	
CO4	2	1	2	1	2	-	-	-	1	1	2	2	1	2	1	
CO5	2	1	3	2	3	-	-	-	3	2	3	2	1	3	2	
Course Contents / Syllabus																
Module 1				Introduction to Nodejs								9 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).																
Module 2				Express Framework								9 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.																
Module 3				Basics of Angular js								9 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.																
Module 4				Building Single Page App with Angular js								9 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.		
Module 5	Connecting Angular js with MongoDB	9 hours
Environment Setup of Mongoddb, data modeling, The current SQL/NoSQL landscape, Create collection in Mongoddb, CRUD Operations in MongoDB. Mongo's feature set, Introduction to Mongoose, Understanding mongoose schemas and datatypes, Connecting Angular with mongoDB using API.		
Total Lecture Hours		45 hours
Text Books		
S.NO	Book Title	Author
1.	“Web Application Development with MEAN”, 3 rd Illustrated Edition 2017, Packt Publications.	Amos Q. Haviv , Adrian Mejia , Robert Onodi
2.	“Getting MEAN with Mongo, Express, Angular, and Node”, 2 nd Edition 2016, Addison Wesley Publication.	Simon Holmes , Clive Herber
3.	“Comprehensive guide to learn Node.js”, 1 st Edition, 2018 BPB Publications.	Dhruti Shah
4.	“Learning Angular”,3 rd Edition,2017 Packt publications	Christoffer Noring, Pablo Deeleman
Reference Books:		
S.NO	Book Title	Author
1.	“Fullstack Angular: The Complete Guide to AngularJS and Friends”, 4th edition, 2020 International Publishing.	Anthony Accomazzo, Ari Lerner, and Nate Murray
2.	“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.	David Cho
3.	“Complete node.js: The fast guide: Learn complete backend development with node.js”5th edition, 2017 SMV publication.	Richard Haltman & Shubham Vernekar
4.	“Mastering Node.js: Build robust and scalable real-time server-side web applications efficiently” 2nd edition,2016 Packt Publishing Limited.	Glenn Geenen, Sandro Pasquali , Kevin Faaborg
5.	Express & MongoDB Development ,kindle edition,2019 international publishing.	Greg Lim
6.	“AngularJS Master Angular.js with simple steps, guide and instructions” 3rd edition, 2015 SMV publication.	Daniel Perkins
7.	“MongoDB Basics”, 2nd edition ,2018 International Publication.	Peter Membrey, David Hows, Eelco Plugge
Self Study Content Links:		
MOOCs	1. https://www.coursera.org/professional-certificates/ibm-full-stack-cloud-developer?utm_medium=sem&utm_source=gg&utm_campaign=b2c_india_ibm-full-stack-cloud-developer_ibm_ftcof_professional-certificates_cx_dr_bau_gg_sem_pr_in_all_m_hyb_24-06_x&campaignid=21316592778&adgroupid=165695367991&device=c&keyword=courses%20for%20full%20stack%20developer&matchtype=p&network=g&devicemodel=&creativeid=700589190893&assetgroupid=&targetid=kwd-571198547272&extensionid=&placement=&gad_source=1&gad_campaignid=21316592778&gbraid=0AAAAADdKX6Y4gVe2nrA-BD75Xjo7XWZvc&gclid=Cj0KCQjw3K7RBhDJARIsAKRtP5T6KxJN_3NMwp5KCs0I8bBY35dSkaUg10Y0FBCfhLqnqqyQCAG9yzgaAonEEALw_wcB	40 hrs
	2. https://www.udemy.com/career/full-stack-web-developer/?utm_campaign=Search_Keyword_CareerAccelerator_Prof_la.EN_cc.	30 hrs

	India&utm_source=google&utm_medium=paid-search&portfolio=CALP-India&utm_audience=mx&utm_tactic=nb&utm_term=._.ag_177463970814._.ad_749449716155._.kw_how%20to%20become%20a%20web%20developer&utm_content=g&funnel=&test=&gad_source=1&gad_campaignid=22487789892&gbraid=0AAAAADROdO0RdwZEytEck3hJ8p0YLN6Wu&gclid=Cj0KCQjw3K7RBhDJARIsAKRtP5SBLzCT5ZsRMLP4tx1IJo-2jQWUMIsGRaHabTFG0IY_G_eZuu7xmCYaAg1tEALw_wcB							
Video Lectures	1. https://youtu.be/BLI32FvcdVM 2. https://youtu.be/fCACK9ziarQ 3. https://youtu.be/YSyFSnisip0 4. https://youtu.be/mGVFItBxLKU 5. https://youtu.be/bWaucYA1YRI 6. https://youtu.be/7H_QH9nipNs 7. https://youtu.be/AX1AP83CuK4 8. https://youtu.be/ScsSCuHhOw0 9. https://youtu.be/IY6icfhap2o 10. https://youtu.be/z7ikpQCWbtQ 11. https://youtu.be/0LhBvp8qpro 12. https://youtu.be/k5E2AVpwsko 13. https://youtu.be/SQJkj0WYWOE.list=PLvQjNLQMdagP3OzoBMfBT48uJ-SPfSsWj 14. https://youtu.be/0eWrpsCLMJQ.list=PLC3y8-rFHvwhBRAgFinJR8KHlrCdTkZcZ 15. https://youtu.be/ZSB4JcLLrIo 16. https://youtu.be/0LhBvp8qpro 17. https://youtu.be/k5E2AVpwsko 18. https://youtu.be/SQJkj0WYWOE.list=PLvQjNLQMdagP3OzoBMfBT48uJ-SPfSsWj 19. https://youtu.be/0eWrpsCLMJQ.list=PLC3y8-rFHvwhBRAgFinJR8KHlrCdTkZcZ 20. https://youtu.be/ZSB4JcLLrIo 21. https://youtu.be/Kvb0cHWFkdc 22. https://youtu.be/pQcV5CMara8 23. https://youtu.be/c3Hz1qUUIyQ 24. https://youtu.be/Mfp94RjugWQ 25. https://youtu.be/SyEQLbbSTWg	17 hrs						
Web References	1. https://angular.io 2. https://www.mongodb.com/docs							
Mode of Evaluation								
CIE							ESE	Total
ST1	ST2	ST3	TA1 10	TA2 10	TA3 10	Attendance 10		
30			20				100	150



1.	Construct a program to demonstrate usage of Node.js fs module to read a file.	CO1
2.	Construct a program to display system information using the os module.	CO1
3.	Construct a program to create and export a simple Node.js module.	CO1
4.	Construct a program to parse a URL using the Node.js url module.	CO1
5.	Construct a program to create a basic HTTP server using Node.js	CO1
6.	Construct a program to demonstrate callback-based asynchronous execution.	CO1
7.	Construct a program to illustrate promise creation and resolution.	CO1
8.	Construct a program to demonstrate promise chaining with multiple operations.	CO1
9.	Construct a program to show JSON data parsing and stringifying.	CO1
10.	Construct a program to demonstrate routing in an Express application.	CO1
11.	Construct a program to demonstrate AngularJS data binding.	CO1
12.	Construct a program to build a Node.js server that handles GET requests.	CO1
13.	Construct a program to implement POST request handling using Express.	CO1
14.	Construct a program to perform CRUD operations using Express and MongoDB.	CO1
15.	Construct a program to create middleware for logging request details.	CO1

16. Construct a program to serve static files using Express.	CO1
17. Construct a program to create a MongoDB collection and insert documents.	CO1
18. Construct a program to build an AngularJS form with validation.	CO1
19. Construct a program to implement an API call using AngularJS AJAX.	CO1
20. Construct a program to compare synchronous and asynchronous file operations.	CO1
21. Construct a program to demonstrate differences between callbacks and promises.	CO1
22. Construct a program to illustrate REST API endpoints with multiple HTTP methods.	CO1
23. Construct a program to demonstrate middleware execution order in Express.	CO1
24. Construct a program to show one-way and two-way data binding in AngularJS.	CO2
25. Construct a program to analyze MongoDB document structure using Mongoose schema.	CO2
26. Construct a program to measure execution time of synchronous vs asynchronous code.	CO2
27. Construct a program to test REST API endpoints using different HTTP methods.	CO2
28. Construct a program to validate user authentication using Express sessions.	CO2
29. Construct a program to handle error responses with proper HTTP status codes.	CO2
30. Construct a program to demonstrate secure API access using middleware.	CO3
31. Construct a program to develop a RESTful API using Node.js, Express, and MongoDB.	CO3
32. Construct a program to build a single-page application using AngularJS.	CO3
33. Construct a program to integrate AngularJS frontend with Node.js backend.	CO3
34. Construct a program to implement user registration and login system.	CO3
35. Construct a program to build a full-stack application with CRUD operations and API integration.	CO3
Total Hours: 30 hrs	

Note: After completing all the laboratory experiments, students are required to obtain a Free Angular Online Course with Certificate - Beginner through [ScholarHat](https://www.scholarhat.com/free-course/angular-course?utm_source=chatgpt.com)

Web Reference	https://www.scholarhat.com/free-course/angular-course?utm_source=chatgpt.com Free Angular Online Course with Certificate - Beginner Level (8 hours)
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					NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306 (An Autonomous Institute) School of Computer Science & Information Technology											
Course Code: BCSML0511					Course Name: Deep Learning							L	T	P	C	
Course Offered in: CSE/CSE(R)/IT												3	0	0	3	
Pre-requisite: Python, Machine Learning																
Course Outcome: After completion of the course, the student will be able to													Bloom's Knowledge Level (KL)			
CO1		Describe ANN architectures, activation functions, and learning strategies in deep learning.										K2				
CO2		Discuss CNN, RNN, and Autoencoder architectures for intelligent applications.										K2				
CO3		Develop ANN and CNN models for classification and object detection problems.										K3				
CO4		Employ RNN, LSTM, and GRU models for sequence analysis and prediction tasks.										K3				
CO5		Evaluate Autoencoders and optimization methods for feature extraction and dimensionality reduction.										K4				
CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	
CO1	3	3	1	2	3	-	-	-	-	-	2	3	-	2	2	
CO2	3	2	3	2	3	-	-	1	1	-	2	3	1	2	2	
CO3	2	3	2	2	3	-	-	-	-	-	2	3	1	2	2	
CO4	3	3	2	2	3	-	-	1	1	-	3	3	-	3	2	
CO5	3	3	2	3	3	-	-	-	-	-	2	3	-	3	2	
Course Contents / Syllabus																
Module 1					Introduction							9 hours				
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. 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 Introduction to Deep Learning. Regularization for Deep Learning -Parameter Norm Penalties, Dataset Augmentation, Noise Robustness, Early Stopping, Dropout, Batch Normalization.																
Module 2					Convolution Neural Network							9 hours				
Introduction to Computer Vision and 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.																
Module 3					Detection & Recognition							9 hours				
Object Detection Fundamentals: Bounding Box and Localization, IoU; Evaluation metrics: Precision, Recall, mAP; Real-Time Detection: YOLO, SSD; Advanced Object Detection Models: YOLOv8, RetinaNet; Object Tracking: Tracking by Detection, Algorithm: SORT, Deep SORT																
Module 4					Recurrent Neural Networks							9 hours				
Sequential Data, 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							9 hours				

Definition and Motivation, Architecture of Autoencoder, Loss Functions in Autoencoders, Type of Autoencoder, Variational Autoencoder, Stacked auto-encoders, Sequence Autoencoder: Application of Autoencoder									
Total Lecture Hours								45 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		
3.	Machine Learning: A Probabilistic Perspective, MIT Press, 2012,						Murphy, K. P		
4.	The Elements of Statistical Learning, 2nd Edition, Springer, 2009.						Hastie, T., Tibshirani, R., and Friedman, J		
Self-Study Contents Links:								Duration	
MOOCs		https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01274814254931148859_shared/overview					34 hour 51 min		
Video Lectures		YOLOv8 Full Tutorial Playlist Object Detection, Segmentation & Classification Explained - YouTube:					10 Hour 30 min		
Web References		https://www.datacamp.com/blog/yolo-object-detection-explained					2 hour		
Mode of Evaluation									
CIE							ESE		Total
ST1	ST2	ST3	TA1 10	TA2 10	TA3 10	Attendance 10			
30			20				100		150



NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
GREATER NOIDA-201306
(An Autonomous Institute)
School of Computer Science & Information Technology

LAB Course Code: BCSML0511P	LAB Course Name: Deep Learning Lab	L	T	P	C
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Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)	0	0	2	1
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Pre-requisite: Python Programming

Course Objectives:

The course aims to develop practical skills in data preprocessing, feature engineering, supervised and unsupervised machine learning.

Course Outcome: After completion of the course, the student will be able to Level	Bloom Knowledge
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CO1	Outline ANN implementation, optimization, and regularization techniques.	K2
CO2	Construct CNN and transfer learning models for image classification and detection tasks.	K3
CO3	Examine RNN, LSTM, GRU, and Autoencoder models for sequence learning and feature representation	K4

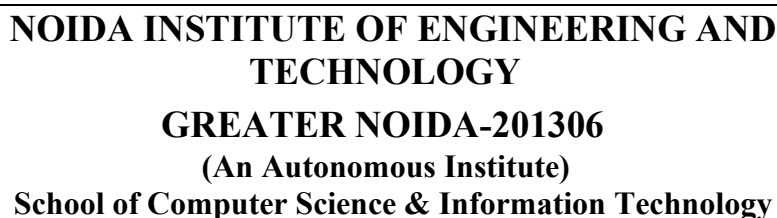
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	1	-	1	1	-	2	3	2	2	1
CO2	3	3	3	3	3	1	-	1	1	1	2	3	2	3	2
CO3	3	3	3	3	3	1	-	1	1	1	3	3	3	2	2

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

S.No	Experiment (Case Study Based Question)	CO Mapping
1	Build and train an Artificial Neural Network using a custom dataset (e.g., digit or medical classification).	CO1
2	Write a program to Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.	CO1
3	Demonstrate dropout and batch normalization in training a deep network.	CO1
4	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.	CO1
5	Train a CNN on image data (e.g., CIFAR-10 or MNIST) and evaluate performance.	CO2
6	Apply Transfer Learning using pre-trained models like VGG16 or ResNet on a custom dataset.	CO2
7	Perform hyperparameter tuning (batch size, learning rate, filters) on a CNN	CO2
8	Implement Precision, Recall, F1 Score for a classification task using confusion matrix.	CO2
9	Design a simple object detection model using YOLOv8 on sample images.	CO2
10	Implement a basic RNN for text generation or sequence prediction.	CO3
11	Build LSTM/GRU-based language model (e.g., sentiment analysis or next-word prediction).	CO3
12	Implement Long Short-Term Memory Networks using sample data.	CO3
13	Implement a Denoising Autoencoder.	CO3
14	Implement an Autoencoder on MNIST to reconstruct images.	CO3
15	Implement a Variational Autoencoder (VAE) on the MNIST dataset for image generation	CO3

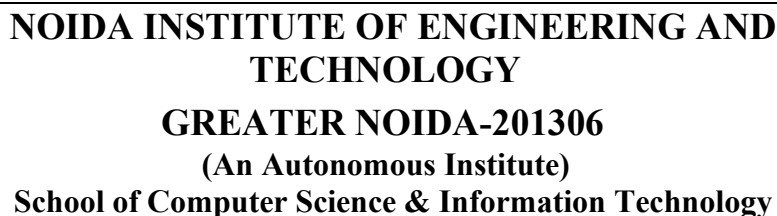
Total Hours: 17 Hours



Course Code: BCSAI0520						Course Name: Cloud Virtualization						L	T	P	C
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)												3	0	0	3
Pre-requisite: Introduction to Cloud Computing															
Course Objectives:															
Provide virtualization concepts to design, deploy, and manage open-source virtualized environments and cloud infrastructure. Learn different types of virtualization techniques, including server virtualization, storage virtualization, network virtualization, and desktop virtualization. Develop the ability to install, configure, and manage virtual machines using virtualization tools and platforms. Analyze the performance, resource allocation, security, and scalability aspects of virtualized environments. Gain practical knowledge of deploying and managing virtualization solutions for efficient utilization of hardware and cloud infrastructure resources.															
Course Outcome: After completion of the course, the student will be able to													Bloom's Knowledge Level (KL)		
CO-1	Understand the fundamentals of virtualization technologies, hypervisors, and their role in cloud computing environments												K2		
CO-2	Analyze server and desktop virtualization platforms, virtual machines, and resource allocation mechanisms.												K4		
CO-3	Apply network virtualization concepts and Software-Defined Networking (SDN) techniques in virtualized environments.												K3		
CO-4	Apply storage virtualization models and cloud-based storage solutions for efficient data management.												K3		
CO-5	Examine various security tools and techniques for selecting suitable security solutions in cloud environments.												K4		
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)															
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	1	–	–	1	–	–	–	–	–	–	3	–	2	1
CO2	2	3	2	1	3	–	–	–	–	–	1	3	–	2	2
CO3	2	2	3	2	3	–	–	–	1	–	–	2	1	3	2
CO4	2	2	3	2	3	–	–	–	–	–	1	3	–	2	2
CO5	2	3	2	1	2	–	–	1	–	–	2	3	1	2	3
Course Contents / Syllabus															
Module-1				Introduction to Virtualization Technologies and Hypervisors										09 hours	
Virtualization and cloud computing: Evolution of virtualization technologies, Limitations and challenges, Need of virtualization, benefits, limitations, Level of Virtualization, Types of Virtualizations, Session-based virtualization, Guest OS and host OS															
Hardware virtualization: Full virtualization, Partial virtualization, Paravirtualization, Hardware assisted Virtualization															
Software virtualization: Hypervisor, role of hypervisors, Hypervisor Architecture, Types of Hypervisors (Type-1, Type-2), Virtualization Architecture, Virtual Box, VMware.															
Module-2				Server and Desktop Virtualization										09 hours	

Virtual Machine: Introduction, Types of virtual machines, Server Virtualization, types of server virtualization, Physical vs virtual servers, Resource allocation (CPU, memory, storage and I/O). Business Cases for Server Virtualization, Uses of Virtual Server Consolidation, Selecting Server Virtualization, Platform-Desktop Virtualization, Remote access protocols (RDP, ICA), Centralized vs distributed desktop environments, Types of Desktop Virtualization: VDI, EC2. VMware ESXi, Microsoft Hyper-V, KVM, QEMU, XenServer Installation and configuration.		
Module-3	Network Virtualization	9 hours
Network Virtualization: Concept and Evolution of network virtualization Types, Overlay and underlay networks, VLAN Vs. VXLAN, VMware NSX, Virtual Network Interface Cards (vNICs), Software-Defined Networking (SDN): SDN architecture and control plane/data plane, Virtual switches, Virtual Routing, OpenFlow protocol, SDN controllers (e.g., ONOS, OpenDaylight), Virtual Private Cloud (Public, Private).		
Module-4	Storage Virtualization	9 hours
Storage Virtualization: Introduction, Benefits, Types of Storage: Direct Attached Storage, Storage Area Network, Network Attached Storage, RAID), Virtualization-Block, File-Address space Remapping, Risks of Storage, Types of Storage Virtualization: Block-level virtualization, File-level virtualization, Object storage virtualization. Storage Provisioning Techniques: Thick provisioning vs thin provisioning, Storage tiering (hot, warm, cold data). Data Management Techniques: Data deduplication, Data compression, Data replication (synchronous and asynchronous), Data migration, Backup and Recovery. Storing data in the cloud: S3 and Glacier, EBS and EFS, Using Relational Database Service: RDS, NoSQL Database Service: DynamoDB.		
Module-5	Security & Trends	9 hours
Threats and Vulnerabilities: Hypervisor attacks and vulnerabilities, VM escape and VM hopping, Denial of Service (DoS), Insider Secure boot, VM Security, VM isolation and sandboxing, Network Security, Data Security, Virtualization in edge and hybrid cloud virtualization, Virtual firewalls and security policies. Cloud Security: firewall, IAM, Multi-Factor Authentication, Data Encryption (at rest and in-transit) Emerging trends: Serverless computing, Function-as-a-Service (FaaS), Confidential computing.		
Total Lecture Hours		45 hours
Textbook:		
Book Details		Authors Name
Virtualization Essentials, Wiley India Pvt. Ltd., 2nd Edition, 2016		Matthew Portnoy
Virtual Machines: Versatile Platforms for Systems and Processes, Morgan Kaufmann Publishers, 1st Edition, 2005		James E. Smith and Ravi Nair
Professional Xen Virtualization, Wiley Publishing Inc., 1st Edition, 2008		William von Hagen
Reference Books:		
Book Details		Authors Name
Virtualization: From the Desktop to the Enterprise, Apress Publications, 1st Edition, 2005		Chris Wolf, Erick M. Halter
Cloud Native Security, O'Reilly Media, 1st Edition, 2021		Mike Ryan
Cloud Computing Security: Concepts and Practice, Emereo Publishing, 1st Edition, 2013,		Ivanka Menken
Self-Study Content Links:		Duration (in Hrs)
MOOCs	Mastering VMware vSphere 6.5	16Hrs 08Min
Video Lectures	1. https://www.youtube.com/watch?v=7m3f-P-WWbg (Edureka) 2. https://www.youtube.com/watch?v=wOBA6Wri0Fg 3. https://www.youtube.com/watch?v=b_krXFeOEDU 4. youtube.com/watch?v=2LaAJq1lB1Q&t=147s&pp=0gcJCQYLAYcqIYzv	00Hrs 25Min 01Hrs 51Min 03Hrs 48Min 10Hrs 17Min
Web References	1. https://awsacademy.instructure.com/courses/ 2. https://www.getyoureducation.net/course/virtualization-sharing-cloud-resources?utm_source=chatgpt.com	
Mode of Evaluation		

CIE							ESE	Total
ST1	ST2	ST3	TA1 10	TA2 10	TA3 10	Attendance 10		
30			20				100	150



LAB Course Code: BCSAI0520P				LAB Course Name: Cloud Virtualization Lab									L	T	P	C
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)													0	0	2	1
Pre-requisite: Introduction to Cloud Computing																
Course Objectives:																
Learn to provide students with practical experience in using cloud services and tools. This involves setting up virtual machines, storage solutions, databases, and networking configurations. Understand and implement different virtualization techniques including server, storage, and network virtualization. Gain hands-on experience in creating and managing virtualized cloud environments and resource allocation. Analyse the performance, scalability, and security aspects of virtualization in cloud computing environments. Apply virtualization technologies to optimize hardware utilization, system management, and cloud infrastructure deployment.																
Course Outcome: After completion of the course, the student will be able to													Bloom's Knowledge Level (KL)			
CO-1	Configuration of virtualization platforms such as VirtualBox, VMware ESXi, and Hyper-V												K3			
CO-2	Analyze virtual networking and storage using tools like VPC and cloud services (S3, EBS, RDS).												K4			
CO-3	Apply security features like Firewalls and IAM along-with auto-scaling and its policies.												K3			
	CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)															
	CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO1	PSO2	PSO3	PSO4
	CO1	2	1	2	1	3	–	–	–	1	–	–	3	–	2	3
	CO2	2	3	2	2	3	–	–	–	1	–	1	3	–	3	3
	CO3	2	2	3	2	3	–	–	1	–	–	1	3	1	2	3
List Of Practical's															CO	
1	Creation of Virtual Machines using Virtual Box														CO1	
2	Configuration of VMware ESXi / Hyper-V Type-1 hypervisor and explore its interface and VM deployment capabilities.														CO1	
3	Create and configure Linux/Windows EC2 instances with key pairs and security groups.														CO1	
4	Start, stop, reboot, terminate, and connect to EC2 instances via SSH or RDP.														CO1	
5	Monitor CPU, disk, and network metrics of a virtual instance.														CO1	
6	Configure subnets, route tables, internet gateway, and NAT for a Virtual private cloud setup.														CO2	
7	Create S3 buckets, upload/download files, set access policies, and enable versioning.														CO2	
8	Create, attach, detach, and snapshot EBS volumes.														CO2	
9	Set up a MySQL/PostgreSQL database using Amazon RDS and connect it to an application.														CO2	
10	Configure Security Groups for a Virtual private cloud setup.														CO3	
11	Create IAM users/groups, assign policies, and demonstrate fine-grained access control.														CO3	
12	Configure launch templates, auto scaling groups, and scaling policies for an EC2 virtual environment.														CO3	
Total Hours: 30 hrs																



**NOIDA INSTITUTE OF ENGINEERING AND
TECHNOLOGY**
GREATER NOIDA-201306
(An Autonomous Institute)
School of Computer Science & Information Technology

Course Code: BCSE0514	Course Name: Design Patterns	L	T	P	C
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Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)	3	0	0	3
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Pre-requisite: Object Oriented Analysis and Design. Data structures and algorithms. Programming Language (C++ or Java)

Course Objectives: 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.

Course Outcome: After completion of the course, the student will be able to

CO	Course Outcome	Bloom's Level
CO1	Analyze, classify, and apply appropriate design patterns to solve real-world software problems, understanding their structure and selection principles.	K3
CO2	Identify, compare, and apply creational design patterns (Factory, Abstract Factory, Builder, Prototype, Singleton) to develop flexible and reusable software components.	K4
CO3	Analyze, design, and implement structural design patterns to improve flexibility, reusability, and maintainability of software systems.	K4
CO4	Analyze, design, and apply behavioral design patterns (Mediator, Memento, Observer) to manage object interactions and system behavior effectively.	K3
CO5	Analyze and implement advanced behavioral design patterns to solve common software design problems.	K4

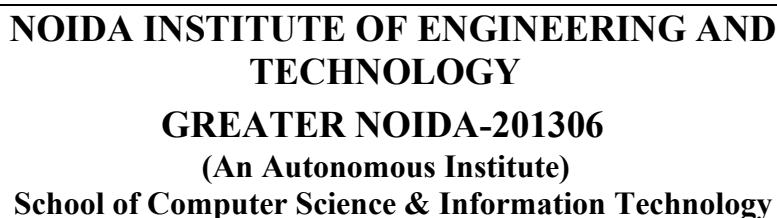
CO-PO Mapping (Scale: 1: Low, 2: Medium, 3: High)

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	2	-	-	1	1	-	2	2	—	3	2
CO2	3	2	3	1	3	-	-	1	1	-	2	2	1	3	2
CO3	3	3	3	2	3	-	-	1	1	-	2	2	1	3	2
CO4	3	3	3	2	2	-	-	1	1	-	2	2	—	3	2
CO5	3	2	3	2	2	-	-	1	2	-	3	2	—	3	3

Course Contents / Syllabus

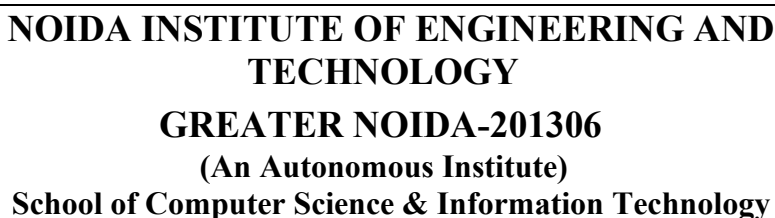
Module 1	Introduction to Design Patterns	9 hours
Describing Design Patterns, Design Patterns in Smalltalk MVC, The Catalog of Design Patterns, Organizing the Catalogue, Design Patterns for Solving the Real-life Problems, Selection and Use of Design patterns.		
Module 2	Creational Design Pattern	9 hours
Creational Patterns: Abstract Factory, Builder, Factory Pattern, Prototype Pattern, Singleton pattern.		
Module 3	Structural Design Pattern	9 hours

Structural Pattern Part-I, Adapter, Bridge, Composite.									
Structural Pattern Part-II, Decorator Pattern, Facade Pattern, Flyweight Pattern, Proxy Pattern.									
Module 4		Behavioural Patterns - I					9 hours		
Behavioural Patterns Part: I, Chain of Responsibility Pattern, Command Pattern, Interpreter Pattern, Iterator Pattern. Behavioural Patterns Part: II, Mediator, Memento, Observer Pattern.									
Module 5		Behavioural Patterns - II					9 hours		
Behavioral Patterns Part: III, State Patterns, Strategy, Template Patterns, Visitor, Expectation from Design Patterns Relationship between different Design Patterns.									
Total Lecture Hours							45 hours		
Textbook:									
S.NO.	TITLE					Authors			
1	First Design Patterns, 2004, O'Reilly					Eric Freeman, Elisabeth Freeman, Kathy Sierra, Bert Bates Head			
2	Design Patterns: Elements of Reusable Object oriented Software Addison-Wesley, 1995.					Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides			
Reference Books:									
S.NO.	TITLE					Authors			
1	Design Patterns Pearson Education					Erich Gamma			
2	Patterns in JAVA Volume -I					Mark Grand, Wiley Dream			
Self Study Content Link:									
MOOCs		1. https://www.coursera.org/learn/design-patterns 2. https://www.udemy.com/course/soft-design-patterns/?utm_campaign=Search_DSA_Beta_Prof_la.EN_cc.India&utm_source=google&utm_medium=paid-search&portfolio=India&utm_audience=mx&utm_tactic=nb&utm_term=_ag_160270535505_ad_696202838334_kw_&utm_content=g&funnel=&test=&gad_source=1&gad_campaignid=21178559974&gbraid=0AAAAADROdO3wWjcAcJrZ3ow_Fcj2OFn24&gclid=Cj0KCQjw3K7RBhDJARIsAKRtP5TgfS7r7XJhzwC-gZgMsTFRkUx44pchkPY7WDXEXQyxDGeidGMqrbAaAn56EALw_wcB&couponCode=PMNVD2025					25 hrs		
							5 hrs		
Video Lectures		1. https://www.youtube.com/watch?v=ysoC8S96pZU&list=PLBBog2r6uMCRsrR48HzIFtNx4-BDOmU0 2. https://www.youtube.com/playlist?list=PLmCsXDGbJHdhULIoYzIIIeFFJSo1NIMbN 3. https://www.youtube.com/watch?v=dCWuXDBRFtk&list=PL2NZAYdLkYvhFnqvbLbwf4ZM4rH99Jap6 4. https://www.youtube.com/watch?v=a4u_caEWTR8&list=PL2NZAYdLkYvg_5SpIDMIROPz-dD_KsIX					36 Min		
							1 hr		
							6 Min		
							8 Min 50 Sec		
Web References		1. https://refactoring.guru/design-patterns 2. https://www.geeksforgeeks.org/system-design							
Mode of Evaluation									
CIE							ESE		Total
ST1	ST2	ST3	TA1 10	TA2 10	TA3 10	Attendance 10			
30			20				100		150



Course Code: BCSSL0512				Course Name: Natural Language Processing								L	T	P	C
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)												3	0	0	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	
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)															
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	1	2	-	-	-	1	1	-	3	–	2	1
CO2	3	3	2	2	3	-	-	-	1	1	-	3	–	2	2
CO3	3	3	2	3	3	1	-	-	1	2	1	3	–	2	2
CO4	3	2	3	2	3	1	-	-	1	2	1	3	–	3	2
CO5	3	3	3	2	3	2	1	1	1	2	1	3	1	3	3
Course Contents/ Syllabus															
Module 1				Introduction to Natural Language Processing										9 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										9 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										9 hours	
Text classification, Sentiment Analysis, Topic modelling, LSA, LDA, Opinion Mining, Information Extraction, Information Retrieval.															
Module 4				Sequential Modelling and Transformers										9 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										9 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								45 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, 2018Cryptography and Network						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						JYaov Goldeberg	
Self Study Content Link:									
MOOCs		1. https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs45 2. https://www.coursera.org/specializations/deep-learning?utm_medium=sem&utm_source=gg&utm_campaign=b2c_india_deep-learning_deeplearning-ai_ftcof_specializations_cx_dr_bau_gg_pmax_pr_in_all_m_hyb_24-01_desktop&campaignid=20920191021&adgroupid=&device=c&keyword=&matchtype=&network=x&devicemodel=&creativeid=&assetgroupid=6487004747&targetid=&extensionid=&placement=&gad_source=1&gad_campaignid=20930155807&gbraid=0AAAAADdKX6Z3pSpwkoWShwEGojAlPVNXW&gclid=Cj0KCQJw3K7RBhDJARIsAKRtP5QRJj8-PsTeIrazzbMavqCMSxjvO9s1VAm6-uBOUoSqHvjEGVV0wJcaAgNHEALw_wcB						12 Weeks 40 hrs	
Video Lectures		1. https://www.youtube.com/watch?v=XRpJMxLaLeA&list=PLZ2ps_7DhBY8Mbke8rzGsACDQIIocCqH 2. https://www.youtube.com/watch?v=AfVhsg9jJNA&list=PLtCBuHKmdxOefxJhd6u8KY9vTN8G5D5yG&index=31						30 hrs 8 hrs	
Web References		1. https://huggingface.co/docs 2. https://www.nltk.org							
Mode of Evaluation									
CIE							ESE		Total
ST1		ST2	ST3	TA1 10	TA2 10	TA3 10			
30				20			100		150



Pre-requisite: Students should have basic knowledge of programming concepts, database management systems (DBMS), computer networks, operating systems, and data structures. Familiarity with SQL queries, file handling, and basic Linux/Unix commands is desirable.

Course Outcome: After completion of the course, the student will be able to	Bloom's Knowledge Level (KL)
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CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

Course Contents / Syllabus									
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Introduction to Big Data : Types of digital data, history of Big Data innovation, introduction to Big Data platform, drivers for Big Data, Big Data architecture and characteristics, 5 Vs of Big Data, Big Data technology components, Big Data importance and applications, Big Data features, Big Data Analytics, modern data analytic tools.

Module 2	Hadoop	9 hours
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Hadoop, scaling out, Hadoop streaming, Hadoop pipes, Hadoop Echo System.
Map Reduce: Map-Reduce framework and basics, how Map Reduce works, anatomy of a Map-Reduce job run, failures, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats, Map Reduce features, Real-world Map Reduce.
Hadoop Eco System and YARN: Hadoop ecosystem components, Hadoop 2.0 New Features, MRv2, YARN

Design of HDFS, HDFS concepts, benefits and challenges, file sizes, block sizes and block abstraction in HDFS, how does HDFS store, read, and write files, Flume and Scoop, Hadoop archives, Hadoop I/O: compression, serialization, Avro and file-based data structures. Hadoop Eco- System Frameworks: PIG, HIVE, HBASE, ZOOKEEPER.

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

Module 4	Cloud Technologies And Advancements Hadoop	9 hours
Cloud Technologies And Advancements Hadoop : MapReduce, Cloud overview & characteristics, cloud service model (iaas, paas, saas) , cloud deployment model (public, private, hybrid), Google cloud platform (GCP) infrastructure overview create GCP account & console overview, Virtual Box , Google App Engine, Programming Environment for Google App Engine Open Stack Federation in the Cloud, our Levels of Federation, ederated Services and Applications, Future of Federation.		

Module 5	Virtual Networks	9 hours
Virtual Networks :Virtual Private Cloud (VPC) & types, subnets , addresses (public/private), NIC ,routes & route table , firewalls , network topology options .		
Google cloud storage overview & Structure : Cloud datastore, Cloud bigtable : nosql big data service bigquery basics, how to use machine learning with Bigquery.		

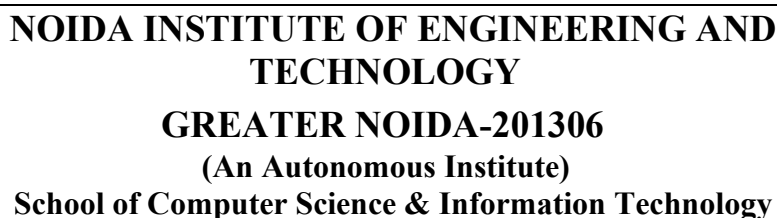
Total Lecture Hours	45 hours
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Textbook:		
S.No	Book Title	Authors
1	"Programming Hive", O'Reilley, 2012. 7. Lars George, "HBase:The Definitive Guide", O'Reilley, 2011.	Michael Minelli, Michelle Chambers, and Ambiga Dhiraj
2	"Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012. 5. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.	Tom White,
3	Programming Hive", O'Reilley, 2012. 7. Lars George, "HBase:The Definitive Guide", O'Reilley, 2011.	E. Capriolo, D. Wampler, and J. Rutherglen, "

Reference Books:		
S.No	Book Title	Authors
1	"Programming Pig", Paperback Edition, O'Reilly Media, 1st Edition, 2011	Alan Gates
2	"Big Data, Black Book: Covers Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization", Dreamtech Press, 2016	DT Editorial Services

Self Study Content Link:		
MOOCs	1. https://www.coursera.org/specializations/big-data	3 Months
	2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc22_cs65	8 Weeks
Video Lectures	1. https://www.youtube.com/watch?v=9QxZhapbo0o	12 hrs
	2. https://www.youtube.com/watch?v=XueP_ex_rqg	12 hrs
	3. https://www.youtube.com/watch?v=nY6hOJ3bFGQ	12 hrs
Web References	1. https://spark.apache.org/docs	
	2. https://hadoop.apache.org	

Mode of Evaluation								ESE	Total
CIE									
ST1	ST2	ST3	TA1 10	TA2 10	TA3 10	Attendance 10			
30			20				100	150	



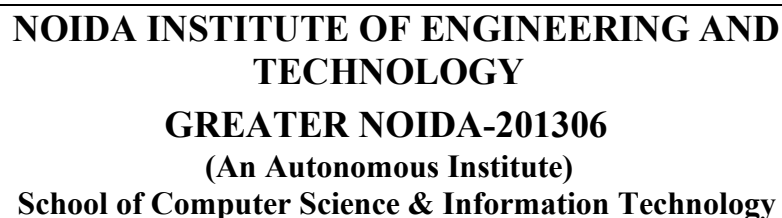
Popular Image Segmentation Architectures, FCN Architecture, Upsampling Methods, Pixel Transformations, Geometric Operations, Spatial Operations in Image Processing, Instance Segmentation, Localisation, Object detection and image segmentation using CNNs.

LSTM and GRU's. Vision Models, Vision Languages, Quality Analysis, Visual Dialogue, Active Contours & Application, Split & Merge, Mean Shift & Mode Finding, Normalized Cuts.		
Module 4	Object Detection	9 hours
Object Detection and Sliding Windows, R-CNN, Fast R-CNN, Object Recognition, 3-D vision and Geometry, Digital Watermarking. Object Detection, face recognition instance Recognition, Category Recognition, Object classification. R-CNN, F-RCN, SSD, Retinanet, YOLO, CornerNet, Image Segmentation- U-Net, SegNet, Mask-RCNN, Attention Models- Vision Transformers.		
Module 5	Visualization and Generative Models	9 hours
Benefits of Interpretability, Fashion MNIST, Class Activation, Map code walkthrough, GradCAM,ZFNet. Introduction about Deep Generative Models, Generative Adversarial Networks Combination VAE and GAN's, other VAE and GAN's deep generative models. GAN Improvements, Deep Generative Models across multiple domains, Deep Generative Models image and video applications. Case Study: Computer Vision based Mouse, Computer Vision based Text Scanner, Computer Vision based Smart Selfie, Surveillance Robot, Sixth Sense Robot, IoT-enabled assistive devices, Surveillance Robots or Smart CCTV.		
Total Lecture Hours		45 hours
Textbook:		
S. No		
1.	"Introductory Techniques for 3D Computer Vision", edition 2009	William Stallings and Lawrie Brown
2	"Computer Vision: Algorithms and Applications", 2022, The University of Washington Edition, 2022	Szelisk Richard
3	"Computer Vision - A Modern Approach", Prentice Hall,, Edition 2015	Forsyth D. and Ponce J.,
4	"Introductory Techniques for 3D Computer Vision", Prentice Hall.	Trucco E. and Verri A.,
5	"Computer & Machine Vision", Academic Press 4th Edition 2012	Davies E. R.,
6	"Computer Vision: Models, Learning, and Inference", Cambridge University Press Edition, 2012	Simon J. D. Prince,
Reference Books:		
S.No	Book Title.	Author
1.	"Computer Vision: A Modern Approach", Prentice Hall, 2nd edition, 2015	Forsyth D. and Ponce J.,
2	"Computer Vision: Models, Learning, And Inference". Cambridge University Press, 1st Edition, 2012.	"Prince, Simon J.D.
3	"Computer Vision", Prentice-Hall, 2008.	Ballard D. H., Brown C. M
4	"Understanding Augmented Reality, Concepts and Applications", Morgan Kaufmann, Edition 2013	Craig Alan B
5	"Computer Vision: Algorithms and Applications (CVAA)", Springer edition, 2022	Richard Szeliski
Self Study Content Link:		Hours
MOOCs	1. NPTEL Computer Vision Course https://nptel.ac.in/courses/106106224? 2. Coursera Deep Learning for Computer Vision https://www.coursera.org/learn/deep-learning-computer-vision?	80 Hrs 20 Hrs

Video Lectures	1. OpenCV Tutorial for Beginners https://www.youtube.com/watch?v=oXlwWbU8l2o	3 Hrs						
	2. CNN and Object Detection Tutorial https://www.youtube.com/watch?v=pj9-rr1wDhM	3 Hrs						
	3. YOLO Object Detection Explained https://www.youtube.com/watch?v=MPU2Histivl	2 Hrs						
Web References	1. TensorFlow Computer Vision Tutorials https://www.tensorflow.org/tutorials/images/ 2. PyTorch Vision Tutorials							
Mode of Evaluation								
CIE							ESE	Total
ST1	ST2	ST3	TA1	TA2	TA3	Attendance		
			10	10	10	10		
30			20				100	150

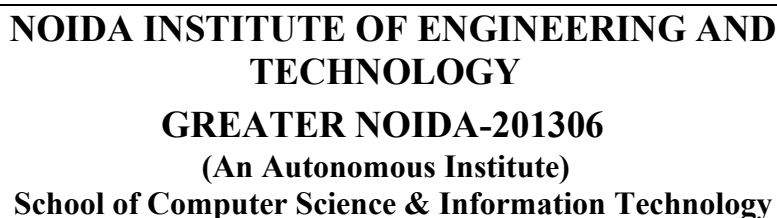
				NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306 (An Autonomous Institute) School of Computer Science & Information Technology											
Course Code: BCSE0603				Course Name: Software Engineering and Design								L	T	P	C
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)												3	1	0	4
Pre-requisite: Fundamental knowledge of programming concepts, data structures, object-oriented concepts															
Course Objectives: 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.															
Course Outcome: After completion of the course, the student will be able to													Bloom's Knowledge Level (KL)		
CO1	Understand software engineering principles, software process models, and Agile methodologies for effective software project development and management.												K2		
CO2	Demonstrate SRS documentation and software quality assurance practices to ensure software design and development meet applicable standards.												K3		
CO3	Compare and contrast various design concepts to develop effective software design solutions.												K4		
CO4	Analyze software testing techniques along with test management practices to ensure and improve software quality.												K4		
CO5	Analyze software maintenance, project management, estimation techniques, software metrics, risk management, and configuration management concepts in software development.												K4		
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	-	-	-	-	-	-	-	1	2	-	2	-
CO2	2	2	2	-	2	-	2	-	-	1	1	3	2	-	2
CO3	2	2	3	-	2	-	-	-	-	-	-	2	1	3	-
CO4	-	2	2	2	3	-	-	-	-	-	1	2	2	-	3
CO5	-		1	-	2	-	-	-	-	2	3	1	3	2	2
Course Contents / Syllabus															
Module 1				Introduction to Software Engineering and Development models										9 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, detailed Case study on Agile methodology.															
Module 2				Software Requirement and Quality Assurance										9 hours	
Software Requirement Specifications (SRS): Functional and non – functional requirements, 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.															
Module 3				Software Design										9 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.															
Module 4				Software Testing										9 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.									
Module 5			Project Maintenance and Management Concepts						9 hours
Software Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Need of 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.									
Total Lecture Hours								45 hours	
Textbook:									
S.No	Book Title						Author		
1	Software Engineering						KK Aggarwal and Yogesh Singh		
2	Software Engineering: A Practitioner's Approach						RS Pressman		
3	Fundamentals of Software Engineering						Rajib Mall		
Reference Books:									
S.No	Book Title						Author		
1	Software Engineering						Pankaj Jalote		
2	Fundamentals of Software Engineering						Ghezzi, M. Jarayeri, D. Manodrioli		
3	Software Engineering						Kassem Saleh		
4	Software Engineering						Ian Sommerville		
Self-Study Contents Links:								Duration	
Moocs		https://onlinecourses.nptel.ac.in/e-learning/preview/noc20_cs68						18(hr)	
Video Lectures		1. https://www.youtube.com/playlist?list=PLh11ucJN276JGE-oNKj2DDcBQmRKV_SQB 2. https://www.youtube.com/watch?v=NILM3sVF8wY&t=20969s 3. https://www.youtube.com/playlist?list=PLZ2ps_7DhBYt5yvXrYAjjWtf5O399Xea						13(hr) 6(hr) 17(hr)	
Web References		1. https://www.atlassian.com/agile 2. https://www.ibm.com/topics/software-engineering							
Mode of Evaluation									
CIE							ESE		Total
ST1	ST2	ST3	TA1	TA2	TA3	Attendance			
			10	10	10	10			
30			20				100		150



Lab No.	Title of Program	CO
1.	Building a simple convolutional neural network for spam classification.	CO1
2.	Building a simple convolutional neural network for image classification.	CO1
3.	Implementing different types of pooling layers and comparing their effects on network performance.	CO2
4.	Training a CNN model on a large-scale image classification dataset using cloud- based GPU acceleration.	CO1
5.	Building a simple convolutional neural network for Cats-v-dogs classification	CO1
6.	Fine-tuning a pre-trained CNN for a specific image recognition task.	CO1
7.	Building a simple convolutional neural network for transfer learning using finetuning.	CO1
8.	Building a simple convolutional neural network for transfer learning using feature extraction.	CO1

9.	Building a CNN model for object detection using a pre-trained architecture like YOLO.	CO1
10.	Exploring different activation functions and comparing their effects on network performance.	CO1
11.	Write a program to Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.	CO1
12.	Implement a program for basic image operations.	CO2
13.	Implement a program for image enhancement	CO2
14.	Building a simple convolutional neural network for spam classification.	CO1
15.	Implement a program for image compression	CO2
16.	Implement a program for color image processing	CO2
17.	Implement a program for image segmentation	CO2
18.	Design a program for image morphology	CO2
19.	Implementing De-noising auto encoder.	CO2
20.	Implementing Deep auto encoder.	CO2
21.	Implementing convolutional auto encoder.	CO2
22.	Implementing feature extraction for classification using auto encoder.	CO3
23.	Implementing feature extraction for regression using auto encoder.	CO3
24.	Perform scaling, rotation and shifting operations on an image using OpenCV()	CO3
25.	Perform image reflection on an image using OpenCV().	CO3
26.	Implementing a basic Variational Autoencoder (VAE) for image generation	CO3
27.	Training a Generative Adversarial Network (GAN) to generate synthetic images.	CO3
28.	Implement and apply using Image Restoration	CO3
29.	Implement and apply using Edge detection	CO3
30.	Implement a program for color image processing	CO2
		Total Hours:30 hrs



LAB Course Code: BCSE0653Y					LAB Course Name: Software Engineering and Design Lab								L	T	P	C
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)													0	0	4	2
Pre-requisite: Fundamental knowledge of programming concepts, data structures, object-oriented concepts																
Course Objectives:																
The course develops students' skills in software development across different phases of the Software Development Life Cycle (SDLC). It emphasizes software quality assurance, software development models, UML-based design, and test case generation. Students gain practical knowledge of structural, behavioral, and architectural modeling using StarUML along with software testing techniques and test suite design.																
Course Outcome: After completion of the course, the student will be able to														Bloom's Level		
CO1	Apply Software Engineering principles and appropriate software development life cycle models in software projects to develop IEEE standard SRS documents.													K3		
CO2	Design and represent software projects using different UML diagrams based on software design concepts.													K3		
CO3	Perform software testing using various testing techniques and generate test cases to ensure software quality.													K4		
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)																
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	
CO1	3	3	2	-	2	-	2	-	-	1	2	2	-	2	1	
CO2	2	2	3	-	2	-	-	-	-	-	-	1	2	2	-	
CO3	2	3	2	2	3	-	-	-	-	1	2	3	2	-	3	
List Of Practical's (Indicative & Not Limited To)																
S.No	Experiment (Case Study Based Question)													CO Mapping		
1	Team formation and allotment of Mini project: Problem statement, Literature survey, Requirement. Analysis. OR Case Study : (Airline/Railway Reservation System, College ERP System, Banking System, Food Delivery Application, ATM Management System, Online Ticket Booking System, Mobile Recharge Application, Vehicle Rental System etc.													CO1		
2	To draw the Use Case Diagram for the selected mini project or case study identified in Experiment 1 using UML modelling techniques													CO2		
3	To draw the Data Flow Diagram (DFD) at different levels for the mini project or case study identified in Experiment 1													CO2		
4	To design an Entity Relationship (ER) Diagram with multiplicity for the mini project or case study identified in Experiment 1.													CO2		
5	To prepare a Software Requirement Specification (SRS) document based on IEEE recommended standards for the mini project or case study identified in Experiment 1.													CO2		
6	To draw the State Chart Diagram for the mini project or case study identified in Experiment 1 using UML modelling techniques.													CO3		
7	To design Object and Class Diagrams for the mini project or case study identified in Experiment 1.													CO3		
8	To create a Sequence Diagram for Software Design Description (SDD) of the mini project or case study identified in Experiment 1													CO3		
9	To create a Collaboration Diagram for Software Design Description (SDD) of the mini project or case study identified in Experiment 1													CO3		
10	To draw the Activity Diagram for the mini project or case study identified in Experiment 1													CO3		

11	To create the Component Diagram for the mini project or case study identified in Experiment 1	CO3
12	To design the Deployment Diagram for the mini project or case study identified in Experiment 1	CO3
13	Create a test plan document for any application (e.g., Library Management System, identified in Experiment 1)	CO4
14	To Create Test Scenario for any application(e.g. Google pay login module)	CO4
15	To Design test cases for Gmail inbox, Google Search page.	CO4
16	To design test cases for a banking application or Login System using the Boundary Value Analysis (BVA) testing technique.	CO4
17	To Design Test Cases for Social Media Application Using Regression Testing.	CO4
18	To Design Test Cases Using Equivalence Class Partitioning for Login Authentication System.	CO4
19	To design test cases for an Online Payment Gateway using the Decision Table testing technique.	CO4
20	Create test cases for a program which determine whether an integer is prime or not by using path testing.	CO4
21	Create test cases for a program which determine whether an integer is prime or not by using Cyclomatic complexity.	CO4
22	To generate independent execution paths and test cases for a factorial program using Cyclomatic Complexity	CO4
23	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
24	To Estimation of Test Coverage Metrics and Structural Complexity.	CO4
25	Perform Analysis and comparisons of at least 3 testing tools (eg. Qtp,winrunner, postman)	CO4
26	Perform Analysis and comparisons bug tracking tool (e.g., Bugzilla, Bug bit)	CO4
27	Perform Analysis of any web testing tool (e.g., Selenium)	CO4
28	Perform Analysis of any open source-Testing tool (e.g., Test link, Test Rail)	CO4
29	To estimate software size, development effort, development time, and project cost using LOC (Lines of Code) based estimation techniques.(refer Experiment-1)	CO5
30	To estimate the effort, development time, staffing requirement, and cost of a mini project or Case study identified in experiment 1 using the Basic COCOMO Model.	CO5
Total Hours: 30 hrs.		



**NOIDA INSTITUTE OF ENGINEERING AND
TECHNOLOGY**
GREATER NOIDA-201306
(An Autonomous Institute)
School of Computer Science & Information Technology

Course Code: BCSE0655	Course Name: Data Analytics	L	T	P	C
Course Offered in: CSE/CSE(R)/IT/ M.Tech (Int)		0	0	6	3

Pre-requisite: Basic Knowledge of Statistics and Probability.

Course Objectives: To provide students with a strong foundation in Data Science concepts, data handling, preprocessing techniques, exploratory data analysis, and data-driven decision-making using modern tools and technologies. To develop the ability to collect, clean, transform, analyze, and visualize diverse datasets using R/Python and Tableau for extracting meaningful insights and solving real-world problems.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Understand the fundamental concepts of data analytics in the areas that plays major role within the realm of data science.	K1
CO2	Explain and exemplify the most common forms of data and its representations.	K2
CO3	Understand and apply data pre-processing techniques.	K3
CO4	Analyse data using exploratory data analysis.	K4
CO5	Illustrate various visualization methods for different types of data sets and application scenarios.	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	–	2	–	–	–	–	–	2	3	–	2	1
CO2	3	2	1	–	2	–	–	–	–	–	1	2	–	2	1
CO3	3	2	2	1	3	–	–	–	–	–	2	3	–	2	2
CO4	3	3	2	2	3	1	–	–	–	–	2	3	–	2	3
CO5	2	2	2	1	3	1	–	–	1	–	2	2	–	2	3

Course Contents/ Syllabus

Module 1	Introduction to Data Science	12 hours
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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.

Module 2	Data Handling	18 hours
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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.

Module 3	Data Pre-processing	12 hours
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Form of Data Pre-processing, data Attribute and its types, understanding and extracting useful variables, KDD process, Data

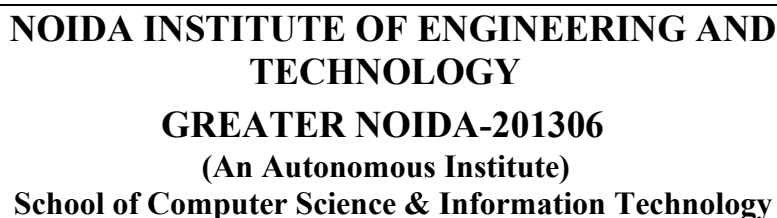
Cleaning: Missing Values, Noisy Data, Discretization and Concept hierarchy generation (Binning, Clustering, Histogram), Inconsistent Data, Data Integration and Transformation. Data Reduction: Data Cube Aggregation, Data Compression, Numerosity Reduction.		
Module 4	Exploratory Data Analysis:	12 hours
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.		
Module 5	Data Visualization	18 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		
Total Lecture Hours		72 hours
Textbook:		
S. No	Book Title	Author
1.	Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 2007.	Glenn J. Myatt
2.	Data Analysis and Data Mining, 2nd Edition, & Sons Publication, 2014	John Wiley
Reference Books:		
S.No	Book Title	Author
1.	Open Data for Sustainable Community: Glocalised Sustainable Development Goals	Neha Sharma, Santanu Ghosh, Monodeep
2.	The Data Science Handbook	Field Cady, John Wiley
3.	Data Mining Concepts and Techniques, Third Edition	Jiawei Han, Micheline Kamber, Jian Pei, Morgan Kaufmann
Self Study Content Link:		
MOOCs	1. https://nptel.ac.in/courses/106107220 2. https://www.coursera.org/professional-certificates/google-data-analytics	8 Weeks 60 hrs
Video Lectures	1. https://www.youtube.com/playlist?list=PL15FRvx6P0OWTINBS_93NHG2hIn9cynVT 2. https://www.youtube.com/playlist?list=PLLy_2iUCG87DxxkLX4Pc3wCvsF1yAvz0T 3. https://www.youtube.com/watch?v=lhO3fBiMDag 4. https://www.youtube.com/watch?v=q4pyaVZjqk0 5. https://www.youtube.com/playlist?list=PLWPirh4EWFpGXTBu8ldLZGJCUeTMBpJFK	30 hrs 25 hrs 30 Min 30 Min 6 hrs
Web References	1. https://pandas.pydata.org/docs 2. https://www.kaggle.com/learn	

Mode of Evaluation								
CIE							PE	Total
ST1	ST2	ST3	TA1 10	TA2 10	TA3 10	Attendance 10		
30			20				100	150
List of Practical								
Sr. No.	Program Title							CO Mapping
1	- Installation of MySQL, Anaconda, and Tableau - To perform data import/export (.CSV, .XLS, .TXT) operations using data frames in R/Python - To perform data pre-processing operations i) Handling Missing data ii) Min- Max normalization - To perform dimensionality reduction operation using PCA Houses Data Set - To perform statistical operations (Mean, Median, Mode and Standard deviation) using							CO1
2	<u>Tableau – getting started</u> - User interface - Methodology for working with the interface - Connecting to different types of data sources (Excel, csv, Access, MySQL, Tableau Server) - Editing Data Connections and Data Sources; Live mode vs. Extract mode - Date interpreter / Pivot <u>Joining multiple datasets</u> - Union / Join - Cross database joins Data Blending – integrating different data source							CO2
3	<u>Basic functionalities</u> - Filtering - Sorting - Grouping - Hierarchies - Creating sets - Pivot tables Types of dates – Continuous vs. Discreet <u>Calculations</u> - Syntax - Table calculations - LOD expressions - Aggregate Date, Logic, String, Number, Type calculations <u>Built-in chart types/visualisations:</u> - Line chart - Dot chart - Bar chart - Other types of visualisation (bullet graph, Heat map, Tree map, etc.). Combo charts – dual axis							CO3

4	Custom chart types: • KPI matrix • Waterfall • Gantt • Dot plot • Pareto Analytics' options: trend lines, forecasting, clustering.	CO4
5	CREATE AND FORMAT REPORTS USING THE TABLEAU DESKTOP • Describe the use of Page Backgrounds and Templates • Create visualizations to display the data • Apply drill through and drill down • Create and manage slicers with the use of filters • Explore visual interactions • Review Bookmarks • Publish the report to the Tableau online Dashboards and stories • Building dashboards • Dashboard objects Dashboard formatting Dashboard extensions Story points	CO5
Total Hours: 60 hrs		

				NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306 (An Autonomous Institute) School of Computer Science & Information Technology											
LAB Course Code: BCSE0659X				LAB Course Name: Applied Research with Mini Project								L	T	P	C
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)												0	0	2	1
Pre-requisite: Basic knowledge of programming, data structures, databases, and fundamental concepts of software development. Familiarity with tools and technologies for system development is desirable.															
Course Objectives:															
This course aims to develop the ability to design and implement solutions for real-world problems using appropriate tools and technologies. It emphasizes system integration, performance evaluation, and effective documentation, along with promoting research skills through the preparation of a structured research paper.															
Course Outcome: After completion of the course, the student will be able to														Bloom's level	
CO1	Identify and define a domain-specific real-world problem through literature review, objective formulation, and structured project planning suitable for research-based implementation.											K4			
CO2	Design, develop, and validate a functional prototype/model/system using appropriate tools, technologies, or methodologies while considering performance, ethics, safety, and reliability.											K6			
CO3	Document, analyze, and present project outcomes through a technical report and a structured research paper in IEEE/Scopus/UGC-approved format, demonstrating research communication and publication readiness.											K4			
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)															
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	2	-	-	1	2	2	1	3	1	2	3
CO2	3	3	3	3	3	1	1	2	3	2	2	3	3	3	3
CO3	2	2	2	2	2	-	-	2	3	3	2	2	–	2	3
Module				Common Applied Research-Based Mini Project Activities (All Branches)								Expected Outcomes			
Module 1: Research Foundation & Project Planning				1. Identify domain-specific problem statement relevant to the branch. 2. Define objectives, hypothesis, and expected outcomes 3. Conduct literature review 4. Select suitable tools, technologies, software, datasets, laboratory methods, or platforms. 5. Design project methodology, workflow, or system/process architecture								Clear research problem formulation, defined objectives, foundational knowledge, and structured project roadmap. (CO1)			
Module 2: Development, Design & Implementation				6. Develop core project components, models, experiments, prototypes, or processes. 7. Integrate relevant modules such as software, hardware, simulation, experimentation, analysis, or field implementation. 8. Apply discipline-specific techniques such as coding, fabrication, experimentation, surveys, analytics, optimization, or modelling.								Functional prototype/model/system/process with interdisciplinary implementation and practical technical skills. (CO2)			

	9. Incorporate safety, ethics, reliability, sustainability, and security considerations where applicable	
Module 3: Testing, Validation & Optimization	10. Perform testing, experimentation, or validation of developed work. 11. Analyze performance, efficiency, feasibility, or effectiveness. 12. Apply analytical, computational, statistical, or intelligent techniques where relevant. 13. Optimize design, methodology, process, or implementation for improved outcomes	Validated and optimized project demonstrating performance improvement, technical analysis, and practical feasibility. (CO2)
Module 4: Documentation, Research Publication & Presentation	14. Document project design, methodology, implementation, and results. 15. Prepare technical report/project dissertation. 16. Draft a research paper in standard format (Abstract, Introduction, Methodology, Results, Conclusion, References) 17. Format manuscript according to IEEE/Scopus/UGC-approved guidelines. 18. Include proper figures, tables, graphs, citations, and references 19. Present project findings through seminar/poster/presentation. 20. Demonstrate developed system/model/prototype/process. 21. Submit final project report and research paper for evaluation/publication consideration	Complete technical documentation, publishable-quality research paper, professional presentation skills, and final project submission. (CO3)



Course Code: BCSE0615						Course Name: Web Development using MERN STACK with Devops						L	T	P	C
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)												3	0	0	3
Pre-requisite: Basic knowledge of HTML, CSS, JavaScript, and fundamental programming concepts in any language.															
Course Objectives: This course aims to equip students with practical skills in building dynamic full-stack applications using React, Node.js, Express, and MongoDB. It also introduces DevOps principles, Agile methodologies, and CI/CD automation using tools like GitHub, Jenkins, Docker, and Kubernetes.															
Course Outcome: After completion of the course, the student will be able to												Bloom's Knowledge Level (KL)			
CO1	Apply the knowledge of ES6 that are vital to implement react application over the web.											K3			
CO2	Implement and Understand the impact of web designing by database connectivity with Mongoddb.											K3			
CO3	Explain, analyze and apply the role of server side scripting language like Nodejs and Express js framework.											K4			
CO4	Apply the benefits of DevOps over other software development processes to Gain insights into the DevOps environment.											K4			
CO5	Demonstrate popular open-source tools with features and associated terminology used to perform Continuous Integration and Continuous Delivery.											K3			
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)															
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	1	3	1	1	-	1	-	2	2	2	3	1
CO2	3	2	3	1	3	1	1	-	1	-	2	2	2	3	1
CO3	3	2	3	1	3	1	1	2	1	2	2	2	2	2	2
CO4	3	1	1	1	3	2	-	-	2	1	2	2	1	2	1
CO5	3	1	1	1	3	1	-	-	2	1	2	2	1	3	2
Course Contents / Syllabus															
Module 1				Modern Frontend Development with React JS										9 hours	
Introduction: to React, Setting up React projects, React Folder Structure, JSX, Functional Components, and React Hooks (useState, useEffect, use Context), Props vs State, Stateless vs Stateful Components, Component Lifecycle, Routing with react-router-dom Introduction to Next.js for Server-Side Rendering and SEO, Integrating APIs with axios or fetch,.															
Module 2				UI Libraries & MongoDB Integration										9 hours	
UI Libraries : Introduction to Google Material UI, Tailwind CSS, Theming and responsive design with MUI, Creating reusable UI components (Navbar, Toolbar, Dialogs), Introduction to MongoDB, CRUD Operations using Mongoose Indexes: Creating, Getting, Dropping, Aggregation Pipelines and Query Optimization, Data Modeling & Relationships, Auto-Sharding and Replication Concepts, Modern MongoDB tools: MongoDB Atlas, Compass.															
Module 3				Backend with Node.js & Express										9 hours	
Node.js: Introduction to Node.js Setting up Express applications, Routing & Middleware, Restful API Design , JWT-based Authentication & Authorization ,Working with dotenv, CORS, body-parser. Express MVC Architecture in Express, File Upload Handling with Multer, Connecting Frontend with Backend via APIs, Introduction to GraphQL.															
Module 4				DevOps Culture and Lifecycle										9 hours	
Introduction to DevOps: Culture & Principles, DevOps Lifecycle and Agile vs DevOps, SDLC Models: Agile, Lean, Scrum, Kanban, Scrum: Process flow, Planning, Testing, Release Management, Introduction to Site Reliability Engineering (SRE), Overview of Terraform/Ansible, Configuration Management basics															

Module 5			CI/CD, Docker & Kubernetes					9 hours	
Git & GitHub: Introduction to Git, GitHub, Branching strategies, CI/CD Pipelines: Jenkins, GitHub Actions, Creating Jenkins Jobs and Pipelines, Integrating Git, Maven, and SonarQube, Introduction to Docker: Images, Containers, Lifecycle ,Building custom Docker Images, Docker Compose for multi-container apps, Container orchestration with Kubernetes Creating Deployments, Services, and scaling with K8s, Basic monitoring tools: Prometheus and Grafana									
Total Lecture Hours								45 hours	
Textbook:									
S.No	Book Title					Author			
1.	Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node Paperback, 2 nd Edition (2017)					Vasan Subramanian			
2.	Hands-On MERN Stack Web Development: Build production-grade web apps and APIs with MERN stack ,3 rd Edition (2019)					Shama Hoque			
3.	Beginning MERN Stack: Build and Deploy a Full Stack MongoDB, Express, React, Node.js App 2 nd Edition (2021)					Greg Lim			
Reference Books:									
S.No	Book Title					Author			
1.	The DevOps Handbook: How to Create World-Class Agility, Reliability, & Security in Technology Organizations 2nd Edition (2003).					Gene Kim, Jez Humble, Patrick Debois, John Willis			
2.	Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation, 2nd Edition (2004).					Jez Humble, David Farley			
3.	Test and Deploy Production-Grade Web Applications 1st Edition (2023).					Nabendu Biswas			
Self Study Content Link:									
MOOCs		1. https://www.coursera.org/learn/fullstack-web-development 2. https://www.coursera.org/professional-certificates/ibm-full-stack-cloud-developer					4 Weeks 6 Months		
Video Lectures		1. https://youtu.be/CvCiNeLnZ00 2. https://youtu.be/4nKWREmCvsE 3. https://youtu.be/f2EqECiTBL8 4. https://youtu.be/6GQRb4fGvTk 5. https://youtu.be/kTp5xUcalw					8 hrs 25 Min 7 hrs 8 Min 6 hrs		
Web References		1. https://react.dev 2. https://docs.docker.com							
Mode of Evaluation									
CIE							ESE	Total	
ST1	ST2	ST3	TA1 10	TA2 10	TA3 10	Attendance 10			
30			20				100	150	

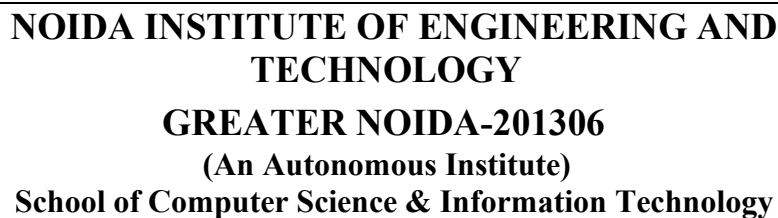
				NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306 (An Autonomous Institute) School of Computer Science & Information Technology												
LAB Course Code: BCSE0615P				LAB Course Name: Web Development Using Mern Stack Lab								L	T	P	C	
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)												0	0	2	1	
Pre-requisite: Basic knowledge of HTML, CSS, JavaScript, and fundamental programming concepts in any language																
Course Objectives:																
This course aims to equip students with practical skills in building dynamic full-stack applications using React, Node.js, Express, and MongoDB. It also introduces DevOps principles, Agile methodologies, and CI/CD automation using tools like GitHub, Jenkins, Docker, and Kubernetes.																
Course Outcome: After completion of the course, the student will be able to														Bloom's Taxonomy		
CO1		Apply the knowledge of ES6 that are vital to implement react application over the web.												K3		
CO2		Implement and Understand the impact of web designing by database connectivity with Mongoddb.												K3		
CO3		Explain, analyze, and apply server-side scripting using Node.js and the Express.js framework while identifying the benefits of DevOps practices and gaining insights into the DevOps environment for modern software development and deployment.Demonstrate popular open-source tools with features and associated terminology used to perform Continuous Integration and Continuous Delivery.												K4		
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)																
CO-PO Mapping		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1		3	2	3	1	3	1	1	-	1	-	2	2	2	3	1
CO2		3	2	3	1	3	1	1	-	1	-	2	2	2	3	1
CO3		3	2	3	1	3	1	1	2	1	2	2	2	2	2	2
List Of Practical's (Indicative & Not Limited To)																
Lab No.	Program / Task														CO	
1	Set up a React project and display "Welcome to React Workshop" using JSX and Functional Components														CO1	
2	Create a User Profile application using Functional Components and Props														CO1	
3	Develop a Counter Application using useState Hook														CO1	
4	Fetch and display data from a REST API using useEffect and Axios														CO1	
5	Implement Theme Switching using Context API (useContext)														CO1	
6	Demonstrate Props vs State using Parent-Child Components														CO1	
7	Create Stateless and Stateful Components to compare data handling														CO1	
8	Implement Navigation using React Router (Home, About, Contact Pages)														CO1	
9	Develop a Next.js application with Server-Side Rendering (SSR)														CO1	
10	Design a Responsive Product Landing Page using Tailwind CSS and Material UI Components														CO1	
11	Connect Node.js with MongoDB using Mongoose and create a Student Collection														CO2	
12	Perform CRUD Operations on a Book Collection using Mongoose														CO2	
13	Implement MongoDB Indexing and Query Optimization														CO2	
14	Use MongoDB Aggregation Pipeline to calculate category-wise statistics														CO2	

15	Model User–Order Relationship and retrieve nested data using Mongoose Population	CO2
16	Configure MongoDB Atlas and connect it with a Node.js Application	CO2
17	Create a Basic Node.js Application and Express Server with Routing	CO2
18	Implement Middleware for Logging and Request Body Handling	CO2
19	Develop RESTful APIs for CRUD Operations using Express.js	CO2
20	Implement JWT-based Authentication and Protected Routes	CO2
21	Build a Student Management System using MVC Architecture in Express.js	CO2
22	Create a Profile Picture Upload System using Multer Middleware	CO2
23	Develop a React Frontend consuming REST APIs and GraphQL Services	CO2
24	Perform Git & GitHub Operations (Clone, Commit, Push, Branching) and Containerize an Application using Docker	CO3
25	Build a Complete CI/CD Pipeline using Jenkins, Maven, SonarQube, Docker, and Deploy a Containerized Application	CO3
		Total Hours:30 hrs

					NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306 (An Autonomous Institute) School of Computer Science & Information Technology												
Course Code: BCSML0612						Course Name: Generative AI						L	T	P	C		
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)												3	0	0	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		Explain the fundamentals of generative models, probabilistic learning, and latent variable models.										K2					
CO2		Apply GMMs, HMMs, and Autoencoders for feature representation and synthetic data generation tasks.										K3					
CO3		Develop GAN models for image synthesis and generative learning tasks.										K3					
CO4		Apply transformer architectures, large language models, and prompt engineering techniques for text generation applications.										K3					
CO5		Analyze diffusion, flow-based, multimodal generative models, and ethical AI challenges in real-world applications										K4					
COs	POs/	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	
CO1		3	2	1	1	2	–	–	1	–	–	2	3	–	2	1	
CO2		3	3	1	2	2	–	–	1	1	1	2	3	–	2	2	
CO3		3	3	2	2	2	–	–	1	1	1	2	3	–	3	2	
CO4		3	3	3	2	3	–	1	2	1	1	2	3	1	3	2	
CO5		3	3	3	2	3	1	2	2	1	1	2	3	1	3	2	
Course Contents / Syllabus																	
Module 1			Foundations of Generative Model												9 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												9 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)												9 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												9 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												9 hours		

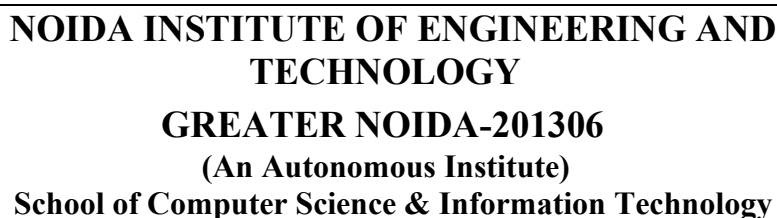
Diffusion Models: Forward and Reverse Process, Denoising Diffusion Probabilistic Models (DDPM)			
Flow-Based Models: NICE, RealNVP, Glow, Fine-Tuning Pretrained Models: GPT-2, Stable Diffusion			
Multimodal Models: CLIP, DALL·E, Flamingo, GPT-4 + Multimodal Inputs, Ethical Issues: Deepfakes, AI Bias, Copyright, Content Authenticity, and Responsible AI			
Total Lecture Hours			45 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)	
Self Study Content Link:			
MOOCS	Udemy (Build AI Agents using Google Agent Development Kit (ADK))	https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26_mg37	2 Hours
	CognitiveClass.ai (Agentic Ai Hands -On)	https://cognitiveclass.ai/learn/agentic-ai-hands-on	11.25 Hours
	CognitiveClass.ai (Mastering RAG: Build Smart, Data-Driven Application)	https://cognitiveclass.ai/learn/mastering-rag-build-smart-data-driven-application	3.91 Hours
	CognitiveClass.ai (Prompt Engineering for Everyone)	https://cognitiveclass.ai/courses/prompt-engineering-for-everyone	5 Hours
Video Lectures	1. https://www.youtube.com/watch?v=hjsZSmL67Ck		0.27 hours
	2. https://www.youtube.com/watch?v=EsTrWCV0Ph4		2 hours
	3. https://www.youtube.com/watch?v=rVfZHWTwXSA		0.33 hour
	4. https://www.youtube.com/watch?v=E0Aed5dQyA8		1:23 hours
	5. https://www.youtube.com/watch?v=qJeaCHQ1k2w		0.33 hour
	6. https://www.youtube.com/watch?v=luBkbzjo-TA		1 hour

	7. https://www.youtube.com/watch?v=AALBGpLbj6Q						2 hours	
	8. https://www.youtube.com/watch?v=NOSuy0NOe9k						0.91 hours	
	9. https://www.youtube.com/watch?v=M1pF0QGDQyU						0.26 hours	
	10. https://www.youtube.com/watch?v=nJ25yl34Uqw						22 hours	
Web References	1. https://platform.openai.com/docs 2. https://huggingface.co/docs							
Mode of Evaluation								
CIE							ESE	Total
ST1	ST2	ST3	TA1 10	TA2 10	TA3 10	Attendance 10		
30			20				100	150



Course Code: BCSML0612P							Course Title: Generative AI Lab					L	T	P	C
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)												0	0	2	1
Prerequisite: Probability & Statistics,Machine Learning,Deep Learning, Python Programming															
Course Objective: To develop practical skills in implementing and evaluating generative AI models for image, text, and multimodal data generation. Students will gain hands-on experience with Autoencoders, GANs, Transformers, LLMs, and Diffusion Models using modern AI frameworks, while analyzing model performance and ethical aspects of generative AI applications.															
Course Outcome: After completion of the course, the student will be able to												Bloom's Knowledge Level (KL)			
CO1	Describe the working principles of probabilistic models, Autoencoders, and generative AI techniques.											K2			
CO2	Apply GANs, transformers, and attention-based models for image and text generation tasks.											K3			
CO3	Analyze diffusion, flow-based, and multimodal generative AI models using modern AI tools and frameworks.											K4			
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)															
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3	–	–	–	–	–	2	3	1	2	2
CO2	3	3	3	2	3	–	–	1	1	–	2	3	2	3	2
CO3	3	3	2	3	3	1	1	2	1	1	2	3	2	3	2
List of Experiments															
Sr. No.	Name of Experiment														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.	Use CLIP or DALL·E to generate images from text prompts	CO3
18.	Demonstrate multimodal capabilities using Flamingo or GPT-4 with image and text inputs	CO3
19.	Case study: Analyze ethical concerns in generative AI with examples (deepfakes, bias, and responsible AI frameworks)	CO3
20.	Certification Course on Generative AI for Everyone https://www.deeplearning.ai/courses/generative-ai-for-everyone	CO3
Total Hour: 30 hrs.		



Course Code: BCSAI0611					Course Name: Cloud Storage Management							L	T	P	C
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)												3	0	0	3
Pre-requisite: Basics of Cloud Computing															
Course Objectives:															
To understand cloud storage fundamentals and architectural models. To examine modern cloud storage services and technologies. To familiarize learners with migration strategies in cloud environments. To develop understanding of security and governance mechanisms in cloud storage. To explore advanced storage systems and their real-world applications.															
Course Outcome: After completion of the course, the student will be able to													Bloom's Knowledge Level (KL)		
CO-1	Describe cloud storage fundamentals and architectures.												K2		
CO-2	Examine various cloud storage services and technologies.												K4		
CO-3	Infer migration strategies in cloud environments.												K2		
CO-4	Analyze security and governance techniques in cloud storage.												K4		
CO-5	Illustrate advanced storage systems and real-world applications.												K2		
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)															
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	2	-	-	-	-	-	-	3	–	2	1
CO2	2	3	-	1	3	-	-	-	-	-	-	3	–	2	2
CO3	2	2	2	-	2	-	-	-	-	-	-	3	–	2	2
CO4	3	3	2	2	3	2	-	2	-	-	-	3	1	2	3
CO5	2	2	2	-	2	-	-	-	2	2	2	3	1	3	2
Course Contents / Syllabus															
Module-1				Fundamentals of Cloud Storage										08 hours	
Introduction to Cloud Computing, Evolution of Storage Systems (Traditional vs Cloud), Importance of Cloud Storage, Types of Cloud Storage: Object, Block, and File Storage, Storage Virtualization, Storage Architectures (Centralized & Distributed), Cloud Deployment Models (Public, Private, Hybrid), Challenges in Cloud Storage (Latency, Availability, Durability)															
Module-2				Cloud Storage Solutions										09 hours	
Tiered Storage - Storage Reliability - Availability - Serviceability (RAS) - Storage Services and Functionalities - Storage System Architectures - Storage Virtualization and Virtual Storage, Cloud storage, Types of storage in cloud, AWS: S3, EBS, EFS, FSx, RDS, DynamoDB. Google Cloud Storage: Persistent Disk, Filestore, Cloud Storage, Archival storage. Hybrid cloud storage: AWS storage gateway.															
Module-3				Cloud Infrastructure and Migration Solutions										10 hours	
Data Movement and Migration, IaaS migration, PaaS Migration, SaaS migration, VM migration, Migration solutions, AWS: Snow family, DataSync, Transfer family. Google cloud migration, Database Migration Services (DMS).															
Module-4				Security in Cloud Storage										10 hours	
Data Security Concepts – Threats, data breaches, insider attacks, malware, Shared responsibility model in cloud security.															

Access Control Mechanisms: Role-Based Access Control, Attribute-Based Access Control, Access Control Lists, Multi-Factor Authentication, IAM.

Big Data Storage- Data ingestion methods (batch & real-time), Metadata management and Data Lakes architecture and components
Storage Solutions, Storage Cost Optimization Techniques, Storage Automation and Orchestration, Case Studies of Enterprise Cloud
driven Storage).

Textbook:

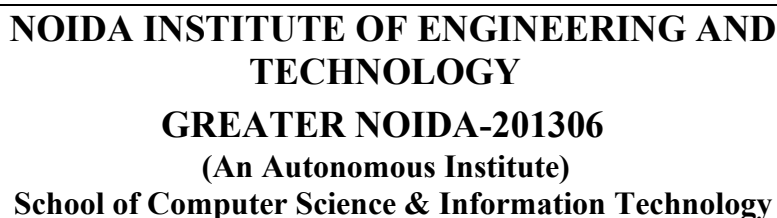
Reference Books:

Self-Study Content Links:	Duration (in Hrs)
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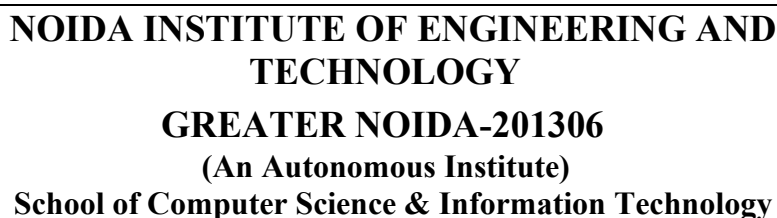
Video Lectures	1. https://www.youtube.com/watch?v=7m3f-P-WWbg (Edureka)	00Hrs 25Min
	2. https://www.youtube.com/watch?v=wOBA6Wri0Fg	01Hrs 51Min
	3. https://www.youtube.com/watch?v=b_krXFeOEDU	03Hrs 48Min
	4. youtube.com/watch?v=2LaAJq1lB1Q&t=147s&pp=0gcJCQYLAYcqIYzv	10Hrs 17Min

Mode of Evaluation

[illegible]



LAB Course Code: BCSAI0611P					LAB Course Name: Cloud Storage Management Lab								L	T	P	C	
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)													0	0	2	1	
Pre-requisite: Basics of Cloud Computing																	
Course Objectives:																	
To develop practical skills in cloud storage provisioning and virtualization using AWS services. To enable learners to configure and manage cloud-based storage resources efficiently. To provide hands-on experience in cloud storage backup, migration, and monitoring techniques. To familiarize learners with data lake implementation and efficient cloud data management practices. To apply security, encryption, access control, and cost optimization techniques in cloud storage environments.																	
Course Outcome: After completion of the course, the student will be able to													Bloom's Knowledge Level (KL)				
CO-1	Demonstrate cloud storage provisioning, virtualization, and storage management using AWS services and virtualized environments.												K3				
CO-2	Implement cloud storage operations including backup, migration, monitoring, and data lake solutions for efficient data management.												K3				
CO-3	Apply security, access control, encryption, and cost optimization techniques in cloud storage environments.												K3				
	CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)																
	CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	
	CO1	2	–	3	–	3	–	–	–	–	–	–	3	–	2	3	
	CO2	2	2	3	2	3	–	–	–	1	–	2	3	–	3	3	
	CO3	2	3	2	2	3	–	–	1	–	–	2	3	1	2	3	
List Of Practical's															CO		
1	Storage Virtualization and Virtual Machine Storage Management using VirtualBox															CO1	
2	Create S3 buckets, upload/download files, set access policies, and enable versioning.															CO1	
3	Create, attach, detach, and snapshot EBS volumes.															CO1	
4	Set up a MySQL/PostgreSQL database using Amazon RDS and connect it to an application.															CO1	
5	Implementing Data Backup using EBS Snapshots															CO2	
6	Storage Cost Optimization using S3 Intelligent-Tiering															CO2	
7	Migrate Virtual Machine in a cloud environment using Virtual Box															CO2	
8	Monitoring Storage Performance and Usage of storage services using CloudWatch															CO2	
9	Performing Cloud Data Migration using AWS DataSync															CO3	
10	Encrypting Cloud Storage Data at Rest and In Transit using AWS KMS															CO3	
11	Create IAM users/groups, assign policies, and demonstrate fine-grained access control.															CO3	
12	Building a Simple Data Lake Architecture using AWS Glue															CO3	
Total Hours: 30 hrs																	

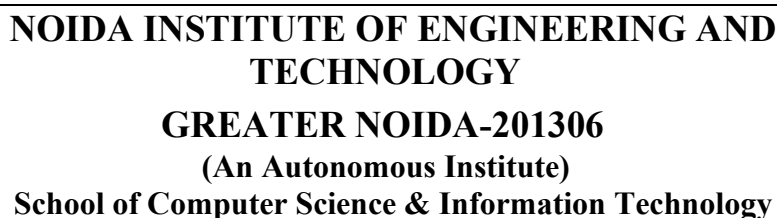


Course Code: BCSE0612					Course Name: Full-Stack Web Development using Laravel with Vue.JS							L	T	P	C	
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)												3	0	0	3	
Pre-requisite: Basic knowledge of HTML, CSS, JavaScript & PHP required.																
Course Objectives:																
This course focuses on how to design and build a robust API in Laravel and a Single Page Application with Vue.js. This course includes advanced topics like Inertia.js, Model Events, and Laravel framework for interactive web applications that use rich user interfaces.																
Course Outcome: After completion of the course, the student will be able to														Bloom's Level		
CO1	Apply the knowledge of PHP that are vital in understanding Laravel application and analyze the concepts, principles and methods in current Server-side technology to implement Laravel application over the web.												K3			
CO2	Explain, analyze and apply the role of Client-side scripting language like Vuejs in the workings of the web and web applications.												K3			
CO3	Implementing and analyzing the concept of Larvel Faker and Authentication on Laravel.												K5			
CO4	Understand the impact of web designing by database connectivity with different databases in the current market place where everyone use to prefer electronic medium for shoping, commerce, and even social life also.												K3			
CO5	Analysing and Creating a functional website using Laravel and Vuejs and Deploying and Optimizing Web Application using Forge / Vapor.												K4			
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)																
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3	PSO 4	
CO1	3	2	1	1	2	-	-	-	1	-	1	2	—	3	2	
CO2	2	2	2	1	3	-	-	1	2	-	1	2	—	3	2	
CO3	3	3	2	2	3	1	1	1	1	-	2	2	—	2	3	
CO4	2	2	2	1	2	3	1	1	1	1	1	3	—	2	2	
CO5	3	3	3	2	3	2	1	2	2	2	3	3	—	3	3	
Course Contents / Syllabus																
Unit 1				Introduction to Laravel											09 hours	
Laravel Features, Laravel installation, Application Structure of Laravel, Root Directory, App Directory, Basic Configuration, Environmental Configuration, Routing, Routing Parameters, Middleware, Terminable Middleware, Middleware Parameter, Controllers, Restful Resource Controllers, Implicit Controllers, Constructor Injection, Method Injection, Laravel Sail, Laravel Jetstream..																
Unit 2				Vue.js Framework&Inertia.js											09 hours	
Vue.js Template Syntax and Expressions, Vue directives, loops and conditional rendering, Vue Devtools, Handling user Inputs, Handling Events, Vuejs Methods and Computed Properties, Attribute Bindings and dynamic classes, Concepts of Inertia.js, How it works, Inertia protocol, Routing, Responses and Pages, Creating links, GET, POST, PUT, PATCH, and DELETE method in Inertia.is.																

Unit 3		Laravel Authentication & Laravel Faker		09 hours
Laravel design pattern, Laravel blade template engine, Artisan command, Login with username or email, Register with username or email, Logout, Validate request data (required, unique, etc..), Protecting Router, Password Confirmation, Social & Other Authentication method, Show success / Failure message, Faker PHP library, Create data seeder, Seed data, Localisation, Model Factories				
Unit 4		Connecting Laravel with databases		09 hours
Database Configuration File,Read/Write connections,Running A Select Query,Running an Insert, Update, Delete Statement, Listening For Query Events, Database Transaction, rollback and commit method, Accessing connections, Query Logging, Laravel Query Builder & ORM, Laravel Migration& Eloquent.				
Unit 5		Deployment Laravel application to production		09 hours
PHP Extension: BCMath, CType, cURL, JSON, Mbstring, OpenSSL, PCRE, PDO Server Configuration, Nginx, Laravel server management service Laravel Forge, Autoloader optimization, Optimizing Configuration Loading, Optimizing Route Loading, Optimizing View Loading, Debug Mode, Deploying With Vapor..				
Total Lecture Hours				45 hours
Textbook:				
S.NO.	Title			Authors
1	“Laravel: The Ultimate Beginner's Guide to Learn Laravel Step by Step”, 2nd Edition 2020, BPB Publications.			Rufus Stewart, mEmInc,
2	“Full-Stack Vue.js 2 and Laravel 5”, 3rd Edition 2017, Packet Publication.			Anthony Gore,
3	“Laravel (French, Paperback, Stewart Rufus)”, 2ndEdition, 2018 BPB Publications			Stewart Rufus
4	“Laravel: Up & Running: A Framework for Building Modern PHP Apps”, 2nd Edition, 2019, O'Reilly Media Publications.			Matt Stauffer
5	Vue.js – Up and Running: Building Accessible and Performant Web Apps”,1stEdition, 2019, O'Reilly Media Publications..			Callum Macrae
Reference Books:				
1	Ari Lerner, and Nate Murray, “Fullstack Laravel: The Complete Guide to Laravel and Friends”, 4th edition, 2020 International Publish in			2. Anthony Accomazzo,
2	“Full-Stack Laravel, Type Script, and Vuejs: Build cloud-ready web applications using Laravel with Hooks and GraphQL”, 2nd edition, 2017 Packt Publishing Limited.			3. David Cho,
3	“Beginning Laravel: Build Websites with Laravel 5.8”2nd edition, 2019, Apress publication.			Sanjib Sinha,
4	“Mastering Vue.js: Build robust and scalable real-time server-side web applications efficiently” 2nd edition, 2016,Packt Publishing Limited.			Glenn Geenen, Sandro Pasquali, Kevin Faaborg,
5	”Beginning Node.js, Express & MongoDB Development ,kindle edition,2015, international publishing.			Greg Lim
6	“Laravel and Vuejs Master Angular.js with simple steps, guide and instructions” 3rd edition, 2015 SMV publication.			Daniel Perkins,
7	“MongoDB Basics”, 2nd edition ,2018 International Publication.			Peter Membrey, David Hows, EelcoPlugge,
Self Study Content Link:				
MOOCs		1. https://www.coursera.org/learn/packt-laravel-from-scratch-gdu5v 2. https://www.coursera.org/learn/fundamentals-of-vuejs		2 Weeks 5 hrs.

Video Lectures	1. https://youtu.be/ImtZ5yENzgE 2. https://youtu.be/0urHFBFHsLc?list=PL8p2I9GklV46dcIS4GDzBFHBi0JVlbnzT 3. https://youtu.be/vjDLtAPXP34?list=PL7BQ4lqtgECS0oCt5jGaf0v77mBjS5r5O 4. https://youtu.be/EU7PRmCpx-0?list=PLlIlGF-RfqBYhQsN5WMXy6VsDMKGadrJ 5. https://youtu.be/JNhmEoBsZ48 6. https://youtu.be/qZXtIAom3Cs 7. https://youtu.be/FXpIoQ_rT_c 8. https://youtu.be/bzIFvd0b65c 9. https://youtu.be/e-E0UB-YDRk 10. https://youtu.be/XCrnk1bKxf4 11. https://youtu.be/UWniysfpTmM 12. https://youtu.be/Zf6o7ag5WPI 13. https://youtu.be/dBImazCqQAU 14. https://youtu.be/w1JNkv-GH3A 4 hrs 25 Min 5 Min 10 Min 17 Min 2 hrs 53 Min 1 hr 50 Min 3 hr 39 Min 57 Min 10 hrs 20 Min 20 Min 31 Min 5 Min 13 Min 54 Sec 9 Min	
Web References	1. https://laravel.com/docs 2. https://vuejs.org/guide	

Mode of Evaluation								
CIE							ESE	Total
ST1	ST2	ST3	TA1 10	TA2 10	TA3 10	Attendance 10		
30			20					
							100	150



Course Code: BCSML0613				Course Name: Digital Image Processing								L	T	P	C
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)												3	0	0	3
Pre-requisite: Linear algebra, Matrices, Matrix Operations, Determinants, Systems of Linear Equations, Eigen values, Eigenvectors, Statistics and probability, Programming experience, preferably in Matlab															
Course Objectives: To introduce the student to image processing fundamentals and correlation and convolution technique. To describe the image enhancement techniques. To describe various Image transformation technique. To describe the morphological image processing and segmentation Techniques. To describe Image compression Technique.															
Course Outcome: After completion of the course, the student will be able to													Bloom's Knowledge Level (KL)		
CO 1	Understand The fundamentals of images and its processing													K2	
CO 2	Apply the concepts of Image enhancement and image Restoration Algorithms/techniques													K3	
CO 3	Apply the various image transformation Algorithms/techniques													K3	
CO 4	Understand and apply morphological image processing and image Segmentation Algorithms/technique													K3	
CO 5	Understand the concepts of image (gray and color) compression technique													K2	
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)															
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	1	–	–	2	–	–	–	–	–	1	2	1	2	1
CO2	3	2	2	1	3	–	–	–	–	–	2	3	1	2	2
CO3	3	2	2	1	3	–	–	–	–	–	2	3	1	2	2
CO4	3	3	2	2	3	1	–	–	–	–	2	3	1	3	2
CO5	3	2	2	1	3	1	–	–	–	–	2	2	1	2	2
Course Contents/ Syllabus															
Module 1				Introduction							9 hours				
Fundamental steps of image processing, components of an image processing of system, the image model and image acquisition, sampling and quantization, Image file formats Relationship between pixels, distance functions, scanner, Image Analysis, Intensity transformations, contrast stretching, Correlation and convolution															
Module 2				Statistical and spatial operations							9 hours				
Grey level transformations, histogram equalization, histogram specification, smoothing & sharpening-spatial filters, frequency domain filters, homomorphic filtering, image filtering & restoration. Inverse and weiner filtering. FIR weiner filter, Filtering using image transforms, smoothing splines and interpolation.															
Module 3				Image Transforms							9 hours				
Fourier, DFT, DCT, DST, Haar, Hotelling, Karhunen -Loeve, Singular value decomposition, Walsh, Hadamard, Slant. Representation															

and Description - Chain codes, Polygonal approximation, Signatures Boundary Segments, Skeltons, Boundary Descriptors, Regional Descriptors, Relational Descriptors, PCA.

Module 4	Morphological and other area operations	9 hours
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basic morphological operations, opening and closing operations, dilation erosion, Hit or Miss transform, morphological algorithms, extension to grey scale images. Segmentation and Edge detection region operations, basic edge detection, second order detection, crack edge detection, gradient operators, compass and laplace operators, edge linking and boundary detection, thresholding, Otsu's method, region based segmentation, segmentation by morphological watersheds. Use of motion in segmentation

Module 5	Image compression	9 hours
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Types and requirements, statistical compression, spatial compression, contour coding, quantizing compression, image data compression-predictive technique, pixel coding, transfer coding theory, lossy and lossless predictive type coding. Basics of color image processing, pseudo color image processing, color transformation, color smoothing and sharpening, color segmentation, color image compression, compression standards

Total Lecture Hours	45 hours
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Textbook:

S. No	Book Title	Author
1.	Digital Image Processing Pearson, Third Edition, 2010	Rafael C. Gonzalez, Richard E. Woods
2.	Fundamentals of Digital Image Processing Pearson, 2002	Anil K. Jain
3.	Digital Image processing, TMH, 2012	S Jayaraman

Reference Books:

S.No	Book Title	Author
1.	Digital Image Processing, 3rd Edition, John Wiley, 2001.	William K. Pratt
2.	Image processing, analysis and machine vision Brookes/Cole, Vikas Publishing House, 2nd edition, 1999	Milan Sonka et al
3.	Digital Image Processing using MATLAB Pearson Education, Inc., 2011.	Rafael C. Gonzalez, Richard E. Woods, Steven Eddins
4.	Digital Image Processin, Pearson, 2006.	Kenneth R. Castleman

Self Study Content Link:

MOOCs	1. https://www.coursera.org/learn/introduction-image-processing 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc22_ee116	9 hrs 14 Weeks
Video Lectures	1. https://youtu.be/N0Dwh3avx9A?list=PLi7vCu7jEp8_nFoyZ-8exq5UYW_CAZ6zM 2. https://youtu.be/MQm6ZP1F6ms 3. https://youtu.be/LyDrGJRT0PI 4. https://youtu.be/994ZNi7rSXo https://youtu.be/sjK4zrZmjak 5. https://youtu.be/5qxrzD6ODHc 6. https://youtu.be/rIXEO87thug 7. https://youtu.be/AisfQIql0bY 8. https://youtu.be/sckLJpjH5p8 https://youtu.be/IbHPLbng_d4 9. https://youtu.be/uTwm3Zv1HfA https://youtu.be/11b5NnpEoVE 10. https://youtu.be/S8FkaEWfCOg	34 Min 15 Min 51 Min 58 Min 56 Min 1 hrs 23 Min 44 Min 56 Min 56 Min 59 Min 57 Min
Web References	1. https://opencv.org 2. https://scikit-image.org	

Mode of Evaluation

CIE	ESE	Total
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ST1	ST2	ST3	TA1 10	TA2 10	TA3 10	Attendance 10		
30			20				100	150



**NOIDA INSTITUTE OF ENGINEERING AND
TECHNOLOGY**
GREATER NOIDA-201306
(An Autonomous Institute)
School of Computer Science & Information Technology

Course Code: BCSAI0613				Course Name: Cloud Security								L	T	P	C
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)												3	0	0	3
Pre-requisite: Basics of Cloud Computing															
Course Objectives: To provide in-depth knowledge of securing cloud environments, with practical alignment to AWS security services, best practices, and certification domains.															
Course Outcome: After completion of the course, the student will be able to														Bloom's Knowledge Level (KL)	
CO1	Explain cloud security principles, threat landscape, and governance frameworks.													K2	
CO2	Infer identity and access management techniques for secure cloud environments.													K2	
CO3	Assess data protection mechanisms including encryption and secure storage practices													K4	
CO4	Analyze cloud infrastructure security components and network protection mechanisms													K4	
CO5	Analyze monitoring, incident response, and compliance strategies in cloud systems.													K4	
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)															
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	-	-	-	-	1	3	–	2	2
CO2	2	3	2	-	3	-	-	-	-	-	2	3	1	2	2
CO3	2	3	3	-	2	-	-	-	2	-	-	3	1	2	3
CO4	2	2	3	3	3	-	-	-	2	-	1	3	1	3	3
CO5	2	3	-	-	-	2	2	3	-	-	-	3	–	2	3
Course Contents/ Syllabus															
UNIT-I				Cloud Security Foundations & Governance								9 hours			
Introduction to cloud security concepts, Security benefits and challenges in cloud computing, Cloud Threat Landscape, CSA Top Threats, Insider Threats, Data Breaches, Security design principles (defense in depth, least privilege, zero trust), Edge Locations, AWS Shared Responsibility Model(customer vs provider responsibilities), AWS Well-Architected Framework (Security Pillar), Policies, Standards, Cloud Governance Framework.															
UNIT-II				Identity, Access Management & Security Administration								9 hours			
IAM: Introduction, JSON elements, Users, Roles, Groups, Policies, Policy evaluation logic, role chaining, Managed vs inline policies, permission boundaries, Principle of least privilege and policy optimization, Authentication & Authorization, Multi-Factor Authentication, Federation & Single Sign-On, SAML, Open Authorization basics.															
Access Control Models: RBAC vs ABAC, Trust Boundaries, Temporary credentials using AWS Security Token Service.															
UNIT-III				Data Security & Protection								9 hours			

Data Security Concepts: CIA Triad (Confidentiality, Integrity, Availability), Data States: Data at Rest, In Transit, In Use.		
Encryption Techniques: Symmetric vs Asymmetric Encryption, Encryption at rest and in transit (TLS/SSL), AWS Key Management, KMS, Envelope Encryption, Key Rotation.		
Secure Storage: S3 Security (Bucket Policies, Versioning, Access Control), Database security (RDS encryption, backups, IAM authentication).		
UNIT-IV	Cloud Infrastructure Security	9 hours
Infrastructure Security: Host-Level, Network-Level, Application-Level Security, Secure Cloud Architecture, VM Security, Auto Scaling, Load Balancing.		
Amazon VPC Design: Subnets (Public/Private), Routing Tables, Internet Gateway, NAT Gateway, Bastion Hosts, DNS security with Amazon Route 53.		
Security Controls: Security Groups vs Network ACLs (stateful vs stateless), DDoS Protection & Mitigation, Hybrid Cloud Security, VPN, Direct Connect.		
UNIT-V	Cloud Monitoring, Incident Response & Compliance	9 hours
Monitoring & Logging: CloudTrail, CloudWatch, Log Analysis, Threat Detection (Behavioral Analysis, Anomaly Detection, Incident Response Lifecycle, Preparation) Containment, Recovery.		
AWS Security Services: GuardDuty, CloudWatch, Security Hub, Application Security.		
Privacy & Compliance, Data Privacy Concepts, GDPR, HIPAA, Digital Personal Data Protection Act-2023, ISO 27001 basics, Legal & Regulatory Framework.		
Total Lecture Hours		45 hours
Textbook:		
S. No	Book Title	Author
1.	“Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance” O'ReillyMedia; 1edition [ISBN:0596802765], 2009	Tim Mather, Subra Kumara swamy,Shahed Latif
2.	“Cloud Security Handbook: Find out how to effectively secure cloud environments using AWS, Azure, and GCP”, Packt Publishing; 1st edition, 2023	Eyal Estrin
Reference Books:		
S.No	Book Title	Author
1.	“Cloud Computing Security: Strategies and Best Practices”, CRC Press; 1st edition, 2021	Krishnendu Gupta, Nabanita Roy
2.	“Cloud Security: Concepts, Applications and Practices”, Springer; 1st edition, 2017,	Kumar Saurabh
Self Study Content Link:		
MOOCs	1. https://nptel.ac.in/courses/106106248 2. https://skillbuilder.aws/learn/S2N5PM41ZK/aws-security-fundamentals/E71QQGTCRZ	12 Weeks 15 hrs
Video Lectures	1. https://youtu.be/XsRBDJ5hedg 2. https://youtu.be/w2caA8ty36s 3. https://youtu.be/fpNmVxYhsN0 4. https://youtu.be/amCrXVFX1C4 5. https://youtube.com/playlist?list=PLShJJCRzJWxhz7SfG4hpaBD5bKOloWx9J&si=wLJBL0TKrcs8Jkmc 6. https://youtu.be/1ZKuwyATV3c	26 Min 38 Min 27 Min 39 Min 13 hrs 1 hr 17 Min

	7. https://youtu.be/ZHCtVZ6cjdg?si=G0w6pE1v4dDNt2KV	8 Min						
Web Reference s	1. https://owasp.org 2. https://cloudsecurityalliance.org							
Mode of Evaluation								
CIE							ESE	Total
ST1	ST2	ST3	TA1 10	TA2 10	TA3 10	Attendance 10		
30			20				100	150