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 Information Technology(IT)

Third Year

(Effective from the Session: 2026-27)

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

B. TECH (IT)
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		
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	Deprtmental Elective	3	0	0	30	20	50		100		150	3
4		Departmental Elective-III	Deprtmental 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	Deprtmental 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.	BMC0060	Twitter Bootstrap	Infosys Wingspan (Infosys Springboard)	23h	1.5
3.	BMC0096	Scrum In Practice	Infosys Wingspan (Infosys Springboard)	26h 30m	2
4.	BMC0086	Java Programming Fundamentals	Infosys Wingspan (Infosys Springboard)	36h 10m	3
5.	BMC0117	An Introduction to world of AI with Machine Learning	NASSCOM	30h	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 (IT)

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	Deprtmental Elective	3	0	0	30	20	50		100		150	3
4		Departmental Elective-V	Deprtmental 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	Deprtmental 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								
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.	BMC0027	Network Fundamentals	Infosys Wingspan (Infosys Springboard)	37h 57m	3
4.	BMC0132	AD183 -Red Hat Application Development 1: Programming in JAVA EE 7.0	RedHat	32h	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	BCSCY0515	Ethical Hacking	DE II	Cyber Security	CSE	5
11	BCSCY0513	Network Security And Cryptography	DE II	Cyber Security	CSE	5
12	BCSCY0513P	Network Security And Cryptography Lab	DE III	Cyber Security	CSE	5
13	BCSE0614	Web Development Using Mern Stack With Devops	DE IV	Fullstack Bucket	CSE	6
14	BCSE0614P	Web Development Using Mern Stack With Devops Lab	DE IV	Fullstack Bucket	CSE	6
15	BCSE0612	Full-Stack Web Development Using Laravel With Vue.Js	DE V	Fullstack Bucket	CSE	6
16	BCSML0612	Generative AI	DE IV	AIML	CSE	6
17	BCSML0612P	Generative AI Lab	DE IV	AIML	CSE	6
18	BCSML0613	Digital Image Processing	DE V	AIML	CSE	6
19	BCSAI0611	Cloud Storage Management	DE IV	Cloud Computing	CSE	6
20	BCSAI0611P	Cloud Storage Management Lab	DE IV	Cloud Computing	CSE	6
21	BCSAI0613	Cloud Security	DE V	Cloud Computing	CSE	6
22	BCSCY0613	Malware Analysis And Reverse Engineering	DE IV	Cyber Security	CSE	6
23	BCSCY0613P	Malware Analysis And Reverse Engineering Lab	DE IV	Cyber Security	CSE	6
24	BCSCY0612N	Blockchain And Cryptocurrency Security	DE V	Cyber Security	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 to18 =1 Credit
3. For 19 to 24 =1.5 Credit
4. For 25 to 30 =2 Credit
5. For 31 to 35 =2.5 Credit
6. For 36 to 41 =3 Credit
7. For 42 to 47 =3.5 Credit
8. For 48 and above =4 Credit

For registration to MOOCs Courses, the students shall follow 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

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, 7th Edition, Pearson Education.	Hoboken
3.	Introduction to Networks Companion Guide (CCNAv7), 1st Edition, Cisco Press / Pearson Education, 2020.	Cisco Networking Academy
4.	Switching, Routing, and Wireless Essentials (SRWE), (CCNAv7), 1st 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=PLh94XVT4dq02frQRRZBHzvj2hwuhzSByN&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

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, handing 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**

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**

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**

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=EYeF2e2IKEo 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

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

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 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. 10.Basic Switch Configuration Configure switch settings, ports, and management IP.	**CO1**
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

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

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

Course Code: BCSE0556	**Course Name: Advanced Java Programming**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)		**0**	**0**	**6**	**3**

Pre-requisite: Basic knowledge of Core Java (OOP, exception handling, collections), multithreading, and fundamentals of SQL/database operations.

Course Objectives:

To equip students with in-depth knowledge of server-side programming using Java technologies such as Servlets, JSP, JDBC, and frameworks like Spring and Hibernate. The aim of this course is to enable students to build dynamic web applications and enterprise-level solutions with real world project exposure.

Course Outcome: After completion of the course, the student will be able to		Bloom's Level
CO1	Apply JDBC to integrate Java applications with relational databases for dynamic data handling and managing server-side programming using Servlets for handling web requests and responses.	K3
CO2	Analyze the use of JSP scripting elements, expression language, and directives to determine their effectiveness in dynamic web page rendering and maintainability.	K4
CO3	Implement modular, maintainable Java applications using advanced dependency injection techniques within the Spring Ecosystem.	K3
CO4	Design modular, loosely coupled web applications by implementing the MVC architecture using Spring MVC and Spring Boot.	K5
CO5	Deploy JPA to map, store, retrieve, and update data from java objects to relational databases and vice versa with RESTful APIs to enable scalable and maintainable services.	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	2	2	2	2	1	1	1	1	2	3	2	1	1
CO2	3	2	3	2	2	2	1	1	1	1	2	3	2	1	1
CO3	3	3	3	2	3	2	1	1	1	1	2	3	2	1	1
CO4	3	3	2	3	3	1	2	2	2	1	2	2	1	1	1
CO5	3	3	3	3	3	1	2	2	2	2	3	3	2	1	1

Course Contents / Syllabus

Module 1	**JDBC & Servlets**	**14 hours**

Jdbc: Introduction, JDBC Driver, DB Connectivity, Connection, Statement, Result Set, Prepared Statement, Transaction Management, Stored Procedures.

Servlet: Servlet Overview, Servlet Life Cycle, Servlet API, Generic Servlet, HTTP Servlet, Redirect requests to other resources using Request Dispatcher, send Redirect, Session Tracking: Using cookies, URL rewriting, and HTTP Session.

Module 2	**JSP**	**14 hours**

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=PLlhM4lkb2sEjVsbbZ_kiixY5CcR84IQUg 2. https://www.youtube.com/playlist?list=PL-XjHn7CHrmQhMkVC6KCfmsPHdklvUlQr 3. https://www.youtube.com/playlist?list=PL9ooVrP1hQOEfi91PCFQMawtBJrPpir7y 4. https://www.youtube.com/playlist?list=PL-XjHn7CHrmQhMkVC6KCfmsPHdklvUlQr 5. https://www.youtube.com/playlist?list=PLGRDMO4rOGcNSBOJOlrgQqGpIgo6_VZgR	13 hrs 1 hrs 18 hrs 50 Min 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 ModelMap 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_ftcof_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=0AAAAADdKX6YJHt3GyzupmRYbPOgHkEeFp&gclid=Cj0KCQjw3K7RBhDJARIsAKRtP5RBjckHBvGEYiEnTRFA8EtXpl89ha-X8id2TOYd0e4Sf9WTvVnonK4aAmqrEALw_wcB 2. https://www.coursera.org/learn/uva-darden-designbiz	4 weeks 6 hrs
Video Lectures	1. ht ps://www.youtube.com/watch?v=6_mHCOAAEI8 ht ps://nptel.ac.in/courses/110106124 https://designthinking.ideo.com/ 2. https://www.youtube.com/watch?v=7enWesSofhg 3. https://youtu.be/rthuFS5LSOo https://www.youtube.com/watch?v=kho6oANGu_A 4. https://www.youtube.com/watch?v=9vMpHk44XXo&list=PL1xHD4vteKYVpaliy295pg6_SY5qznc77&index=6 5. Reinforcement Learning Tutorial | Reinforcement Learning Example Using Python | Edureka - YouTube 6. Associat on Rule Mining – Solved Numerical Quest on on Apriori 7. Algorithm(Hindi) - YouTube 8. 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**

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

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	PSO 4
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=HYj4Ght1_qs 3. https://www.youtube.com/watch?v=N9tJCs-czOU&list=PLnIj1GYixjfrOhcWQq_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 shoping, 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 Mongodb, data modeling, The current SQL/NoSQL landscape, Create collection in Mongodb, CRUD Operations in MongoDB. Mongo's feature set, Introduction to Mongoose, Understanding mongoose schemas and datatypes, Connecting Angular with mongoDB using API.

	Total Lecture Hours	**45 hours**

Text Books

S.NO	**Book Title**	**Author**
1.	"Web Application Development with MEAN", 3rd Illustrated Edition 2017, Packt Publications.	Amos Q. Haviv , Adrian Mejia , Robert Onodi
2.	"Getting MEAN with Mongo, Express, Angular, and Node", 2nd Edition 2016, Addison Wesley Publication.	Simon Holmes , Clive Herber
3.	"Comprehensive guide to learn Node.js", 1st Edition, 2018 BPB Publications.	Dhruti Shah
4.	"Learning Angular",3rd 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=0AAAADdKX6Y4gVe2nrA-BD75Xjo7XWZvc&gclid=Cj0KCQjw3K7RBhDJARIsAKRtP5T6KxJN_3NMwp5KCs0I8bBY35dSkaUg10Y0FBCfhLqnqqyQCAG9yzgaAonEEALw_wcB 2. https://www.udemy.com/career/full-stack-web-developer/?utm_campaign=Search_Keyword_CareerAccelerator_Prof_la.EN_cc.	40 hrs 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=0AAAADROdO0RdwZEytECk3hJ8p0YLN6Wu&gclid=Cj0KCQjw3K7RBhDJARIsAKRtP5SBLzCT5ZsRMLP4tx1IJo-2jQWUMlsGRaHabTFG0lY_G_eZuu7xmCYaAg1tEALw_wcB	
Video Lectures	1. https://youtu.be/BLl32FvcdVM 2. https://youtu.be/fCACk9ziarQ 3. https://youtu.be/YSyFSnisip0 4. https://youtu.be/mGVFltBxLKU 5. https://youtu.be/bWaucYA1YRI 6. https://youtu.be/7H_QH9nipNs 7. https://youtu.be/AX1AP83CuK4 8. https://youtu.be/SccSCuHhOw0 9. https://youtu.be/lY6icfhap2o 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-rFHvwhBRAgFinJR8KHIrCdTkZcZ 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-rFHvwhBRAgFinJR8KHIrCdTkZcZ 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

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

LAB Course Code: BCSE0515P	**LAB Course Name: Web Development Using Mean 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 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		**Bloom's Level**
CO1	Develop server-side web applications using Node.js and Express framework by implementing modules, asynchronous programming, REST APIs, middleware, template engines, and document modeling with Mongoose.	K6
CO2	Design and build dynamic Single Page Applications (SPAs) using AngularJS and TypeScript by applying components, modules, data binding, controllers, dependency injection, forms, and AJAX concepts.	K6
CO3	Create and manage MongoDB databases by performing data modeling, CRUD operations, schema design using Mongoose, and integrating Angular applications with MongoDB through APIs.	K6

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	3	2	3	-	-	-	1	1	-	3	3	2	1
CO2	3	2	3	2	3	-	-	-	2	2	-	3	3	3	2
CO3	3	3	3	2	3	-	-	-	1	1	-	3	2	3	2

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

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

Web Reference	https://www.scholarhat.com/free-course/angular-course?utm_source=chatgpt.com **Free Angular Online Course with Certificate - Beginner Level (8 hours)**

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**
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)		**0**	**0**	**2**	**1**

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		**Bloom Knowledge Level**
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 Art f cial Neural Network using a custom dataset (e.g., digit or medical classification).	CO1
2	Write a program to Build an Art f cial Neural Network by implement ng the Backpropagat on 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 dif erent act vat on funct ons (sigmoid, softmax, ReLU, leaky ReLU, ELU, and tanh). Compare their outputs by plot ng how each act vat on funct on 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., sent ment 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 Variat onal Autoencoder (VAE) on the MNIST dataset for image generation	CO3

Total Hours:.17 Hours

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School of Computer Science & Information Technology

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 c virtualization, Virtual firewalls and security policies.

Coud 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**

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

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School of Computer Science & Information Technology

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

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School of Computer Science & Information Technology

Course Code: BCSE0514	**Course Name: Design Patterns**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)		3	0	0	3

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-11, 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=0AAAADROdO3wWjcAcJrZ3ow_Fcj2OFn24&gclid=Cj0KCQjw3K7RBhDJARIsAKRtP5TgfS7r7XJhzwC-gZgMsTFRkUx44pchkPY7WDXEXQyxDGeidGMqrbAaAn56EALw_wcB&couponCode=PMNVD2025	25 hrs 5 hrs
Video Lectures	1. https://www.youtube.com/watch?v=ysoC8S96pZU&list=PLBBog2r6uMCResrR48HziFtNx4-BDOmU0 2. https://www.youtube.com/playlist?list=PLmCsXDGbJHdhULIoYzIIIeFFJSo1NlMbN 3. https://www.youtube.com/watch?v=dCWuXDBRFtk&list=PL2NZAYdLkYvhFnqbvLbwf4ZM4rH99Jap6 4. https://www.youtube.com/watch?v=a4u_caEWTR8&list=PL2NZAYdLkYvg__5SpIDMlRopz-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**

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

Course Code: BCSML0512	**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=0AAAADdKX6Z3pSpwkoWShwEGojAlPVNXW&gclid=Cj0KCQjw3K7RBhDJARIsAKRtP5QRJj8-PsTe1razzbMavqCMSxjvO9s1VAm6-uBOUoSqHvjEGVV0wJcaAgNHEALw_wcB	12 Weeks 40 hrs
Video Lectures	1. https://www.youtube.com/watch?v=XRpJMxLaLeA&list=PLZ2ps__7DhBY8Mbke8rzGsACDQlIOcCqH 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**	**Attendance 10**		
30			**20**				**100**	**150**

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

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School of Computer Science & Information Technology

Course Code: BCSAI0523	**Course Name:** BIG DATA	**L**	**T**	**P**	**C**
Course Offered in: CSE/CSE(R)/IT/M.Tech Int. (CSE)		**3**	**0**	**0**	**3**

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 Objectives: The objective of this course is to introduce students to Big Data technologies, Hadoop ecosystem, and Cloud Computing concepts. It aims to develop understanding of distributed data processing, storage frameworks, and cloud-based data analytics tools.

Course Outcome: After completion of the course, the student will be able to		**Bloom's Knowledge Level (KL)**
CO1	Identify Big Data and relevance of Big Data Analytics.	K2
CO2	Analyze Map Reduce and demonstrate its use in features extraction.	K4
CO3	Explain the YARN and HDFC in Data management	K2
CO4	Articulate the concept of Cloud Computing and evolution of cloud computing with characteristics.	K3
CO5	Analyze the components of open stack & Google Cloud platform	K4

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	1	1	-	1	-	2	1	-	1	-	2	2	-	2	1
CO2	3	3	3	3	-	2	1	-	1	1	2	3	2	2	2
CO3	3	3	3	3	3	2	2	-	2	1	2	2	1	3	2
CO4	1	-	2	-	3	2	2	1	2	1	2	2	-	3	1
CO5	3	3	3	3	3	2	2	1	2	1	2	3	2	3	2

Course Contents / Syllabus

Module 1	**Introduction to Big Data**	**9 hours**

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

Introduction to Cloud Computing: Definition of Cloud, Evolution of Cloud Computing, Underlying Principles of Parallel and Distributed Computing, Cloud Characteristics.

Module 2	**Hadoop**	**9 hours**

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

Map Reduce: Map-Reduce framework and basics, how Map Reduce works, anatomy of a Map-Reduce job run, failures, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats, Map Reduce features, Real-world Map Reduce.

Hadoop Eco System and YARN: Hadoop ecosystem components, Hadoop 2.0 New Features, MRv2, YARN

Module 3	**HDFS (Hadoop Distributed File System)**	**9 hours**

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**

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 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc22_cs65	3 Months 8 Weeks
Video Lectures	1. https://www.youtube.com/watch?v=9QxZhapbo0o 2. https://www.youtube.com/watch?v=XueP_cx_rqg 3. https://www.youtube.com/watch?v=nY6hOJ3bFGQ	12 hrs 12 hrs 12 hrs
Web References	1. https://spark.apache.org/docs 2. https://hadoop.apache.org	

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

Course Code: BCSCY0515	Course Name: Ethical Hacking	L	T	P	C
Course Offered in: SCSIT, SCSET		3	0	0	3

Prerequisite: Basic understanding of computer networks, operating systems, cybersecurity fundamentals, and programming concepts.

Course Objectives: Equip participants with hands-on skills in ethical hacking methodologies—from reconnaissance to reporting—enabling them to identify, exploit, and remediate vulnerabilities in real-world environments.

Course Outcome: After completion of this course students will be able to		Bloom's Knowledge Level (KL)
CO1	Explain ethical hacking concepts and apply basic ethical hacking techniques in practical scenarios.	K2
CO2	Apply tools for footprinting, reconnaissance, and port scanning activities.	K3
CO3	Examine security vulnerabilities in web applications using ethical hacking tools and techniques.	K3
CO4	Explain scanning and enumeration concepts for identifying network resources and vulnerabilities using OpenVAS.	K3
CO5	Describe system hacking techniques such as unauthorized access, privilege escalation, and persistent control along with defense methods.	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	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	-	1	-	1	-	2	-	-	2	1
CO2	3	3	2	2	2	-	2	-	2	-	2	-	2	3	2
CO3	3	3	3	2	3	-	3	2	2	1	3	-	3	3	3
CO4	2	2	2	1	2	1	3	2	2	-	3	-	-	3	3
CO5	2	2	2	2	1	1	3	2	2	1	3	-	-	2	3

Course Contents / Syllabus

Module 1	**Introduction to Ethical Hacking.**	**9 hours**
Introduces the origins and progression of hacking, ethical guidelines and code-of-conduct, applicable legal frameworks (IT Act, GDPR), core terminologies (white-hat, black-hat, APT), and provides hands-on orientation to essential toolkits like Kali Linux and Metasploit.		
Module 2	**Foot printing & Reconnaissance**	**8 hours**
OSINT techniques; Passive/active reconnaissance; DNS interrogation (NS lookup, dig command); WHOIS lookup; Social engineering; Vulnerability scanning.		
Module 3	**Web Application Security**	**10 hours**
Introduction to Web Application Security, Common Web Vulnerabilities, Owasp: Broken Access Control, Securities Misconfiguration, Software Supply Chain failures, Cryptographic failures, Injection, Insecure Design, Authentication failures, Software data integrity failures, Securities logging and alerting failures, Mishandling of exceptional conditions, Web Application Reconnaissance and Foot printing, Web Application Scanning and Enumeration, Secure Coding Practices and Web Application Hardening		
Module 4	**Network Attacks and Défense Mechanisms**	**8 hours**
Port Scanning Techniques (TCP, UDP), Nmap Tool, Service Enumeration and Version Detection, OS Fingerprinting, Vulnerability Assessment and Analysis Using Scanning Tools like, Nessus, and OpenVAS..		
Module 5	**Defensive strategies**	**10 hours**
Introduction to Password Cracking Tools & Techniques, Wi-Fi Password Cracking Techniques, Escalating Privileges and Gaining Unauthorized Access, Exploiting System Vulnerabilities, Introduction to Malware Analysis & Reverse Engineering, Countermeasures and Defensive Strategies against System Hacking.		
	Total Lecture Hours	**45 hours**

Textbook:

1. The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy by Patrick Engebretson. 2nd Edition Elsevier / Syngress
2. CEH Certified Ethical Hacker All-in-One Exam Guide by Matt Walker. 2nd Edition, McGraw Hill
3. Web Application Hacker's Handbook: Finding and Exploiting Security Flaws By Dafydd Stuttard and Marcus Pinto. 2nd Edition, Wiley Publishing

Reference Books:

1. Penetration Testing: A Hands-On Introduction to Hacking, Georgia Weidman. 1st Edition, No Starch Press

NPTEL/ YouTube/ Faculty Video Link:

Self-Study Content Links:		Duration (in Hrs)
MOOCs	1. Mastering Ethical Hacking - TOC | Infosys Springboard	6 Hrs 46 Min
Video Lectures	1. https://www.youtube.com/watch?v=aFpI0VIkRKg 2. https://nptel.ac.in/courses/106105217	10 Hrs. 37 min
Web References	• OWASP Foundation • Kali Linux Documentation • Nmap Official Documentation	14 Hrs

	• Wireshark Documentation • Metasploit Framework • Burp Suite Documentation • OWASP Web Security Testing Guide (WSTG) • National Vulnerability Database (NVD) • MITRE ATT&CK Framework • CISA Cybersecurity Resources	

Note: Self-study material may include assignments, seminars, micro projects, industrial visits, any other student activities, etc.

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

Course Code: BCSCY0513	Course Name: Network Security and Cryptography	L	T	P	C
Course Offered in: SCSIT, SCSET		3	0	0	3

Prerequisite: Familiarity Understanding of basic Networking Terms (e.g., IP, LAN, Router), Awareness of Digital Tools (Email, Cloud, Antivirus), Fundamental Logical Thinking, Cybersecurity fundamentals

Course Objectives: This course aims to introduce the fundamental principles and concepts of network security and cryptography, provide insights into common network-based attacks and vulnerabilities and develop the ability to design secure network architectures using modern cryptographic tools and techniques.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Understand the fundamentals of cryptography and its applications in network security.	K1
CO2	Analyze different encryption algorithms and cryptographic protocols.	K2
CO3	Implement secure communication protocols to protect data transmission over networks.	K3
CO4	Identify common network attacks and employ countermeasures to mitigate them.	K3
CO5	Implement secure network architectures using cryptographic techniques.	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
CO1	3	1	-	-	1	-	-	-	-	-	-	2	3	1
CO2	3	3	1	1	2	-	-	-	-	-	-	2	3	2
CO3	2	2	3	2	3	1	-	1	1	1	1	3	2	2
CO4	2	3	2	2	2	2	1	1	-	-	-	2	2	3
CO5	3	2	3	2	3	2	1	1	1	1	2	3	3	3

Course Contents / Syllabus

Module 1	Cryptographic Techniques	10 hours

Introduction to Cryptography, Classical Cryptographic Techniques (Caesar Cipher, Monoalphabetic Cipher), Modern Symmetric Encryption Algorithms (AES, DES), Public Key Cryptography and RSA Algorithm (Key Generation, Encryption/Decryption), Digital Signatures and Hash Functions (SHA, Message Authentication Codes)

Module 2	Introduction to Network Security	9 hours

Overview of Network Security Principles, Goals and Objectives of Network Security, Threats, Attacks, and Vulnerabilities (e.g., Malware, DoS), Security Policies and Mechanisms (e.g., Access Control, Firewalls), Risk Management and Assessment (e.g., Risk Analysis, Mitigation Strategies).

Module 3	Secure Communication Protocols	9 hours

Secure Socket Layer (SSL) / Transport Layer Security (TLS – handshake process, certificate-based authentication), Internet Protocol Security (IPsec – AH/ESP protocols, tunnel and transport mode), Secure Shell (SSH – key-based authentication, port forwarding), Wireless Security Protocols (WPA, WPA2 – PSK, EAP authentication), Virtual Private Networks (VPNs – site-to-site VPN, remote access VPN).

Module 4	**Network Attacks and Defense Mechanisms**	**8 hours**

Types of Network Attacks (e.g., Denial of Service, Man-in-the-Middle), Intrusion Detection and Prevention Systems (IDS/IPS, Signature-based and Anomaly-based Detection), Secure DNS and DHCP (DNSSEC, DHCP Snooping), Introduction to OSSEC, OSSEC Architecture (Agent-based and Agentless Modes), Event Collection (Syslog, File Monitoring), Rule-Based Detection (Decoders and Rules), -Real-Time Alerting (Active Responses, Notifications).

Module 5	**Secure Network Design and Implementation**	**9 hours**

Network Architecture Design Principles (segmentation, least privilege), Defense-in-Depth Strategy (multiple security layers, redundancy), Secure Routing Protocols (BGP security, OSPF authentication), Security Best Practices for LANs, WANs, and Wireless Networks (encryption, access control), Security Assessment and Auditing (vulnerability scanning, log analysis)

Total Lecture Hours	**45 hours**

Textbook:

1. Network Security with OpenSSL: Cryptography by John Viega, Matt Messier, Pravir Chandra, published by O'Reilly Media
2. Cryptography and Network Security: Principles and Practice by William Stallings, **7th Edition Pearson**

Reference Books:

1. **Cryptography: Theory and Practice by Douglas Stinson, 4th Edition, CRC Press, taylor and Francis**

Self-Study Content Links:		Duration (in Hrs)
MOOCs	1. Python Case Study - Cryptography - TOC | Infosys Springboard	5 Hrs 47 Min
Video Lectures	1. https://www.youtube.com/watch?v=Q-HugPvA7GQ&list=PL71FE85723FD414D7 2. https://onlinecourses.nptel.ac.in/noc22_cs90/preview	59 Min 2 Sec 21 Hrs
Web References	1. NIST Cryptographic Standards 2. NIST Computer Security Resource Center (CSRC) 3. RFC Editor Repository 4. OpenSSL Documentation 5. Wireshark Documentation 6. Cisco Networking Academy	2 Hrs 3 Hrs 15 min 1 Hrs 4 Hrs 5 Hrs 3 Hrs

Note: Self-study material may include assignments, seminars, micro projects, industrial visits, any other student activities, etc.

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

LAB Course Code: XXXXXX	Course Name: Network Security and Cryptography Lab	L	T	P	C
Course Offered in: B. Tech CSE and Emerging Branches as Department Elective		0	0	2	1

Pre-requisite: Understanding basic Networking Terms (e.g., IP, LAN, Router), Awareness of Digital Tools (Email, Cloud, Antivirus), Fundamental Logical Thinking, Cybersecurity fundamentals.

Course Objectives:

Objectives: This course aims to introduce the fundamental principles and concepts of network security and cryptography, provide insights into common network-based attacks and vulnerabilities and develop the ability to design secure network architectures using modern cryptographic tools and techniques. Provide hands-on experience with classical and modern cryptographic algorithms.

1. Develop understanding of encryption, decryption, and key exchange mechanisms.
2. Demonstrate the use of cryptographic hash functions and authentication techniques.
3. Enable practical knowledge in configuring secure communication protocols.
4. Introduce tools and methods for basic penetration testing and security assessment.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Demonstrate the implementation and analysis of classical and modern cryptographic techniques including shift cipher, monoalphabetic cipher, one-time pad, MACs, hash functions, AES, DES, RSA, and ECC for secure data communication.	K3
CO2	Configure and evaluate secure communication protocols and network security mechanisms such as SSL/TLS, TLS handshake analysis, IPsec VPNs, and firewall configurations using appropriate security tools and techniques.	K4
CO3	Analyze and perform network security assessment activities including Man-in-the-Middle (MITM) attack simulation, DoS attack simulation, and penetration testing to identify vulnerabilities and strengthen system security.	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
CO1	3	2	1	1	2	-	-	1	-	-	-	2	3	1
CO2	3	3	2	2	3	1	-	1	1	1	1	3	2	2
CO3	3	3	1	2	2	-	-	1	-	-	-	1	3	3

List Of Practical's (Indicative & Not Limited To)	CO Level
1. Implementing Shift Cipher (Caesar Cipher).	CO1
2. Implementing Monoalphabetic Substitution Cipher.	CO1
3. Implementing One-Time Pad and Perfect Secrecy.	CO1
4. Implementing Message Authentication Codes (MAC).	CO1
5. Implementing Cryptographic Hash Functions (SHA-256).	CO1
6. Implementation of AES Encryption Algorithm.	CO1
7. Implementation of DES Encryption Algorithm using Python.	CO1
8. Implementation of RSA Algorithm (Key Generation, Encryption/Decryption).	CO1
9. Packet Capturing and Analysis using Wireshark.	CO2
10. Configuration of SSL/TLS for Secure Web Communication.	CO2
11. TLS Handshake Analysis using Wireshark.	CO2
12. Secure Remote Login using SSH and Key-Based Authentication.	CO2
13. Setting up IPsec VPN for Secure Network Communication.	CO2

14. Secure Network Design using VLAN Segmentation and Access Control.	CO3
15. Network Security Assessment and Penetration Testing.	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: BCSE0604	**Course Name: Computer Vision**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CSE(R)/IT		3	1	0	4

Pre-requisite: Basic Knowledge of programming language Python/ Advanced Python features/ Libraries/

Course Objectives: To learn about key features of Computer Vision, design, implement and provide continuous improvement in the accuracy and outcomes of various datasets with more reliable and concise analysis results.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Classify knowledge of deep architectures used for solving various Vision and Pattern Association Tasks	K2
CO2	Develop appropriate learning rules for each of the architectures of perceptron and learn about different factors of back propagation.	K3
CO3	Deploy training algorithm for pattern association with the help of memory network.	K5
CO4	Design and deploy the models of deep learning with the help of use cases.	K5
CO5	Understand Analyse different theories of deep learning using neural networks.	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	2	3	3	2	2	2	-	-	1	-	-	1	2	2	3
CO2	3	3	3	3	2	3	-	-	1	-	-	2	3	2	2
CO3	3	3	3	2	3	2	-	-	1	1	1	2	3	3	3
C04	3	3	3	3	3	2	-	2	2	1	1	3	3	3	3
CO5	3	3	2	3	3	3	1	1	2	1	-	3	3	3	3

Course Contents/ Syllabus

Module 1	**Computer Vision Foundations**	**9 hours**

Computer Vision, Research and Applications, Geometric primitives and transformations - Photometric image formation, The digital **Smart Cameras** camera - Point operators - Linear filtering, Digital Image fundamentals, Image Sensing and acquisition, Sampling and Quantization, Image formation models, OpenCV Basics, Edge Detection (Sobal, Canny) ,Most popular examples Categorization of Images, Retrieval of Images Based on Their Contents, Computer Vision Tasks classification.

Module 2	**Architectures**	**9 hours**

Representation of a Three-Dimensional Moving Scene. Convolutional layers, pooling layers, and padding. Transfer learning and pre-trained models Architectures. Architectures Design: LeNet-5, AlexNet, VGGNet, GoogLeNet, ResNet, Efficient Net, Mobile Net, RNN Introduction.

Module 3	**Segmentation**	**9 hours**

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, **S**urveillance 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 2. CNN and Object Detection Tutorial https://www.youtube.com/watch?v=pj9-rr1wDhM 3. YOLO Object Detection Explained https://www.youtube.com/watch?v=MPU2HistivI	3 Hrs 3 Hrs 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=NlLM3sVF8wY&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**

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

Course Code: BCSE0654	**Course Name: Computer Vision Lab**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CSE(R)/IT		**0**	**0**	**4**	**2**

Pre-requisite: Python , Machine Learning

Course Objectives:

The objective of this course is to provide practical knowledge of designing, training, and evaluating CNN models for image classification, object detection, and transfer learning applications. It aims to develop skills in digital image processing techniques such as enhancement, segmentation, compression, restoration, and color processing.

Course Outcome: After completion of the course, the student will be able to		**Bloom's Level**
CO1	Apply, implement, train, and evaluate deep learning models based on Artificial Neural Networks (ANNs) and Convolutional Neural Networks (CNNs) for classification, object detection, and transfer learning tasks.	K3
CO2	Apply image processing techniques for image enhancement, segmentation, morphology, compression, restoration, and color image analysis using appropriate software tools and libraries.	K3
CO3	Evaluate and analyze advanced deep learning architectures, including Autoencoders, Variational Autoencoders (VAEs), and Generative Adversarial Networks (GANs), for feature extraction, image transformation, and image generation 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	2	2	1	3	–	–	–	–	–	–	3	1	3	3
CO2	3	3	2	2	3	–	–	–	–	–	–	3	1	2	3
CO3	3	3	3	2	3	–	–	–	2	–	–	3	–	3	3

Course Contents / Syllabus

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

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

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**

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**

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**

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: Glocalized 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=PL15FRvx6P0OWTlNBS_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	**Tableau – getting started** • 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 **Joining multiple datasets** • Union / Join • Cross database joins Data Blending – integrating different data source	CO2
3	**Basic functionalities** • Filtering • Sorting • Grouping • Hierarchies • Creating sets • Pivot tables Types of dates – Continuous vs. Discreet **Calculations** • Syntax • Table calculations • LOD expressions • Aggregate Date, Logic, String, Number, Type calculations **Built-in chart types/visualisations:** • 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)**

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

Course Code: BCSE0614	**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 Mongodb.	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, 2nd Edition (2017)	Vasan Subramanian
2.	Hands-On MERN Stack Web Development: Build production-grade web apps and APIs with MERN stack ,3rd Edition (2019)	Shama Hoque
3.	Beginning MERN Stack: Build and Deploy a Full Stack MongoDB, Express, React, Node.js App 2nd 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/kTp5xUtcalw	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: BCSE0614P	**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 Mongodb.	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 2. https://www.youtube.com/watch?v=EsTrWCV0Ph4 3. https://www.youtube.com/watch?v=rVfZHWTwXSA 4. https://www.youtube.com/watch?v=E0Aed5dQyA8 5. https://www.youtube.com/watch?v=qJeaCHQ1k2w	0.27 hours 2 hours 0.33 hour 1:23 hours 0.33 hour

	6. https://www.youtube.com/watch?v=luBkbzjo-TA 7. https://www.youtube.com/watch?v=AALBGpLbj6Q 8. https://www.youtube.com/watch?v=NOSuy0NOe9k 9. https://www.youtube.com/watch?v=M1pF0QGDQyU 10. https://www.youtube.com/watch?v=nJ25yl34Uqw	1 hour 2 hours 0.91 hours 0.26 hours 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**

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

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.

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

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.

Encryption (At Rest & In Transit): Concept of encryption and its importance, Encryption at rest (stored data protection), Encryption in transit (data during transfer), Use of SSL/TLS protocols.
Access Control Mechanisms: Role-Based Access Control, Attribute-Based Access Control, Access Control Lists, Multi-Factor Authentication, IAM.

Module-5	**Advanced Cloud Storage and Applications**	**08 hours**

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 S driven Storage).

	Total Lecture Hours	**45 hours**

Textbook:

Book Details	**Authors Name**
"Cloud Storage Forensics" (Elsevier); 1st edition, 2014,	Darren Quick, Ben Martini, Kim-Kwang Raymond Choo, Syngress
Virtual Machines: Versatile Platforms for Systems and Processes, Morgan Kaufmann Publishers, 1st Edition, 2005	James E. Smith and Ravi Nair
"Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance" O'Reilly Media; 1st edition, 2009	Tim Mather, Subra Kumaraswamy, Shahed Latif, ,

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	1. Google Associate Cloud Engineer: Data & Storage Management 2. AWS SysOps Associate 2021: Storage Management 3. AWS Solutions Architect Associate (SAA-C03): Cost-Optimized Storage Design	02Hrs 02Min 01Hrs 41Min 01Hrs 02Min
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**

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

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	mplement 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.

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

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.js.

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, mEmlnc,
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 Weeks 5 hrs.

	2. https://www.coursera.org/learn/fundamentals-of-vuejs	
Video Lectures	1. https://youtu.be/ImtZ5yENzgE 2. https://youtu.be/0urHFBFHsLc?list=PL8p2I9GklV46dciS4GDzBFHBi0JVIbnzT 3. https://youtu.be/vjDLtAPXP34?list=PL7BQ4lqtgECS0oCt5jGaf0v77mBjS5r5O 4. https://youtu.be/EU7PRmCpx-0?list=PLillGF-RfqbYhQsN5WMXy6VsDMKGadrJ 5. https://youtu.be/JNhmEoBsZ48 6. https://youtu.be/qZXt1Aom3Cs 7. https://youtu.be/FXpIoQ_rT_c 8. https://youtu.be/bzlFvd0b65c 9. https://youtu.be/e-E0UB-YDRk 10. https://youtu.be/XCrmk1bKxf4 11. https://youtu.be/UWniysfpTmM 12. https://youtu.be/Zf6o7ag5WPI 13. https://youtu.be/dB1mazCqQAU 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

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

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
C04	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**

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**

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**

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**

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
C04	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/XsRBDJ5hcdg 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 References	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

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

Course Code: BCSCY0613	Course Name: Malware Analysis and Reverse Engineering	L	T	P	C
Course Offered in: SCSIT, SCSET		3	0	0	3

Prerequisite: Computer Networks, Operating Systems, C/C++ or Python Programming

Course Objectives: This course introduces techniques for analyzing and understanding malware behavior and reverse engineering malicious software. It equips students with skills to dissect malware through static and dynamic analysis and understand countermeasures and detection techniques.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Demonstrate an understanding of malware, its types, lifecycle, and behavioral characteristics.	K2
CO2	Apply static analysis techniques to examine file structures, metadata, and signatures of malware.	K3
CO3	Perform dynamic analysis to observe runtime behavior and system interaction of malware in isolated environments.	K4
CO4	Detect evasion and obfuscation techniques employed by malware to bypass security mechanisms.	K4
CO5	Develop comprehensive malware analysis reports including IOCs, attack vectors, and mitigation recommendations.	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
CO1	2	2	3	2	3		3	1		1	3	-	2	1
CO2	2	3	3	3	3		3	1		1	3	2	3	2
CO3	2	2	3	3	3	1	3	2	1	1	3	3	3	3
CO4	3	2	3	3	3	1	2	2	1	2	2	2	3	3
CO5	3	3	3	2	3	1	3	2	1	2	3	2	2	3

Course Contents / Syllabus

Module 1	**Introduction to Malware**	**10 hours**

Definition and classification of malware: viruses, worms, Trojans, ransomware, spyware, ~~,~~bots and fileless malware. Malware attack vectors and lifecycle: infection, persistence, execution, command and control (C2), and data exfiltration. Motivation behind malware: cybercrime, hacktivism, cyber espionage, and cyber warfare. Overview of living-off-the-land attacks and script-based malware (PowerShell/macros). Legal and ethical considerations in malware research and responsible handling of malicious software.

Module 2	**Static Analysis Techniques**	**10 hours**

Analyzing executable file formats~~:~~ (Windows) and ELF (Linux) structure. Analyze~~e~~ing executable headers and attributes using tools such as PEStudio, Detect It Easy (DIE), and Exeinfo PE. Extracting and analyzing strings using Strings and FLOSS~~,~~ File fingerprinting using SHA-256 hashing and reputation analysis with VirusTotal. Detecting and unpacking packed binaries~~,~~. Introduction to YARA rules for malware identification and classification.

Module 3	**Dynamic Analysis Techniques**	**10 hours**

Setting up isolated malware analysis environments using VirtualBox/VMware. Monitoring process behaviour using Process Explorer and Process Monitor, Observing network activity using Wireshark, and FakeNet-NG,. Identifying system changes: file system, registry, services, and persistence mechanisms. Introduction to automated malware analysis platforms such as Cuckoo Sandbox, Hybrid Analysis or Any. Run. Behavioural indicators and basic malware evasion techniques.

Module 4	***Reverse Engineering Essentials***	**8 hours**

Overview of x86 architecture and assembly fundamentals. Understanding program control flow (: loops, branches, function calls) and stack operations. Disassembling binaries using IDA Pro and Ghidra Recognizing common library functions and reconstructing , program logic. Debugging malware using x64dbg breakpoints, stepping, memory inspection,. Introduction to code obfuscation and anti-disassembly techniques.

Module 5	***Advanced Topics & Reporting***	**7 hours**

Code injection and hooking techniques: DLL injection, and API hooking,. Memory forensics using Volatility framework for malware investigation. Anti-analysis techniques: anti-debugging, anti-VM, detection and code obfuscation. Extracting Indicators of Compromise (IOC): IPs, domains, registry keys, file paths, and hashes, Mapping malware behaviour to the MITRE ATT&CK framework. Preparation of professional malware analysis reports including attack summary, indicators and mitigation strategies. Case studies of real-world malware such as WannaCry, Emotet, and Zeus).

	Total Lecture Hours	**45 hours**

Textbook:

1. Practical Malware Analysis, Michael Sikorski, Andrew Honig, 1st Edition (2012), No Starch Press.
2. The IDA Pro Book, Chris Eagle, 2nd Edition, No Starch Press.
3. The Art of Memory Forensics, Michael Hale Ligh, Andrew Case, Jamie Levy, Aron Walters, 1st Edition (2014), John Wiley & Sons / Wiley.

Reference Books:

1. Practical Reverse Engineering, Bruce Dang, Alexandre Gazet, Elias Bachaalany, Sebastien Josse, 1st Edition, Wiley.
2. Reversing: Secrets of Reverse Engineering, Eldad Eilam, 1st Edition, Wiley Publishing.
3. Malware Analyst's Cookbook and DVD, Michael Hale Ligh, Steven Adair, Blake Hartstein, Matthew Richard, 1st Edition, Wiley.
4. Learning Malware Analysis, Monnappa K. A., 1st Edition, Packt Publishing.
5. Mastering Malware Analysis, Alexey Kleymenov, Amr Thabet, 1st Edition, Packt Publishing.
6. The Ghidra Book, Chris Eagle, Kara Nance, 1st Edition, No Starch Press.
7. Windows Internals, Part 1 & 2, Pavel Yosifovich, Mark Russinovich, David Solomon, Alex Ionescu, 7th Edition, Microsoft Press.
8. Rootkits and Bootkits, Alex Matrosov, Eugene Rodionov, Sergey Bratus, 1st Edition, No Starch Press.
9. The Shellcoder's Handbook, Chris Anley, John Heasman, Felix Lindner, Gerardo Richarte, 2nd Edition, Wiley.
10. Malware Data Science, Joshua Saxe, Hillary Sanders, 1st Edition, No Starch Press.
11. Windows Kernel Programming, Pavel Yosifovich, 2nd Edition, Leanpub.
12. Rootkits: Subverting the Windows Kernel, Greg Hoglund, James Butler, 1st Edition, Addison-Wesley

Self-Study Content Links:		Duration (in Hrs)
MOOCs	1. Advanced Malware Analysis - TOC | Infosys Springboard	5 Hrs 3 Min
Video Lectures	1. OpenSecurityTraining.info – Reverse Engineering 2. Malware Unicorn – https://www.malwareunicorn.org/ 3. https://bazaar.abuse.ch/	15 hours 10 hours 10 hours
Web References		

Note: Self-study material may include assignments, seminars, micro projects, industrial visits, any other student activities, etc.

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

LAB Course Code: BCSCY0613P	LAB Course Name: Malware Analysis and Reverse Engineering	L	T	P	C
Course Offered in: SCSIT, SCSET		**0**	**0**	**2**	**1**

Pre-requisite: Computer Networks, Operating Systems, C/C++ or Python Programming

Course Objectives:

1. This course introduces techniques for analyzing and understanding malware behavior and reverse engineering malicious software. It equips students with skills to dissect malware through static and dynamic analysis and understand countermeasures and detection techniques.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Understand malware fundamentals, malware categories, attack vectors, executable formats, malware lifecycle, legal and ethical considerations, and basic static malware analysis techniques.	K2
CO2	Apply static and dynamic malware analysis techniques using malware analysis tools, sandboxing environments, network monitoring, and behavioral analysis utilities.	K3
CO3	Perform reverse engineering, debugging, memory forensics, IOC extraction, anti-analysis detection, and professional malware investigation and reporting.	K3

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

CO – PO Mapping	PO 1	PO2	PO3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO1 0	PO11	PSO1	PSO2	PSO3
CO1	3	3	1	2	3	2	-	2	-	1	-	2	1	2
CO2	2	3	2	3	3	1	-	1	1	1	-	2	1	2
CO3	3	3	3	3	3	2	-	2	2	2	-	2	2	1

List Of Practical's (Indicve & Not Limited To)	**CO**
1. Study malware categories, lifecycle, and attack vectors using real-world malware examples	CO1
2. Analyze legal and ethical issues in malware analysis through case studies	CO1
3. Analyze PE and ELF executable structures using PEStudio and Detect It Easy	CO1
4. Perform string extraction, hashing, and VirusTotal reputation analysis	CO1
5. Detect packed malware and create basic YARA rules for malware identification	CO2
6. Configure an isolated malware analysis environment using VirtualBox/VMware	CO2
7. Monitor malware behaviour using Process Explorer and Process Monitor	CO2
8. Capture and analyze malware network traffic using Wireshark and TCPView	CO2
9. Perform automated malware analysis using Cuckoo Sandbox and observe evasion behaviour	CO2
10. Study x86 assembly instructions and analyze program control flow	CO3

11. Perform binary disassembly and debugging using IDA Pro/Ghidra and x64dbg	CO3
12. Identify obfuscation and anti-disassembly techniques in malware binaries	CO3
13. Perform memory forensics using Volatility and extract Indicators of Compromise (IOCs)	CO3
14. Prepare a professional malware analysis report with mitigation strategies and case study analysis	CO3
Total Hours: - 30 Hours	

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science & Information Technology

Course Code: BCSCY0612N	Course Name: Blockchain and Cryptocurrency Security	L	T	P	C
Course Offered in: SCSIT, SCSET		3	0	0	3

Pre-requisite: Computer Networks, Network Security, Operating Systems, Programming skills

Course Objectives: To explore the foundational concepts of blockchain technology and its architecture to develop secure blockchain-based applications and assess their resilience to cyber threats.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Understand the evolution, core architecture, types of blockchain, and distinguish between centralized, decentralized and distributed ledger systems and their real-world use cases across IoT, AI/ML, Data Science and other engineering domains.	K2
CO2	Explain the fundamental cryptographic concepts — hashing, Merkle trees, digital signatures, wallets and PKI — that underpin blockchain security, without requiring advanced mathematical background.	K2
CO3	Apply knowledge of consensus mechanisms, smart contract vulnerabilities and blockchain attack vectors to analyze the security and operational behavior of decentralized networks.	K3
CO4	Develop and deploy smart contracts using Solidity on Remix IDE and understand enterprise blockchain architecture using Hyperledger Fabric, demonstrating ability to write, test and interact with blockchain applications hands-on.	K4
CO5	Evaluate and map real-world blockchain applications across financial systems, supply chain, government, healthcare, IoT and AI/ML domains, and assess emerging trends such as Zero-Knowledge Proofs, Layer 2 solutions and cross-chain interoperability.	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
CO1	3	2	2	2	2	2	1	2	1	-	-	2	2	-
CO2	3	2	1	2	2	1	1	2	1	1	-	2	1	1
CO3	3	3	2	3	2	2	1	3	2	1	-	3	3	2
CO4	3	3	3	2	3	2	1	3	2	2	-	3	2	2
CO5	2	2	2	2	2	3	2	2	2	2	1	2	2	2

Course Contents / Syllabus

Module 1	**Introduction to Blockchain Technology**	**08 hours**

Evolution and history of blockchain; Structure and components of a blockchain (nodes, blocks, chain, mining); Types of blockchains: Public, Private, Consortium; Centralized traditional databases vs. Decentralized databases vs. Distributed Ledger Technology (DLT), Use cases: cryptocurrency (Bitcoin), supply chain, identity management, healthcare; Digital Money to Distributed Ledgers; Blockchain Design Primitives: Protocols, Permissions (Permissioned vs. Permissionless Blockchains), Privacy For Demo: https://andersbrownworth.com/blockchain , https://blockchaindemo.io

Module 2	**Cryptographic Foundations**	**09 hours**

Hash functions and Merkle trees (conceptual); Digital signatures and public-key cryptography (how it works, not proofs); Wallets: types and key management; Blockchain addresses and transactions; PKI Infrastructure — conceptual overview; Two-Factor Authentication

with Blockchain. Browser based tool: CyberChef (GCHQ)https://gchq.github.io/CyberChef , https://www.myetherwallet.com ,		
Module 3	***Consensus, Contracts, and Attacks***	**10 hours**
Need for consensus in decentralized systems; Proof-of-Work (PoW) (conceptual); Proof-of-Stake (PoS), Delegated PoS; Proof-of-Authority (PoA); Practical Byzantine Fault Tolerance (PBFT);Mining and its role in blockchain security , Introduction to Bitcoin, Ethereum and altcoins; Transaction lifecycle; UTXO model vs. account-based model; Smart contracts and their working; Common vulnerabilities: reentrancy, overflow/underflow (awareness level); Attacks:51% attack, Sybil Attack, Eclipse Attack, Routing Attack, Distributed Denial of Service (DDoS) Online Tool: https://www.blockchain.com/explorer, https://txstreet.com/		
Module 4	***Enterprise Blockchain and Smart Contract Development***	**09 hours**
Hyperledger Fabric — Components and Architecture; Chaincode: What it is and how it works; Introduction to Remix IDE — Interface and Setup; Writing Your First Smart Contract on Remix IDE; Smart contract development using Solidity; Deploying and Testing Smart Contracts on Remix IDE;Events, Functions and Modifiers in Solidity; ERC-20 Token Standard — Overview , Tools for auditing smart contracts (Mythril, Slither, Oyente) , (Remix IDE) https://remix.ethereum.org , https://github.com/hyperledger/fabric-samples		
Module 5	***Blockchain Applications and Emerging Technologies***	**09 hours**
Introduction of version control engine, use case of automated assignment grading, peer review workflow, public repositories, building portfolios, collaborating on codebases, track changes, and resolve conflicts, Version-controlled technical manuals ensure up-to-date knowledge sharing using GitHub. Regulatory and legal frameworks for cryptocurrencies (global and national perspectives) https://etherscan.io/		
	Total Lecture Hours	**45 hours**

Textbook:

1. Mastering Bitcoin: Programming the Open Blockchain, Andreas M. Antonopoulos and David A. Harding, 3rd Edition, O'Reilly Media, 2023
2. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Daniel Drescher, 1st Edition, Apress, 2017
3. Mastering Ethereum: Building Smart Contracts and DApps, Andreas M. Antonopoulos and Gavin Wood, 1st Edition, O'Reilly Media, 2018

Reference Books:

1. Blockchain Technology and Applications, Pethuru Raj, Kavita Saini and Chellammal Surianarayanan, 1st Edition, CRC Press / Routledge, 2020
2. The Basics of Bitcoins and Blockchains, Antony Lewis, Updated Edition, Mango Media, 2021
3. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, 1st Edition, Princeton University Press, 2016

Self-Study Content Links:		Duration (in Hrs)
MOOCs	1. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0129294905 29533952761_shared/overview ~ 9 hrs OR 2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013038627 363602432360_shared/overview ~ 11 hrs	10 hrs
Video Lectures	1. https://www.youtube.com/watch?v=EH6vE97qIP4 ~2.5 hrs 2. https://www.youtube.com/watch?v=PPFsG92-HiI ~2.5 hrs 3. https://www.youtube.com/watch?v=0UvVOMZqpEA ~1.5 hrs 4. https://www.youtube.com/watch?v=7Cu8KQmUhu0 ~1.5 hrs 5. https://www.youtube.com/watch?v=w7HDA8gUbpQ ~2 hrs 6. https://www.youtube.com/watch?v=JPkgJwJHYSc ~1.5 hrs 7. https://www.youtube.com/watch?v=9mZpc6sKryk ~1.5 hrs 8. https://www.youtube.com/watch?v=RGOj5yH7evk ~1 hr 9. https://www.youtube.com/watch?v=prG1DJMoqoI ~1 hr	15 hours
Web References	1. https://en.wikipedia.org/wiki/Blockchain ~1 hr 2. https://openknowledge.worldbank.org/bitstreams/5166f335-35db-57d7-9c7e-110f7d018f79/download ~1 hr 3. https://arxiv.org/html/2508.01280v1 ~1.5 hrs 4. https://hyperledger-fabric.readthedocs.io/en/latest/whatis.html ~1 hr	5 hours

Note: Self-study material may include assignments, seminars, micro projects, industrial visits, any other student activities, etc.