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TULSIRAMJI GAIKWAD-PATIL College of Engineering & Technology

DEPARTMENT OF INFORMATION TECHNOLOGY

B.Tech Information Technology

As Per NEP-2020

III Year VI Sem

Syllabus

Session:- 2025-26

GAIKWAD-PATIL GROUP OF INSTITUTIONS

DEPARTMENT OF INFORMATION TECHNOLOGY

Vision of the Institute

To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management.

Mission of the Institute

- To strive for rearing standard and stature of the students by practicing high standards of professional ethics , transparency and accountability.
- To provide facilities and services to meet the challenges of Industry and Society.
- To facilitate socially responsive research, innovation and entrepreneurship.
- To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.

DEPARTMENT OF INFORMATION TECHNOLOGY

Vision of the Department

"To emerge as a learning hub and center of excellence in the domain of Information Technology"

Mission of the Department

- To impart quality technical education through effective teaching learning process.
- To provide a platform to address societal issues as well as challenges faced by IT industries.
- To foster a culture of research and impart innovative and entrepreneurial skills in the field of IT.
- To ensure overall development of students and staff by inculcating knowledge and professional ethics as a part of lifelong learning.

DEPARTMENT OF INFORMATION TECHNOLOGY

PEO's of the Department

PEO 1: Demonstrate essential technical skills to identify, analyze and solve problems and design issues in IT Sector.

PEO 2: Apply field knowledge, research and professional practices to meet the requirements of industries.

PEO3: Imbibe lifelong learning practices and entrepreneurship skills in tune with emerging technologies.

PEO 4: Inculcate professional ethics and managerial skills to satisfy real life problems for serving the needs of society and environment.

PSO's of the Department

PSO1:Develop and apply logical and programing skills to solve real-world challenges.

PSO2: Utilize knowledge of software engineering and network techniques to design and implement efficient solutions.

PSO3: Leverage computing knowledge to conduct research and adopt emerging technologies in the development of IT systems.

Tulsiramji Gaikwad-Patil College of Engineering &Technology, Nagpur

(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur)

SCHEME OF INSTRUCTION & SYLLABI

Programme: B. Tech. in Information Technology

Scheme of Instructions: B. Tech. Information Technology (As Per NEP 2020)

Semester- VI

Sr. No	Sem	Type	BoS/ Dept	Sub Code	Subject	T/P	Contact Hours			Credits	% Weightage			ESE Duration	Total Marks
							L	P	Hrs		CT/IA	CA	ESE		
1	VI	PCC	IT	BIT33601	Interactive Web Programing	T	3	-	3	03	30	10	60	3 Hrs	**100**
2		PCC	IT	BIT33602	Artificial Intelligence & Machine Learning	T	3	-	3	03	30	10	60	3 Hrs	**100**
3		PEC	IT	BIT33603-05	Program Elective-II	T	4	-	4	04	30	10	60	3 Hrs	**100**
4		PEC	IT	BIT33606-08	Program Elective-III	T	4	-	4	04	30	10	60	3 Hrs	**100**
5		MDM	ECE	BEC33611	Internet of Things	T	2	-	2	02	14	6	30	2 Hrs	**50**
6		VSEC	IT	BIT33609	Data Analytics (Lab)	P	-	2	2	01	-	25	25	-	**50**
7		PCC	IT	BIT33610	Interactive Web Programing Lab	P	-	2	2	01	-	25	25	-	**50**
8		PCC	IT	BIT33611	Artificial Intelligence & Machine Learning	P	-	2	2	01	-	25	25	-	**50**
9		PCC	IT	BIT33612	Prompt Engineering Lab	P	-	2	2	01	-	25	25	-	**50**
Total							**16**	**8**	**24**	**20**	**134**	**146**	**370**	**14 Hrs**	**650**

Course Category	BSC/ ESC (Basic Science Course/ Engineering Science Course.)	PCC/PEC (Programme Core courses	VSEC (Skill Course)	Multidisciplinary Courses		Humanities Social Science & Management				Experiential Learning Courses				CC (Co-Curricular Courses)
				MDM (Multidisciplinary minor	OE(Open Elective)	AEC(Ability Enhancement Course)	IKS(Indian Knowledge System)	VEC(Value education Course	Management Course	Research Methodology	Field Project	Project	Internship /OJT	
Credits	-	09/08	01	2	-	-	-	-	-	-	-	-	-	-
Cumulative Sum	16 / 13	39/12	07	10	08	04	02	04	04	-	2	-	-	04

PROGRESSIVE TOTAL CREDITS:105+20=125

Head of Dept. (Information Technology) Tulsiramji Gaikwad-Patil College of Engineering & Technology Nagpur	Dean Academics Tulsiramji Gaikwad-Patil College Of Engineering and Technology, Nagpur	Vice-Principal(Academics) TGPCET, NAGPUR	Dr. Premanand Naktode Principal TGPCET, Nagpur	Nov,2025	1.00	Applicable for AY 2025-26 Onwards
Chairperson	Dean-Academics	Vice-Principal(Academics)	Principal	Date of Release	Version	

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SCHEME OF INSTRUCTION & SYLLABI

Programme: B. Tech. in Information Technology

Scheme of Instructions: B. Tech. Information Technology (As Per NEP 2020)

Programme: B.Tech In Information Technology

List of **Program Electives** offered by Information Technology Department

Program Elective- I	Program Elective-II	Program Elective- III	Program Elective- IV	Program Elective- V
Semester V	**Semester VI**	**Semester VI**	**Semester VII**	**Semester VIII**
BIT33504- Software Engineering & Project Management	**BIT33603-** Ethical Hacking	**BIT33606-** Digital Forensics	**BIT34702-** Reinforcement Learning	**BIT34803-** Generative AI
BIT33505- Data Warehousing and Mining	**BIT33604-** Social Media Analytics	**BIT33607-** Big Data Analytics	**BIT34703-** Deep Learning	**BIT34804-** Information Retrieval
BIT33506- Cloud Computing	**BIT33605-** Cyber Laws and Ethics	**BIT33608-** Natural Language Processing	**BIT34704-** Computer Vision	**BIT34805-** Multimedia Forensics

Program: B. Tech in Information Technology

List of **Open Electives** offered by Information Technology

Open Elective-I	Open Elective-II	Open Elective-III
Semester-III	Semester-IV	Semester-V
BIT32312- Operating Systems	BIT32413- Artificial Intelligence	BIT33514- Cyber Security

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Chairperson	Dean-Academics	Vice-Principal(Academics)	Principal	Date of Release	Version	

Exit Course

Award of UG Certificate (After First Year)

Sr. No	Course Name	Mode of conduction	Credits
01	Networking/IT support	Certification Online/Offline/NPTEL	04
02	Programming in C++	Certification Online/Offline/NPTEL	04
OR			
03	Internship(16 week)	-	08
Total			**08**

Award of Diploma (After 2 Year)

Sr. No	Course Name	Mode of conduction	Credits
01	Artificial Intelligence	Certification Online/Offline/NPTEL	04
02	Cloud Computing	Certification Online/Offline/NPTEL	04
OR			
03	Internship(16 week)	-	08
Total			**08**

Exit Course

Award of Vocational Degree (After 3 Year)

Sr. No	Course Name	Mode of conduction	Credits
01	Cyber Security	Certification Online/Offline/NPTEL	04
02	Industry 4.0	Certification Online/Offline/NPTEL	04
OR			
03	Internship(16 week)	-	08
Total			**08**

Chairperson	Dean-Academics	Vice-Principal	Principal	Date of Release	Version	
Chairperson Head of Dept. (Information Tec Tulsiramji Gaikwad-Patil Co Engineering & Technology, I	Dean Academics Tulsiramji Gaikwad-Patil College Of Engineering and Technology, Nagpu	Vice Principal Tulsiramji Gaikwad-Patil College Of Engineering & Technology, Nagpur	Dr. Premanand Naktode Principal TGPCET, Nagpur	June,2025	1.00	Applicable for AY 2025-26 Onwards

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Third Year (Semester-VI) B. Tech. Information Technology

BIT33601:- Interactive Web Programming

Teaching Scheme	
Theory	**3 Hrs/week**
Tutorial	**-**
Total Credits	**3**

Examination Scheme	
CT-I	15 Marks
CT-II	15 Marks
CA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 3Hrs	

Course Objectives:

1.	To explain the features of DHTML.
2.	To analyze the requirements for and create and implement the principles of web page development.
3.	To classify and use cascading style sheets (CSS)
4.	To study and use JavaScript programs
5.	To learn knowledge of DOM objects that interacts with server-based programs

Course Contents

Unit I	HTML and common tags: Introduction, www, Internet, URL, Common tags: Text formatting tags Line and Paragraph tags, Lists: ordered list Unordered List, definition List, anchor tag , Absolute and relative path, Tables and its attributes, Image tag-alt attribute, image mapping frames, forms , cascading style sheet, External style sheet, internal Style sheet.
Unit II	JavaScript: Introduction, benefits of JavaScript, editing JavaScript, displaying information, Alert(), Prompt(), and Confirm dialogs, Operators, Conditional statements, Loops, Functions, Arrays. Stacks implementation in JavaScript: Operations – push(), pop(), peek(), applications of Stack in web development Objects in JavaScript: Math, String, Date, Boolean, Number, Document, Window. DHTML with JavaScript: Object Model Collection, Events in JavaScript, Filters and transitions – Flip filter, Image mask.
Unit III	XML: Introduction, Advantages, Difference between HTML and XML, XML Namespace, Well-formed and valid XML, XML Document type definition, XML schemas, Data types Attribute Types Transformation-xsl, Document object model (DOM)using XML processors: DOM and SAX.
Unit IV	The Server Side: Client side Vs. Server side, Transformation from static to dynamic sites, reading environment parameters, accessing parameter data, state management, event driven tracking. An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions- Form Validation- Regular Expressions – File handling – Cookies – Connecting to Database, Node.js
Unit V	Java Server Pages: Need of JSP, JSP Life Cycle, Elements in JSP Page, Implicit JSP Objects, JSP Objects scope, JSP tags, JSP exceptions ,Expression Language, JSP standard tag Library custom tag Library, JSP and Equivalent Technologies, Introduction to Frameworks

Text Books	
T.1	Web Technology Theory and Practices by M. Shrinivasan, PEARSON publication. 2. Android application Development for Java Programmers by James c. Sheusi, CENGAGE Learning.
Reference Books	
R.1	HTML: The Complete Reference, by Thomas A. Powell, McGraw Hill 2. XML: The Complete Reference, by Williamson, McGraw Hill
Useful Links	
1	https://nptel.ac.in/courses/106/105/106105084/

	Course Outcomes	CL	Class Sessions
BIT33601.1	Classify the concepts of Internet programming and protocols used and to create applications using HTML and CSS	2	9
BIT33601.2	Illustrate applications using different tags of JavaScript and DHTML	2	9
BIT33601.3	Demonstrate applications using different tags of XML	3	9
BIT33601.4	Prepare applications using SERVLETS.	4	9
BIT33601.5	Demonstrate the JSP Life Cycle along with its different tags.	5	9

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Third Year (Semester-VI) B. Tech. Information Technology

BIT33602:- Artificial Intelligence and Machine Learning

Teaching Scheme	
Theory	**3 Hrs/week**
Tutorial	**-**
Total Credits	**3**

Examination Scheme	
CT-I	15 Marks
CT-II	15 Marks
CA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 3Hrs	

Course Objectives:

1.	To classify the various characteristics of a problem-solving agent.
2.	To Explain basic concepts of Knowledge & Reasoning: Statistical Reasoning.
3.	To Discuss the different models of learning and clustering problems.
4.	To elaborate the methods of solving real life problems using the machine learning techniques
5.	To learn the classification, clustering and regression-based machine learning algorithms.

Course Contents

Unit I	Introduction to Artificial Intelligence and Problem-Solving Agent: Problems of AI, AI technique, Tic – Tac – Toe problem. Intelligent Agents, Agents & environment, structure of agents, learning agents. Defining the problem as state space search, production system, problem characteristics, and issues in the design of search programs.
Unit II	Knowledge & Reasoning: Statistical Reasoning: Probability and Bays' Theorem, Certainty Factors and Rule-Base Systems, Bayesian Networks, Fuzzy Logic. AI for knowledge representation, rule-based knowledge representation, procedural and declarative knowledge, Logic programming, Forward and backward reasoning.
Unit III	Introduction to Machine Learning: Exploring sub-discipline of AI: Machine Learning, Supervised learning, Unsupervised learning, Reinforcement learning, Classification problems, Regression problems, Clustering problems, Introduction to neural networks and deep learning.
Unit IV	Supervised and Unsupervised: Convolution neural network (CNN) -Layers in CNN - CNN architectures. Recurrent Neural Network -Applications: Classification Algorithms: back propagation, neural network - k-nearest neighbor rule. Support vector machine: multicategory generalizations – Regression Decision trees
Unit V	Component Analysis and Clustering Algorithms: Principal component analysis - Linear discriminate analysis - Independent component analysis. K-means clustering - fuzzy k-means clustering, Cross-Validation and Resampling Methods, K-Fold Cross Validation, Bootstrapping.

Text Books

T.1	S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2015.
T.2	Nils J. Nilsson, "Artificial Intelligence: A New Synthesis", 1st Edition, Morgan

Reference Books	
R.1	R. O. Duda, E. Hart, and D.G. Stork, "Pattern Classification", Second Edition, John Wiley & Sons, Singapore, 2012.
R.2	Artificial Intelligence: A Modern Approach. Stuart Russell, Peter Norvig; Prentice Hall
Useful Links	
1	https://nptel.ac.in/courses/106102220

	Course Outcomes	CL	Class Sessions
BIT33602.1	Classify knowledge representation, problem solving, and learning methods of artificial Intelligence.	2	9
BIT33602.2	Discuss Knowledge and reasoning and its representation in artificial intelligence.	2	9
BIT33602.3	Illustrate the concepts of machine learning and deep learning.	2	9
BIT33602.4	Analyze supervised learning techniques including CNN, RNN, SVM, and decision trees.	4	9
BIT33602.5	Evaluate machine learning models using cross-validation and resampling techniques like bootstrapping.	5	9

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Third Year (Semester-VI) B. Tech. Information Technology

BIT33603:-Ethical Hacking(Program Elective-II)

Teaching Scheme	
Theory	**4 Hrs/week**
Tutorial	**-**
Total Credits	**4**

Examination Scheme	
CT-I	15 Marks
CT-II	15 Marks
CA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 3Hrs	

Course Objectives:

1.	To study the fundamental concepts of ethical hacking, including various phases and types of hackers
2.	To Identify threats, vulnerabilities, and attacks in computer systems and networks.
3.	To Explore tools and techniques used in ethical hacking such as foot printing, scanning, social engineering, and password cracking.
4.	To evaluate system and network security measures using penetration testing and vulnerability assessment tools.
5.	Demonstrate awareness of the legal, ethical, and professional issues related to cybersecurity practices

Course Contents

Unit I	Introduction to Ethical Hacking, Types of Hackers, Phases of Ethical Hacking, Networking Basics: IP, TCP/IP and OSI, Foot printing Techniques, Google Hacking, Scanning Basics, Social Engineering
Unit II	Introduction to Computer Systems and Networks, Role of Information Systems and Networks in Industry, Business, and Society, Overview of Wireless Networks and their Security Challenges, System and Network Vulnerabilities: OS, Applications, Configuration flaws, Types of Attacks: Malware-based, Network-based , Application-based , Types of Attackers (threat actors): Script kiddies, Cybercriminals, Insider threats, State-sponsored attackers
Unit III	Physical Security, Wireless Hacking, Firewall & Honeypots, IDS & IPS, Vulnerability, Penetration Testing, Session Hijacking, Hacking Web Servers, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow, Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobile Phone Hacking
Unit IV	An introduction to the particular legal, professional and ethical issues likely to face the domain of ethical hacking. Ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking.
Unit V	Understanding the password hacking techniques-Rootkits-Trojans-Backdoors-Viruses and worms sniffers-denial of service-Session hijacking, Latest Study Topics on Cyber Crime and Investigations - Recent Cyber Crime Cases –Recent Digital Forensics Cases , Steganography, Cryptography

Text Books	
T.1	Hands-On Ethical Hacking and Network Defense- James Corley (Author), Kent Backman (Author), Michael Simpson (Author)
T.2	The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy, 2nd Edition, Patrick Engebreston, ISBN: 0124116442
Reference Books	
R.1	Penetration Testing: A Hands-On Introduction to Hacking, Georgia Weidman, ISBN: 1593275641
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc22_cs13/preview

	Course Outcomes	CL	Class Sessions
BIT33603.1	Classify the role of ethical hacking in securing computer and information systems.	2	9
BIT33603.2	Apply reconnaissance and scanning techniques to discover system vulnerabilities.	3	9
BIT33603.3	Analyze the types of threats and simulate common attacks like social engineering, DoS, and malware infections.	4	9
BIT33603.4	Use tools to conduct penetration testing and assess the security posture of a system.	4	9
BIT33603.5	Evaluate the legal and ethical responsibilities of ethical hackers and cybersecurity professionals.	5	9

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Third Year (Semester-VI) B. Tech. Information Technology

BIT33604 :-Social Media Analytics (Program Elective-II)

Teaching Scheme	
Theory	**4 Hrs/week**
Tutorial	**-**
Total Credits	**4**

Examination Scheme	
CT-I	15 Marks
CT-II	15 Marks
CA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 3Hrs	

Course Objectives:

1.	To classify the landscape of social media and the need for analytics in various organizational contexts.
2.	To Apply network models and social network theory to analyze online communities and influencers.
3.	To Analyze online user behavior using web analytics tools and techniques including clickstream analysis, A/B testing, and Google Analytics.
4.	To Evaluate social media performance metrics on platforms like Facebook, Linked In, Instagram, and YouTube using platform-specific analytics tools.
5.	To Process and visualize social media data using Python and tools such as Tableau, Google Data Studio, and Power BI.

Course Contents

Unit I	**Introduction to Social Media Analytics (SMA):** Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Application of SMA in different areas Network fundamentals and models: The social networks perspective - nodes, ties and influencers, Social network and web data and methods. Graphs and Matrices- Basic measures for individuals and networks. Information visualization
Unit II	**Making connections:** Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity. Web analytics tools and techniques: Click stream analysis, A/B testing, online surveys, Use of Google Analytics; Web crawling and Indexing; Natural Language Processing Techniques for Micro-text Analysis
Unit III	**Facebook Analytics:** Introduction, parameters, demographics. Analyzing page audience. Reach and Engagement analysis. Post performance on FB, Use of Facebook Business Manager; Social campaigns. Measuring and Analyzing social campaigns, defining goals and evaluating outcomes, Network Analysis. (LinkedIn, Instagram, YouTube Twitter etc.
Unit IV	**Processing and Visualizing Data**: Influence Maximization, Link Prediction, Collective Classification. Applications in Advertising and Game Analytics (Use of tools like Unity30 / PyCharm). Introduction to Python Programming, Collecting and analyzing social media data; visualization and exploration

Unit V	**Tools and Platforms for Social Media Analytics:** Social Media Listening Tools: Hootsuite, Sprout Social, Brandwatch, Programming with Python/R for Social Media Analytics **Dash boarding Tools:** Tableau, Google Data Studio, Power BICloud-Based Analytics Tools: Google BigQuery, AWS for Social Media, Real-Time Social Media Stream Analysis using Apache Kafka/Spark.
Text Books	
T.1	Social Media Analytics Strategies by April Ursula Fox
T.2	Creating Value With Social Media Analytics by Gohar F. Khan
Reference Books	
R.1	Social Media and Web Analytics by Dr. Anand Vyas
R.2	1st Edition Media Analytics By C. Ann Hollifield, Amy Jo Coffey
Useful Links	
1	https://www.techtarget.com/searchbusinessanalytics/definition/social-media-analytics
2	https://sproutsocial.com/insights/social-media-analytics/

	Course Outcomes	CL	Class Sessions
BIT33604.1	Illustrate the landscape of social media and the need for analytics in various organizational contexts.	2	9
BIT33604.2	Classify network models and social network theory to analyze online communities and influencers.	2	9
BIT33604.3	Analyze online user behavior using web analytics tools and techniques.	4	9
BIT33604.4	Evaluate social media performance metrics on social media platforms using platform-specific analytics tools.	5	9
BIT33604.5	Examine social media data using Python and tools	4	9

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Third Year (Semester-VI) B. Tech. Information Technology

BIT33605:- Cyber Laws and Ethics (Program Elective-II)

Teaching Scheme	
Theory	**4 Hrs/week**
Tutorial	**-**
Total Credits	**4**

Examination Scheme	
CT-I	15 Marks
CT-II	15 Marks
CA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 3Hrs	

Course Objectives:

1.	Discuss the basics of cyber threats & security.
2.	To classify fundamentals of law & act
3.	To study about cyber & security policies.
4.	Explain the nature and applications of cyber law in real life
5.	To understand various security issues in cyber

Course Contents

Unit I	**INTRODUCTION** - Introduction, Forgery, Hacking, Software Piracy, Computer Network intrusion - Category of Cybercrime - Cybercrime Mobile & Wireless devices - Tools and Methods used in cybercrime - Phishing & Identity Theft.
Unit II	**CYBER CRIME**- Constitutional & Human Rights issues in cyberspace freedom of speech and Expression in cyber space, right to access in cyber space-access to internet, right to privacy, right to data protection cybercrimes and legal framework, cybercrime against individual, institution and state, Hacking Digital Forgery cyber stalking/Harassment, Cyber Pornography, identity theft & fraud, cyber terrorism, cyber defamation.
Unit III	**CYBER LAW**- Cyber torts cyber defamation, different types of civil wrongs under IT Act 2000, Intellectual property issues in cyber space, interface with copyright law, interface with patent law, trademark & domain names related issues.
Unit IV	**E-COMMERCE**- E-commerce concept-commerce-salient features online approaches like B2B, B2C & C2Conline contracts, click wrap contracts, applicability of Indian contract act 1872. Intellectual Property: Copyrights, Patents, Trade Secret Laws, Key Intellectual property issues, Plagiarism, Privacy: The right of Privacy, Protection, Key Privacy and K-Anonymity issues, Identity Theft.
Unit V	**JURISDICTION**- Dispute Resolution in cyberspace, concepts of Jurisdiction, Indian context of Jurisdiction and IT Act 2000.Interantional Law and Jurisdictional issues in cyberspace Case studies: Cyber Crime-Some Landmark Occurrence, Recent Trends in Cyber Laws

Text Books	
T.1	S. R. Bhansali, Information Technology Act, 2000, University Book House Pvt. Ltd.
T.2	Jonthan Rosenoer, Cyber Law, Springer, New York.
Reference Books	
R.1	Jennifer L. Bayuk, Jason Healey, Paul Rohmeyer, Marcus H. Sachs, Jeffrey Schmidt, "Cyber Security Policy Guidebook", John Wiley & Sons, 2012.
R.2	Reich, Pauline C, "Law, Policy, and Technology: Cyberterrorism, Information Warfare, and Internet Immobilization", IGI Global, 2012.
Useful Links	
1	https://onlinecourses.swayam2.ac.in/cec24_cs14/preview

	Course Outcomes	CL	Class Sessions
BIT33605.1	Explain forms of cybercrimes, and identity theft.	2	9
BIT33605.2	Classify the legal framework addressing cybercrimes against individuals, institutions, and the state.	2	9
BIT33605.3	Discuss Cyber laws and provisions of IT Act in detail	2	9
BIT33605.4	Analyze the key intellectual property and privacy issues in the digital environment.	4	9
BIT33605.5	Examine jurisdictional challenges and dispute resolution mechanisms in cyberspace	4	9

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Third Year (Semester-VI) B. Tech. Information Technology

BIT33606:- Digital Forensics (Program Elective-III)

Teaching Scheme		Examination Scheme	
Theory	4 Hrs/week	CT-I	15 Marks
Tutorial	-	CT-II	15 Marks
Total Credits	4	CA	10 Marks
		ESE	60 Marks
		Total	100 Marks
		Duration of ESE: 3Hrs	

Course Objectives:

1.	To introduce the fundamentals of computer forensics, types of computer crimes, and legal implications.
2.	To Discuss the procedures and tools used in high-tech corporate investigations and digital recovery.
3.	To develop knowledge on data acquisition methods, tools, and validation techniques in forensic investigations.
4.	To provide the skills to manage crime scenes, secure evidence, and maintain chain-of-custody for digital data.
5.	To familiarize students with modern forensic tools, email forensics, and data-hiding techniques.

Course Contents

Unit I	Computer forensics fundamentals, Benefits of forensics, computer crimes, computer forensics evidence and courts, legal concerns and private issues.
Unit II	Understanding Computing Investigations – Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations
Unit III	Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools.
Unit IV	Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case.
Unit V	Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool.

Text Books

T.1	Warren G. Kruse II and Jay G. Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley, 2002.

T.2	Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.
Reference Books	
R.1	Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.
Useful Links	
1	https://onlinecourses.swayam2.ac.in/cec20_lb06/preview

	Course Outcomes	CL	Class Sessions
BIT33606.1	Explain the fundamentals of computer forensics, types of crimes, evidence handling, and legal frameworks.	2	9
BIT33606.2	Classify the investigation procedures in a corporate environment and utilize tools for digital recovery.	2	9
BIT33606.3	Illustrate the data acquisition methods including remote and RAID-based acquisitions.	2	9
BIT33606.4	Analyze digital evidence using forensics principles.	4	9
BIT33606.5	Evaluate forensic tools and conduct email forensics including identification of evidence and tracing data-hiding.	5	9

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Third Year (Semester-VI) B. Tech. Information Technology

BIT33607:- Big Data Analytics (Program Elective-III)

Teaching Scheme	
Theory	4 Hrs/week
Tutorial	-
Total Credits	4

Examination Scheme	
CT-I	15 Marks
CT-II	15 Marks
CA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 3Hrs	

Course Objectives:

1.	Explain the characteristics, challenges, and need for analytical frameworks in Big Data Analytics.
2.	Apply Hadoop ecosystem concepts to configure clusters, manage data flow, and perform basic administrative operations
3.	Analyze the enhancements in Hadoop 2.0 including YARN and evaluate the role of different ecosystem components and schedulers.
4.	Design and implement data queries using HiveQL and develop scalable data models with HBase and Zookeeper.
5.	Apply machine learning techniques and R programming to perform Big Data Analytics using BigR

Course Contents

Unit I	**Introduction To Big Data:** Data Storage and Analysis - Characteristics of Big Data – Big Data Analytics - Typical Analytical Architecture – Requirement for new analytical architecture – Challenges in Big Data Analytics –Need of big data frameworks
Unit II	**Introduction Hadoop :** Big Data – Apache Hadoop & Hadoop Eco System – Moving Data in and out of Hadoop –Understanding inputs and outputs of MapReduce - Data Serialization hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., Name Node, Secondary Name Node, and Data Node, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.
Unit III	**Hadoop Ecosystem and YARN :** Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features- Name Node High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN
Unit IV	**HIVE AND HIVEQL, HBASE:** Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data -Sorting and Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase concepts- Advanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.
Unit V	Data Analytics with R, Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

Text Books	
T.1	Understanding Big data, Chris Eaton, Dirk deroos et al.McGraw Hill, 2012.
T.2	HADOOP: The definitive Guide, Tom White, O Reilly 2012.
Reference Books	
R.1	Big Data Analytics with R and Hadoop, Vignesh Prajapati, Packet Publishing 2013.
R.2	Big Data Analytics, Seema Acharya, Subhasini Chellappan Wiley 2015.
Useful Links	
1	https://archive.nptel.ac.in/courses/106/104/106104189/
2	https://onlinecourses.nptel.ac.in/noc20_cs92/preview

	Course Outcomes	CL	Class Sessions
BIT33607.1	Explain the characteristics, challenges, and need for Big Data Analytics and frameworks	2	9
BIT33607.2	Demonstrate the Hadoop architecture, HDFS operations, and implement basic Hadoop cluster configurations and maintenance.	3	9
BIT33607.3	Analyze the enhancements introduced with Hadoop 2.0 and YARN.	4	9
BIT33607.4	Interpret Big Data queries using HiveQL, design HBase schemas, and implement Zookeeper-based application	3	9
BIT33607.5	Demonstrate machine learning models using R and BigR for Big Data Analytics.	3	9

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BIT33608:- Natural Language Processing (Program Elective-III)

Teaching Scheme		Examination Scheme	
Theory	4 Hrs/week	CT-I	15 Marks
Tutorial	-	CT-II	15 Marks
Total Credits	4	CA	10 Marks
		ESE	60 Marks
		Total	100 Marks
		Duration of ESE: 3Hrs	

Course Objectives:

1.	To understand the fundamental concepts and techniques of Natural Language Processing.
2.	To learn various NLP tasks, including text processing, information retrieval, and language modeling.
3.	To gain practical experience in implementing NLP algorithms and applications.
4.	To explore the applications of NLP in various domains.
5.	To explore advanced NLP applications, considering ethical implications and emerging trends.

Course Contents

Unit I	**Introduction to Natural Language Processing:** Introduction to NLP: Concepts, applications, and challenges. Levels of Language Analysis: Phonology, Morphology, Syntax, Semantics, Pragmatics. Text Preprocessing: Tokenization, stemming, lemmatization, Stop word removal, noise removal, normalization, Regular expressions for text processing. Text Representation: Bag-of-Words (BoW), Word2Vec, GloVe, FastText, contextual embeddings (BERT embeddings).
Unit II	**Linguistic Essentials and Syntax Analysis:** Morphology: Inflectional and derivational morphology. Parts of Speech (POS) tagging: Rule-based, statistical, and transformation-based tagging, BERT-based POS tagging. Context-Free Grammars (CFGs) and parsing. Dependency Parsing: Concepts and algorithms. Chunking and Named Entity Recognition (NER).
Unit III	**Semantic Analysis and Information Retrieval:** Word Sense Disambiguation (WSD): Approaches and algorithms. Semantic roles and semantic networks. Information Retrieval (IR): Vector space model, relevance ranking, Evaluation metrics for IR.
Unit IV	**Language Modeling and Text Classification: N**-gram language models: Unigram, bigram, trigram. Smoothing techniques: Add-one, Good-Turing. Text classification: Naive Bayes, Support Vector Machines (SVM). Evaluation metrics for classification. Introduction to Recurrent neural network for text processing, LSTM
Unit V	**Advanced NLP Applications and Trends:** Sentiment analysis: Techniques and applications, Machine Translation: Basic concepts and approaches. Neural MT, Text summarization: Extraction and abstraction methods. Dialogue systems: Basic concepts and applications. Introduction to transformer networks. Ethical Considerations in NLP.

Text Books	
T.1	Daniel Jurafsky and James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition," Pearson.
T.2	Natural Language Processing" by James Allen.
Reference Books	
R.1	Steven Bird, Ewan Klein, and Edward Loper, "Natural Language Processing with Python," O'Reilly Media.
R.2	The Oxford Handbook of Computational Linguistics" edited by Ruslan Mitkov.
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc23_cs45/preview

	Course Outcomes	CL	Class Sessions
BIT33608.1	Classify the ability to preprocess text data using NLP techniques.	2	9
BIT33608.2	Demonstrate syntactic parsing methods, including context-free grammars and dependency parsing.	3	9
BIT33608.3	Analyze semantic structures and apply information retrieval techniques to extract meaningful insights from text.	4	9
BIT33608.4	Interpret language models and perform text classification using algorithms in NLP.	3	9
BIT33608.5	Evaluate real-world applications of Natural Language Processing	5	9

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BEC33611:-Internet of Things

Teaching Scheme	
Theory	**2 Hrs/week**
Tutorial	**-**
Total Credits	**2**

Examination Scheme	
CT-I	07 Marks
CT-II	07 Marks
CA	06 Marks
ESE	30 Marks
Total	50 Marks
Duration of ESE: 2Hrs	

Course Objectives:

1.	To introduce the foundational concepts of the Internet of Things (IoT), its architecture, and design challenges.
2.	To explain networking protocols across IoT stack layers including Data Link, Network, Transport, and Session Layers.
3.	To provide hands-on understanding of building and integrating IoT applications

Course Contents

Unit I	Introduction to IoT, IoT Challenges, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints, Data representation and visualization, Interaction and remote control
Unit II	IOT Data Link Layer & Network Layer Protocols: PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, ZWave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP
Unit III	Transport & Session Layer Protocols: Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer HTTP, CoAP, XMPP, AMQP, MQTT IoT platform and application: Customized IOT platform using Virtual Private Server, Amazon Alexa, Google API, Blynk, Cayenne, Thingsboard, Thigspeak, Case study of Applications

Text Books

T.1	Raj kamal, “Internet of Things architecture and design principles “, 1ed, Mc Graw Hill.
T.2	Samuel Greengard, The Internet of Things by Samuel Greengard

Reference Books	
R.1	Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM – MUMBAI Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc22_cs53/preview
2	https://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

	Course Outcomes	CL	Class Sessions
BEC33611.1	Classify the key components of IoT architecture and real-world constraints impacting IoT design.	2	9
BEC33611.2	Differentiate among IoT communication protocols based on performance and applicability.	4	9
BEC33611.3	Evaluate IoT applications using virtual platforms and APIs	5	9

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BIT33609:- Data Analytics Lab

Teaching Scheme		Examination Scheme	
Practical	2 Hrs/week	CA	25 Marks
Tutorial	-		
Total Credits	1	ESE	25 Marks
		Total	50 Marks

Course Objectives:

1.	To understand fundamentals of data analysis, business analytics, and project workflows.
2.	To analyze the statistics, sampling, and exploratory data analysis to interpret datasets.
3.	To explore the concept of hypothesis testing, correlation analysis, and draw insights from sample data
4.	To classify skills in R programming, data handling, visualization, and EDA for continuous and categorical variables.
5.	To illustrate feature engineering, predictive modeling, and create interactive visualizations using Tableau integrated with R/Python.

Course Contents

Unit I	Introduction to data analysis: Overview, Data Science vs Data Analysis, Business Analytics classification, Data Science Project workflow, Project Roles, Introduction to R programming, R Studio, Applications of R
Unit II	Basics of Statistics: Population, Sample, Parameter, Statistic, Types of data: Qualitative & Quantitative. Sampling Methods: Simple Random Sampling, Systematic Sampling, Cluster Sampling, Stratified Sampling, Biased / Non-probability Sampling, Sampling Error. Exploratory Data Analysis (EDA)**:** Summary statistics, Handling missing values & outliers, Basic graphs: Histogram, Box plot, Bar chart. Measures of Central Tendency**:** Mean, Median, Mode, Mid-range, Measures of Dispersion**:** Range, Variance, Standard Deviation, Mean Deviation
Unit III	Introduction to Hypothesis Bayes theorem, Basics and need of hypothesis and hypothesis testing, Pearson Correlation, Sample Hypothesis testing.
Unit IV	Basic Data Analysis through RStudio, Essentials of R Programming: Data Types and Objects in R, Control Structures (Functions) in R, Useful R Packages, Exploratory Data Analysis in R : Basic Graphs, Treating Missing values, Working with Continuous and Categorical Variables
Unit V	Data Manipulation in R: Feature Engineering, Label Encoding and One Hot Encoding. Predictive Modeling using Machine Learning: Linear (Multiple) Regression, Decision Trees, Random Forest, Introduction to Modern Analytics Tools Tableau**:** Overview, worksheets, dashboards: Creating interactive visualizations, Connecting datasets and exploring data, Simple storyboards & insights Integrating R/Python with Visualization Tools**:** Export processed data from R/Python to Tableau, Visualize predictive model outputs

Text Books

T.1	Hands-on Programming with R, Garrett Grolemund.

Reference Books

R.1	Applied predictive modeling by Max Kuhn and Kejell Johnson

Useful Links	
1	NPTEL Course: https://nptel.ac.in/courses/110/106/110106072/

Sr. No	List of Practical	CO
1	a. Installation and Configuration of R/Python Studio. b. Write a R/Python program to create a list of random numbers in normal distribution and count occurrences of each value.	CO1
2	Write an R/Python program to count vowels, consonants, digits, and spaces in given data.	CO1
3	Write an R/Python program to calculate Mean, Median, Mode of a dataset.	CO2
4	Analyze and visualize dataset using Excel or Power BI.	CO2
5	Write an R/Python program to calculate Pearson correlation between two variables.	CO3
6	Write an R/Python program to perform sample hypothesis testing (t-test).	CO3
7	Write an R/Python program to detect and treat missing values in a dataset.	CO4
8	Write an R/Python program to create basic visualizations (bar chart, histogram, boxplot).	CO4
9	Build and evaluate simple Linear Regression model.	CO5
10	Create an Open Ended Project using Backend Database.	CO5

	Course Outcomes	CL	Class Sessions
BIT33609.1	Illustrate the basics of data analysis, and statistical measures.	02	4
BIT33609.2	Apply sampling techniques and perform basic probability, correlation, and hypothesis computations for data-driven decisions.	03	4
BIT33609.3	Analyze R/Python data structures, controls, and functions for effective EDA and data manipulation.	04	4
BIT33609.4	Demonstrate visualizations, manage missing data, and apply basic ML and feature engineering using R/Python.	03	4
BIT33609.5	Implement R/Python skills, ML models, and preprocessing to solve analytical problems.	03	4

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BIT33610: Interactive Web Programming Lab

Teaching Scheme		Examination Scheme	
Practical	2 Hrs/week	CA	25 Marks
Total Credits	1	ESE	25 Marks
		Total	50 Marks

Sr. No	List of Practical	CO
1	Create a web page with the following using HTML i) To embed an image map in a web page ii) To fix the hot spots iii) Show all the related information when the hot spots are clicked.	CO1
2	Create a webpage using all types of Cascading Style Sheets (CSS). Perform client-side validation of web form controls using JavaScript (DHTML).	CO1
3	Write programs in Java to create applets incorporating the following features	CO2
4	Create a color palette with matrix of buttons Set background and foreground of the control text area by selecting a color from color palette. In order to select Foreground or background use check box control as radio buttons To set background images	CO2
5	Write programs in Java using Servlets: To invoke servlets from HTML forms to invoke servlets from Applets	CO3
6	Write programs in Java to create three-tier applications using JSP and Databases for conducting on-line examination for displaying student mark list. Assume that student information is available in database which has been stored in a database server.	CO3
7	Create web page using CSS	CO4
8	To write a program, which takes user id as input and displays the user details by taking the user information from the XML document.	CO4
9	Consider a case where we have two web Services- an airline service and a travel agent and the travel agent is searching for an airline. Implement this scenario using Web Services and Data base.	CO5
10	Write an XML file which will display the Book information which includes the following: 1) Title of the book 2) Author Name 3) ISBN number 4) Publisher name 5) Edition 6) Price Write a Document Type Definition (DTD) to validate the above XML file. Write an XML file which will display the Book information which includes the following: 1) Title of the book 2) Author Name 3) ISBN number 4) Publisher name 5) Edition 6) Price Write a Document Type Definition (DTD) to validate the above XML file.	CO5

Text Books	
1	The Complete Reference HTML and XHTML by Thomas A.Powell, McGraw Hill Pub
2	Learning angular JS by Dayley, Brad Dayley
Reference Books	
1	Learning PHP, MySQL, JavaScript, and CSS: A Step-by-Step Guide to Creating Dynamic
Useful Links	
1	https://nptel.ac.in/courses/106/105/106105084/

	Course Outcomes	CL	Lab Sessions
BIT33610.1	Classify the basic concepts of Internet programming and protocols used and to create applications using HTML and CSS	2	4
BIT33610.2	Illustrate applications using different tags of javascript and DHTML	2	4
BIT33610.3	Demonstrate applications using different tags of XML	3	4
BIT33610.4	Prepare applications using SERVLETS.	4	4
BIT33610.5	Demonstrate the JSP Life Cycle along with its different tags.	5	4

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BIT33611: Artificial Intelligence & Machine Learning Lab

Teaching Scheme		Examination Scheme	
Practical	2 Hrs/week	CA	25 Marks
Total Credits	1	ESE	25 Marks
		Total	50 Marks

Sr. No	List of Practical	CO
1	To understand the basics of Artificial Intelligence and Machine Leaning	CO1
2	Write a Program to Implement Tic-Tac-Toe game using Python.	CO1
3	To classify the Bayesian networks and their usefulness.	CO2
4	To Implement Bayes' Theorem for Simple Probability Calculation	CO2
5	Implement linear regression using python	CO3
6	To illustrate the Q-Learning algorithm using virtual lab	CO3
7	Implementing k-Nearest Neighbor (KNN) for Classification	CO4
8	Implement an algorithm to demonstrate Back Propagation Algorithm in python	CO4
9	Implement K-Means Clustering using python	CO5
10	Implementing Principal Component Analysis (PCA) for Dimensionality Reduction and Data Visualization	CO5

Text Books	
1	S. Russell and P. Norvig, “Artificial Intelligence: A Modern Approach”, Prentice Hall, Third Edition, 2015.
2	Nils J. Nilsson, “Artificial Intelligence: A New Synthesis”, 1st Edition, Morgan
Reference Books	
1	R. O. Duda, E. Hart, and D.G. Stork, “Pattern Classification”, Second Edition, John Wiley & Sons, Singapore, 2012.
2	Artificial Intelligence: A Modern Approach. Stuart Russell, Peter Norvig; Prentice Hall
Useful Links	
1	https://nptel.ac.in/courses/106102220
2	https://www.vlab.co.in/broad-area-computer-science-and-engineering

	Course Outcomes	CL	Lab Sessions
BIT33611.1	Classify knowledge representation, problem solving, and learning methods of artificial Intelligence.	2	4
BIT33611.2	Discuss Knowledge and reasoning and its representation in artificial intelligence.	2	4
BIT33611.3	Illustrate the concepts of machine learning and deep learning.	2	4
BIT33611.4	Analyze supervised learning techniques including CNN, RNN, SVM, and decision trees.	4	4
BIT33611.5	Evaluate machine learning models using cross-validation and resampling techniques like bootstrapping.	5	4

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BIT33612: Prompt Engineering Lab

Teaching Scheme			Examination Scheme	
Practical	2 Hrs/week		CA	25 Marks
Total Credits	1		ESE	25 Marks
			Total	50 Marks

Sr. No	List of Practical	CO
1	Classify prompts to demonstrate Zero-shot, Few-shot, and Instruction prompting using any LLM.	CO1
2	Design prompts to implement the Five Principles of Prompting and analyze their effectiveness.	CO1
3	Create and test Role-based prompts to simulate expert behaviors such as Teacher, Doctor, Interviewer, and Critic.	CO2
4	Generate prompts to perform Text Style Transfer and analyze tone, structure, and writing features.	CO2
5	Design prompts to generate creative content such as social media posts, video scripts, and email marketing copies.	CO3
6	Construct iterative and Chain-of-Thought prompts and analyze their improvement over direct prompting.	CO3
7	Develop prompts for summarization, translation, and explanation tasks to compare output quality across LLMs.	CO4
8	Create image generation prompts using DALL·E / Midjourney / Stable Diffusion and analyze output variations.	CO4
9	Construct Negative and Reverse-Engineering prompts for image correction and optimization.	CO4
10	Design a complete prompting workflow to generate a research-based AI blog including outline, content, and images.	CO5

Text Books	
1	James Phoenix, Mike Taylor, “Prompt Engineering for Generative AI”, O’Reilly, To Release in May 2024
2	Gilbert Mizrahi, “Unlocking the Secrets of Prompt Engineering: Master the Art of Creative Language Generation to Accelerate Your Journey from Novice to Pro”, January 2024
Reference Books	
1	Michael Ferguson, “Prompt Engineering: The Future of Language Generation”, January 2023
Useful Links	
1	https://elearn.nptel.ac.in/shop/completed-courses/partnering-closed/prompt-engineering-for-testers-harnessing-ai-for-smarter-qa/?v=13b5bfe96f3e

	Course Outcomes	CL	Lab Sessions
BIT33612.1	Illustrate the effectiveness of different prompting strategies using real examples.	2	4
BIT33612.2	Classify role-based prompts that simulate expert personalities effectively.	2	4
BIT33612.3	Discuss the effectiveness of structured prompts versus direct prompts.	2	4
BIT33612.4	Demonstrate proficiency in both text-based and image-based multimodal prompting.	3	4
BIT33612.5	Apply ethical principles while generating AI text and images.	3	4

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