DTE Code: 4151 www.tgpcet.com

TULSIRAMJI GAIKWAD-PATIL College of Engineering & Technology

Approved by AICTE, New Delhi and Govt. of Maharashtra | Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

AN AUTONOMOUS INSTITUTE

DEPARTMENT OF INFORMATION TECHNOLOGY

B. Tech in Information Technology

As Per NEP 2020

(Version 2)

Scheme of Instruction & Syllabus

VI Semester

From AY. 2026-27

GAIKWAD-PATIL GROUP OF INSTITUTIONS

B.Tech | B.Arch | M.Tech | MBA | MCA | BBA | BCA | Polytechnic | D.Arch | B.Pharm | D.Pharm | BAMS | B.Sc Nursing | Physiotherapy | Ph.D

Vision Mission of Institution

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

Mission -

- 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.

Vision Mission of Department

Vision - To emerge as a learning hub and centre of excellence in the domain of Information Technology

Mission -

- 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.



Program Specific Outcomes

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.

Program Educational Outcomes

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.

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	3	-	3	03	30	10	60	3 Hrs	**100**
4		PEC	IT	BIT33606-08	Program Elective-III	T	3	-	3	03	30	10	60	3 Hrs	**100**
5		MDM	ECE	BEC33611	Internet of Things	T	2	-	2	02	14	6	30	2 Hrs	**50**
6		PRO	IT	BIT33609	Mini Project	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**	**148**	**152**	**400**	**16 Hrs**	**700**

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	-	08/06	-	2	-	-	-	-	-	-	-	01	-	-
Cumulative Sum	16 / 13	37/10	07	10	08	04	02	04	04	-	2	01	-	04

PROGRESSIVE TOTAL CREDITS:105+20=125

Head of Dept. Information Technology, Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur	Vice Principal Dr. Ganesh Wakte Vicep Principal TGPCET, Nagpur	Patil	Dr. Premanand Naktode Principal TGPCET, Nagpur	October, 2026	2.00	Applicable for AY 2024-25 Onwards
Chairperson	Vice-Principal/ Dean Academics	Director Administration	Principal	Date of Release	Version	

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)

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 VII**
BIT33504- Software Engineering & Project Management	**BIT33603-** Ethical Hacking	**BIT33606-** Digital Forensics	**BIT34704-** Reinforcement Learning	**BIT34707-** Generative AI
BIT33505- Data Warehousing and Mining	**BIT33604-** Social Media Analytics	**BIT33607-** Big Data Analytics	**BIT34705-** Deep Learning	**BIT34708-** Information Retrieval
BIT33506- Cloud Computing	**BIT33605-** Cyber Laws and Ethics	**BIT33608-** Natural Language Processing	**BIT34706-** Computer Vision	**BIT34709-** 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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Programme: B. Tech. in Information Technology

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

HONORS SPECIALIZATION IN CYBER SECURITY

Sr. No	Sem	Course Code	Subject	Nature of Evaluation	Credits
1	III	BIT32325	Computer Networks and Internet Protocol	ESE	03
2	IV	BIT32425	Foundations of Cryptography	ESE	03
3	V	BIT33525	Secure Computation	ESE	03
4	VI	BIT33625	Cyber Security and Privacy	ESE	03
		BIT33626	Online Privacy	ESE	
5	VII	BIT34725	Block Chain and its Applications	ESE	03
6	VIII	BIT34825	Internship(Cyber Security 1 month)	ESE	03
7		BIT34826	Capstone Project	ESE	
Total					18

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Tulsiramji Gaikwad-Patil College of Engineering &Technology, Nagpur

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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)

MINORS SPECIALIZATION IN INFORMATION TECHNOLOGY

Sr. No	Sem	Course Code	Subject	Nature of Evaluation	Credits
1	III	BIT32321	Introduction to Operating System	ESE	03
2	IV	BIT32421	Programming Using C++	ESE	03
3	V	BIT33521	Introduction to Database Systems	ESE	03
4	VI	BIT33621	Programming In Java	ESE	03
5	VII	BIT34721	An Introduction to Artificial Intelligence	ESE	03
6	VIII	BIT34821	Internship(8 Weeks)/ Capstone Project	ESE	03
Total					18

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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**

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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)

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**

Head of Dept. (Information Technology) Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur	Vice Principal Dr. Ganesh Wakte Vicep Principal TGPCET, Nagpur	Patil	Dr. Premanand Naktode Principal TGPCET, Nagpur	October, 2026	2.00	Applicable for AY 2024-25 Onwards
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Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

NAAC Accredited (A+ Grade)

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 build responsive, accessible web pages using HTML5, CSS3 and modern CSS frameworks.
2.	To develop interactive front ends using JavaScript (ES6+), the DOM and React.
3.	To exchange and validate data using XML, JSON and REST APIs.
4.	To develop server-side applications using PHP and Node.js with database connectivity and authentication.
5.	To integrate LLM APIs into web applications, and to deploy and secure them using industry tools.

Course Contents

Unit I	**HTML, CSS and Modern Web Design:** HTML fundamentals, WWW, Internet, URL, common HTML tags, lists, hyperlinks, tables, images, image mapping, frames, forms, CSS types, HTML5 semantic elements, web accessibility, responsive web design, modern CSS, Bootstrap 5, Tailwind CSS, Figma, and AI-assisted web design tools (v0, Lovable)
Unit II	**JavaScript and Modern Frontend Development**: JavaScript fundamentals, dialogs, operators, conditional statements, loops, functions, arrays, stack operations, built-in objects, DOM, BOM, events, DHTML, filters and transitions; ES6+ features, modules, promises, async/await, browser APIs, TypeScript fundamentals, React.js components, props, state, hooks and routing, Fetch API, JSON, HTTP requests, LLM API integration for chatbots, and development tools: VS Code, Chrome DevTools, npm and Vite.
Unit III	**XML, JSON and Web APIs:** XML fundamentals, advantages, HTML vs. XML, namespaces, well-formed and valid XML, DTD, XML Schema, data types, XSLT, XML DOM and SAX parsers; JSON and serialization, RESTful APIs, HTTP methods, API testing using Postman, API documentation using Swagger/OpenAPI, introduction to GraphQL, and frontend–backend data exchange.
Unit IV	**Server-Side Programming and AI Integration:** Client-side vs. server-side programming, static and dynamic websites, state management, PHP fundamentals, form validation, file handling, cookies, Node.js, Express.js, FastAPI, MySQL, MongoDB, CRUD operations, authentication, sessions, JWT, LLM APIs, prompt engineering, AI chatbots, RAG, and secure API key management.

Unit V	**Web Frameworks, Deployment and Security:** JSP fundamentals, lifecycle, implicit objects, scopes, tags, exceptions, Expression Language (EL), JSTL and custom tags; introduction to Spring Boot and Next.js for full-stack development; Git and GitHub, Docker, CI/CD using GitHub Actions, cloud deployment using Render and Vercel, web security (OWASP Top 10, secure authentication and input validation), and AI-assisted software testing and debugging.
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	Illustrate the working of responsive and accessible web pages using HTML5, CSS3 and Bootstrap	2	9
BIT33601.2	Summarize the concept of front-end applications using JavaScript, the DOM, ES6+ and React	2	9
BIT33601.3	Apply XML, JSON and REST APIs for data exchange, and test them with Postman	3	9
BIT33601.4	Demonstrate server-side applications using PHP and Node.js with databases, authentication and LLM API integration	3	9
BIT33601.5	Analyze web applications for security, and deploy them using JSP, a modern framework, Git and CI/CD	4	9

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

BIT33602:- Artificial Intelligence and Machine Learning

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

Course Objectives:

1.	To explain the fundamental concepts of Artificial Intelligence, intelligent agents and problem-solving techniques.
2.	To describe knowledge representation, probabilistic reasoning and inference mechanisms.
3.	To explain supervised, unsupervised and reinforcement learning techniques.
4.	To apply machine learning and deep learning algorithms to real-world problems.
5.	To evaluate classification, regression and clustering models using appropriate performance metrics.

Course Contents

Unit I	**Introduction to Artificial Intelligence and Problem-Solving Agent:** Problems of AI, AI technique, *search strategies (BFS, DFS, A)**, intelligent agents, agents and 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 and Reasoning:** Statistical reasoning: probability and Bayes' theorem, certainty factors and rule-based systems, Bayesian networks, fuzzy logic. AI for knowledge representation, rule-based knowledge representation, logic programming, forward and backward reasoning.
Unit III	**Machine Learning Foundations:** Supervised, unsupervised and reinforcement learning, data preprocessing, feature engineering and selection, linear and logistic regression, decision trees, Random Forest, Gradient Boosting, SVM, k-NN, K-means, hierarchical clustering, DBSCAN, PCA and LDA, bias–variance trade-off, overfitting, underfitting and regularization, K-fold cross-validation, stratified sampling, bootstrapping, hyperparameter tuning, and performance metrics
Unit IV	**Deep Neural Networks and Convolutional Networks:** Perceptron and multilayer neural networks, activation and loss functions, backpropagation, gradient descent variants, regularization techniques, convolutional neural networks (convolution, pooling, layers), CNN architectures, data augmentation, transfer learning and pretrained models.

Unit V	**Sequence Models, Transformers and Generative AI:** Recurrent neural networks, LSTM and GRU, attention mechanism, Transformer architecture, autoencoders, Generative Adversarial Networks, Generative AI and Large Language Models, explainable AI, and model deployment basics.
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	Explain intelligent agents, problem characteristics and state-space search strategies used in AI problem solving.	2	9
BIT33602.2	Illustrate knowledge representation, probabilistic reasoning and inference mechanisms in Artificial Intelligence.	2	9
BIT33602.3	Outline supervised and unsupervised learning algorithms and evaluate models using validation techniques and metrics.	2	9
BIT33602.4	Summarize deep neural networks using activation and loss functions, backpropagation, regularization and transfer learning.	2	9
BIT33602.5	Classify sequence models transformers and generative AI models with explainability and deployment basics.	2	9

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

BIT33603: -Ethical Hacking (Program Elective-II)

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 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	**Fundamentals of Ethical Hacking and Reconnaissance** Introduction to ethical hacking, types of hackers, phases of ethical hacking, networking fundamentals (IP, TCP/IP and OSI model), footprinting and reconnaissance techniques, Google Hacking, scanning and enumeration, and social engineering awareness.
Unit II	**Systems, Networks and Cyber Threats** Computer systems and networks, role of information systems in industry and society, wireless network security, system and network vulnerabilities, operating system and application misconfigurations, malware-based, network-based and application-based attacks, and threat actors including cybercriminals, insiders and state-sponsored attackers.
Unit III	**Vulnerability Assessment and Penetration Testing** Physical and wireless security, firewalls, honeypots, IDS/IPS, vulnerability assessment, penetration testing methodologies, web application security (SQL injection and cross-site scripting), session hijacking, buffer overflow concepts, reverse engineering fundamentals, Bluetooth and mobile security, email security, incident handling and response, and security testing tools.
Unit IV	**Cybersecurity Laws, Ethics and Professional Practice** Legal and regulatory aspects of ethical hacking, authorization and scope of security testing, professional ethics, responsible disclosure, privacy and data protection, professional integrity, responsible use of security tools, and ethical responsibilities in cybersecurity.

Unit V	**Digital Forensics and Emerging Cybersecurity Threats** Password security and auditing, rootkits, Trojans, backdoors, viruses, worms, network sniffing and denial-of-service attacks; cybercrime investigation, digital forensics and evidence preservation, steganography, cryptography, ransomware, phishing, cloud security threats, IoT security, and introduction to AI-driven cybersecurity and threat detection.
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		Examination Scheme	
Theory	**3 Hrs/week**	CT-I	15 Marks
Tutorial	**-**	CT-II	15 Marks
Total Credits	**3**	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	**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.	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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Wardha Road, Nagpur-441 108

NAAC Accredited (A+ Grade)

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

BIT33606:- Digital Forensics (Program Elective-III)

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

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

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 fundamental concepts and techniques of Natural Language Processing.
2.	To apply text preprocessing, syntactic analysis, and information retrieval techniques.
3.	To analyze language models and text classification methods.
4.	To examine NLP applications in different domains.
5.	To identify ethical considerations and emerging trends in NLP.

Course Contents

Unit I	**Introduction to Natural Language Processing:** Introduction to NLP: concepts, applications, and challenges. Levels of language analysis: morphology, syntax, semantics, and pragmatics. Text preprocessing: tokenization, stemming, lemmatization, stop-word removal, normalization, and regular expressions. Text representation: Bag-of-Words (BoW), TF-IDF, Word2Vec, and contextual embeddings.
Unit II	**Linguistic Essentials and Syntax Analysis:** Inflectional and derivational morphology. Parts-of-Speech (POS) tagging: rule-based and statistical approaches. Context-Free Grammars (CFGs), constituency parsing, and dependency parsing. Chunking and Named Entity Recognition (NER).
Unit III	**Semantic Analysis and Information Retrieval:** Word Sense Disambiguation (WSD), semantic roles, and semantic similarity. Information Retrieval (IR): Boolean and vector space models, TF-IDF, and BM25. Evaluation metrics: Precision, Recall, and F1-score. Sentence embeddings and semantic search.
Unit IV	**Language Modeling and Text Classification:** N-gram language models: unigram, bigram, and trigram. Smoothing techniques and perplexity. Text classification using Naive Bayes and Support Vector Machines (SVM). Classification evaluation metrics. Introduction to RNNs and LSTM networks.
Unit V	**Advanced NLP Applications and Trends:** Transformer architecture and attention mechanisms. Pretrained language models and fine-tuning. Sentiment analysis, machine translation, and text summarization. Dialogue systems and conversational AI. Introduction to Large Language Models (LLMs), prompt engineering, and Retrieval-Augmented Generation (RAG). 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	Illustrate text preprocessing techniques to prepare textual data for NLP tasks.	2	9
BIT33608.2	Discuss syntactic parsing methods using grammars and parsing techniques.	2	9
BIT33608.3	Describe semantic structures and apply information retrieval techniques.	2	9
BIT33608.4	Apply language modeling and text classification techniques.	3	9
BIT33608.5	Analyze real-world applications of Natural Language Processing	4	9

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NAAC Accredited (A+ Grade)

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

BEC33611: -Internet of Things

Teaching Scheme		Examination Scheme	
Theory	**2 Hrs/week**	CT-I	07 Marks
Tutorial	**-**	CT-II	07 Marks
Total Credits	**2**	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 and Reference Architecture** Introduction to IoT, challenges, and applications. IoT reference architecture: functional, information, deployment, and operational views. Real-world design constraints, data representation and visualization, device interaction, and remote control.
Unit II	**IoT Data Link and Network Layer Protocols** PHY/MAC layer protocols: IEEE 802.11, IEEE 802.15, Bluetooth Low Energy (BLE), Zigbee, Z-Wave, and WirelessHART. Network layer protocols: IPv4, IPv6, 6LoWPAN, Neighbor Discovery (ND), DHCP, ICMP, and RPL.
Unit III	**IoT Transport, Application Protocols, Platforms, and Applications** Transport and security protocols: TCP, UDP, TLS, and DTLS. Application protocols: HTTP, CoAP, MQTT, AMQP, and XMPP. IoT platforms: Virtual Private Server (VPS)-based platforms, Blynk, Cayenne, ThingsBoard, ThingSpeak, Amazon Alexa, and Google APIs. Case studies of IoT 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	Explain IoT architecture, components, and real-world design constraints.	2	9
BEC33611.2	Analyze IoT communication protocols based on their characteristics and applicability.	4	9
BEC33611.3	Evaluate IoT applications using suitable platforms and APIs.	5	9

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

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	To study the basic HTML5 elements, CSS3 styling, responsive web design principles, and image mapping used in webpage development	CO1
2	To study Bootstrap 5, Tailwind CSS, and basic HTML form validation.	CO1
3	To develop a basic interactive webpage using JavaScript and form validation.	CO2
4	To develop a basic React.js application using components, hooks, routing, Fetch API, and JSON.	CO2
5	To create and validate an XML document using DTD and XML Schema and apply XSLT transformation.	CO3
6	To develop and test a simple REST API using JSON and Postman.	CO3
7	To develop a basic student management application using Node.js and Express.js with simple CRUD operations.	CO4
8	To develop a simple AI chatbot using an LLM API and basic prompts.	CO4
9	To develop and deploy a simple webpage using Next.js and manage source code using Git and GitHub	CO5
10	To study the basics of Docker, CI/CD using GitHub Actions, and web application security testing.	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	Illustrate the working of responsive and accessible web pages using HTML5, CSS3 and Bootstrap	2	4
BIT33610.2	Summarize the concept of front-end applications using JavaScript, the DOM, ES6+ and React	2	4
BIT33610.3	Apply XML, JSON and REST APIs for data exchange, and test them with Postman	3	4
BIT33610.4	Demonstrate server-side applications using PHP and Node.js with databases, authentication and LLM API integration	3	4
BIT33610.5	Analyze web applications for security, and deploy them using JSP, a modern framework, Git and CI/CD	4	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 study the basics of Artificial Intelligence and Machine Learning.	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 calculations.	CO2
5	To 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 in Artificial Intelligence.	2	4
BIT33611.2	Explain knowledge representation, probabilistic reasoning and inference mechanisms in Artificial Intelligence.	2	4
BIT33611.3	Illustrate machine learning and deep learning concepts with algorithms.	2	4
BIT33611.4	Analyze supervised learning and deep learning techniques, including CNNs, RNNs, SVMs and decision trees.	4	4
BIT33611.5	Evaluate machine learning models using cross-validation, bootstrapping and appropriate performance metrics.	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	To benchmark Zero-shot, Few-shot and Instruction prompting on a labeled dataset and compare accuracy and output-format consistency	CO1
2	To design reusable prompt templates based on the Five Principles of Prompting and evaluate their effectiveness	CO1
3	To develop and test role-based system prompts and evaluate their consistency and resistance to prompt injection	CO2
4	To perform text style transfer using LLMs and analyze readability, tone, and semantic similarity.	CO2
5	To automate multi-channel content generation using structured prompts and evaluate output quality.	CO3
6	To implement and compare advanced prompting techniques, including Chain-of-Thought, self-consistency, and iterative refinement.	CO3
7	To evaluate multiple LLMs for summarization, translation, and explanation using performance metrics.	CO4
8	To generate images using structured prompts and analyze the effects of prompt variations on image quality.	CO4
9	To apply negative prompting, image editing, and reverse prompt engineering for image optimization.	CO4
10	To develop an end-to-end prompting workflow for generating research-based AI content with source verification, image generation, and responsible-use documentation	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