TULSIRAMJI GAIKWAD-PATIL College of Engineering & Technology

Mohgaon, Wardha Road, Nagpur - 441 108

An Autonomous Institute

DEPARTMENT OF MASTER IN COMPUTER APPLICATION

III & IV Semester

Teaching Scheme & Syllabus

Considering

National Education Policy 2020

From

Academic Year 2024-25

Vision of Institute

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

Mission of Institute

M1- To strive for rearing standard and stature of the students by practicing high standards of professional ethics, transparency and accountability.

M2- To provide facilities and services to meet the challenges of Industry and Society

M3- To facilitate socially responsive research, innovation and entrepreneurship

M4- To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.

Vision of the Department

The department of Master in Computer Applications aims to generate groomed, technically competent and skilled intellectual professionals specifically from the rural area to meet the current challenges of the modern computing industry.

Mission of the Department

- To stimulate students to learn effectively and apply the knowledge in the field of Engineering and Technology.
- To undertake industry academic collaboration to enhance competency in graduates.
- To foster innovative ideas amongst students for becoming leaders.
- To create an environment of research culture.
- To impart social and ethical values for inculcating the culture of lifelong learning.

Program Educational Objectives (PEO)

- Providing a strong theoretical and practical background across the computer science discipline with an emphasis on software development.
- To provide technical solutions in the field of information technology to the local society.
- To provide need-based quality training in the field of information technology.
- Empowering the youth in rural communities with computer education.
- To provide students with the tools to become productive, participating global citizens and life-long learners.

Program Outcomes (PO)

PO – 1 Computational Knowledge: Apply knowledge of computing fundamentals, computing specialisation, mathematics, and domain knowledge appropriate for the computing specialisation to the abstraction and conceptualisation of computing models from defined problems and requirements.

PO – 2 Problem Analysis: Identify, formulate, research literature, and solve *complex* computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

PO – 3 Design /Development of Solutions: Design and evaluate solutions for *complex* computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PO – 4 Conduct investigations of complex Computing problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO – 5 Modern Tool Usage: Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to *complex* computing activities, with an understanding of the limitations.

PO – 6 Professional Ethics: Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices.

PO – 7 Life-long Learning: Recognise the need, and have the ability, to engage in independent learning for continual development as a computing professional.

PO – 8 Project management and finance: Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO – 9 Communication Efficacy: Communicate effectively with the computing community, and with society at large, about *complex* computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

PO – 10 Societal and Environmental Concern: Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practices.

PO – 11 Individual and Team Work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

PO – 12 Innovation and Entrepreneurship: Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

Tulsiramji Gaikwad-Patil College of Engineering &Technology, Nagpur

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

SCHEME OF INSTRUCTION & SYLLABI

Programme: Master in Computer Application

Scheme of Instructions: Second Year Master in Computer Application (As Per NEP 2020)

Semester – III

Sr.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/week	Credits	Exam Scheme				
									CT- 1	CT- 2	TA/CA	ESE	TOTAL
1.	PCC	MCA32301	Deep Learning	3	-	-	3	3	15	15	10	60	100
2.	PCC	MCA32302	Block Chain Technologies	3	-	-	3	3	15	15	10	60	100
3.	PCC	MCA32303	Data Science	3	-	-	3	3	15	15	10	60	100
4.	PEC	MCA32304 – 07*	Elective Subject	3	-	-	3	3	15	15	10	60	100
5.	CC	MCA32308	Communication & Personal Development	2	-	-	2	2	07	07	6	30	50
6.	PCC	MCA32309	Software Testing and Quality Assurance Lab	-	-	4	4	2	-	-	25	25	50
7	PCC	MCA32310	Mobile Application using Android	-	-	4	4	2	-	-	25	25	50
8	PCC	MCA32311	Tableau Lab based on Data Science	-	-	4	4	2	-	-	25	25	50
9	VSE	MCA32312-15*	Vocational Skill Enhancement – III (Lab)	-	-	4	4	2	-	-	25	25	50
			Total	**14**	**-**	**16**	**30**	**22**	**67**	**67**	**146**	**370**	**650**

L- Lecture T-Tutorial P-Practical CT1-Class Test 1 CT2- ClassTest2 TA/CA- Teacher Assessment / Continuous Assessment

ESE- End Semester Examination (For Laboratory: End Semester Performance)

***Indicates out of the four course codes each student has to select any one PEC from the list provided at the end of structure.**

				June,2025	1.00	Applicable for AY 2024-25 Onwards
Chairperson	Dean-Academics	Vice Principal	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: Master in Computer Application

Scheme of Instructions: Second Year Master in Computer Application (As Per NEP 2020)

Semester – IV

Sr.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/week	Credits	Exam Scheme				
									CT- 1	CT- 2	TA/CA	ESE	TOTAL
1.	PROJ	MCA32401	Internship/ On Job Training	-	-	38	38	19	-	-	300	300	600
2.	PEC	MCA32406	MOOCs Course	-	-	-	-	3	-	-	-	-	-
			Total	**-**	**-**	**38**	**38**	**22**	**-**	**-**	**300**	**300**	**600**

L- Lecture T-Tutorial P-Practical CT1-Class Test 1 CT2- ClassTest2 TA/CA- Teacher Assessment / Continuous Assessment

ESE- End Semester Examination (For Laboratory: End Semester Performance)

#: Indicates at least one NPTEL/MOOCS Course is to add for which direct credit transfer scheme will be applicable. Student should register for the course during 3rd semester and earn the credits which will be credited in his/her 4th semester.

				June,2025	1.00	Applicable forAY2024-25 Onwards
Chairperson	Dean-Academics	Vice Principal	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: Master in Computer Application

Scheme of Instructions: Second Year Master in Computer Application (As Per NEP 2020)

Vocational Skill Enhancement (Lab) Courses

Semester–III		
Course Code	**Course Code**	**Vocational Skill Enhancement – II (Lab)**
MCA31112	MCA32312	Gen AI
MCA31113	MCA32313	Power BI
MCA31114	MCA32314	Google Cloud for NLP
MCA31115	MCA32315	AWS

				June,2025	1.00	Applicable forAY2024-25 Onwards
Chairperson	Dean-Academics	Vice Principal	Principal	Date of Release	Version	

List of Professional Elective Courses

Semester - III		
Course Code	**Course Code**	**Professional Elective-III**
MCA31105	MCA32304	Information Security
MCA31106	MCA32305	Soft Computing
MCA31107	MCA32306	Cyber Security
MCA31108	MCA32307	Natural Language Programming (NLP)

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Program: Master in Computer Applications

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA32301	Deep Learning	3	-	-	3

Pre-Requisites: Knowledge of Machine Learning, Python programming skills

Course Objectives:

1.	To understand the motivation and history of deep learning and the need for deep neural networks.
2.	To understand and analyze the training of deep neural networks and its challenges.
3.	To understand and apply different methods of dimensionality reduction and optimization of Deep Neural Networks.
4.	To understand and analyze different architectures of neural networks.
5.	To discuss case studies of different applications of neural networks.

Course Contents

Unit I	**Introduction:** Introduction to deep learning, Recall machine learning concepts: Linear models (SVM, linear and logistic regression) - Introduction to Neural Networks: History of Deep Learning. Comparing Deep vs Shallow neural networks - Training a neural network: Loss functions, Concepts of activation functions, weight, and bias, Neural networks as universal function approximators.
Unit II	**Training Deep Neural Networks:** A perceptron and its limitations. Probabilistic theory of Deep Learning- Dimensions in Neural Nets - Dimensionality reduction methods: Linear (PCA, LDA) and non-linear (manifolds) - Auto encoders for dimensionality reduction in networks, Supervised, Unsupervised, and Semi-supervised Learning. Training methods: Stochastic Gradient Descent (SGD). Trade-off between weight and bias. Weights initialization.
Unit III	**Optimization and Generalization**: Optimization vs Generalization. Optimization in deep learning– Non-convex optimization for deep networks - Stochastic Optimization. Optimization techniques like backpropagation, regularization, and batch normalization. Generalization in neural networks – Accelerating optimization: use of learning rate as hyperparameter- Adagrad, RMSProp, and other accelerators - Spatial Transformer Networks - Recurrent networks, LSTM - Recurrent Neural Network Language Models - Word-Level RNNs.
Unit IV	**Deep Neural Network Architectures**: Introduction to Convolutional Neural Network Architecture: Function of different layers – Comparative study of different architectures like Alex-Net, VGG, Inception, ResNet - Generative Adversarial Networks (GAN), Deep Reinforcement Learning. - Computational & Artificial Neuroscience.
Unit V	**Case study and applications**: ImageNet- Object Detection, Audio WaveNet, Natural Language Processing, Word2Vec - Joint Detection, Bioinformatics- Face Recognition, Scene Understanding - Gathering Image Captions. Implementation tools and libraries: Tensorflow, Pytorch, Keras, Scikit-Learn

Text Books

1	Deep Learning- Ian Goodfellow, Yoshua Bengio, Aaron Courville, The MIT Press
2	Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.

Reference Books

1	Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
2	Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc20_cs62/preview
2	https://nptel.ac.in/courses/106/106/106106184/

	Course Outcomes	CL	Class Sessions
MCA32301.1	To remember the history of deep learning and milestones	3	9
MCA32301.2	To analyze the training of deep neural networks and its challenges.	3	9
MCA32301.3	To apply different methods of dimensionality reduction and optimization of Deep Neural Networks.	3	9
MCA32301.4	To analyze different architectures of neural networks.	3	9
MCA32301.5	To discuss different applications of neural networks using case studies.	6	9

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA32302	Blockchain Technology	3	-	-	3

Pre-Requisites: Distributed systems and networking, cryptography, and Data structures

Course Objectives:

1.	To understand basic concepts of blockchain, distributed ledger technology.
2.	To understand and apply the concept of cryptography and algorithms.
3.	To understand and apply the concept of consensus, different block chain architectures and smart contracts
4.	Different case studies and recent advances in Blockchain technology

Course Contents

Unit I	**Introduction to Blockchain:-** Overview of Blockchain, Public Ledgers, Protocol, Currency, The Double-Spend and Byzantine Generals' Computing Problems, Permissioned Model of Blockchain, Distributed Ledger Technology (DLT), Crypto currency, eWallet Services and Personal Crypto security. Types of Blockchain: case study Bitcoin, Ethereum and Hyper ledger, Public and private Blockchain. **Bitcoin:** Bitcoin creation, transaction in Bitcoin, consensus, Bitcoin exchanges, Bitcoin limited supply, Scalability (1MB problem), Wallets Ethereum: Ethereum concept, account management, contracts and transactions, gas, solidity. **Hyperle ledger Fabric:** System architecture, ledger format, chain code execution, transaction flow and ordering, private channels, membership service providers.
Unit II	**Consensus Protocol:** Double spending issue, Requirements for the consensus protocols, Distributed Consensus, Proof of Work (POW), Proof of stake, Scalability aspects of Blockchain consensus protocols, Consensus protocols for Permissioned Blockchains, Proof of burn and Proof of elapsed time. **Cryptography for Blockchain:** History and Goal of Cryptography, Symmetric-key cryptography, Public-key cryptography, cryptographic Hash functions, Properties of hash functions, Hash Pointer and Merkle tree ,Digital signature, Elliptic curve cryptography.
Unit III	**Smart Contracts:** Financial Services Crowd funding Bitcoin, Prediction Markets Smart Property, Smart Contracts Blockchain, Protocol Projects Wallet, Development Projects, Blockchain Development Platforms and APIs, Blockchain Ecosystem: Decentralized Storage, Communication, and Computation, Ethereum: Turing-Complete Virtual Machine Counterparty, Re-creates Ethereum's Smart Contract Platform, Dapps, DAOs, DACs, and DASs: Increasingly Autonomous Smart Contracts, Dapps ,DAOs and DACs, DASs and Self-Bootstrapped Organizations.
Unit IV	**Cryptocurrency: Flat** currencies, property, equality, securities, Money as a store of value versus money for transactions, incentive mechanism-mining and transactions fees, Asset backed currency, hyperinflation. Supply and demand, Inflation and deflation, Exchanges, Decentralized exchanges. **Security: Bitcoin**: Sybil, DDOS, Majority (51%) attack, Ethereum: DOA hack, keeping secretes in smart contracts, state vulnerability, Hyperledger: RAT, Log injection, code injection.

Unit V	**Recent Advances in Blockchain Technology: Terminology** and Concepts, Currency, Token, Tokenizing Community coin: Hayek's Private Currencies Vie for Attention, Campus coin Drops as a Strategy for Public Adoption, Currency: New Meanings, Currency Multiplicity: Monetary and Nonmonetary Currencies, Demurrage Currencies: Potentially Incitory and Redistributable, Extensibility of Demurrage Concept and Features.
Text Books	
1	Swan, Melanie, Blockchain: Blueprint for a new Economy, O'Reilly Media Inc., 2015, 3rd Edition
2	Bambera, Joseph J, et al, Blockchain a practical guide to developing business, law and technology solutions – McGrahill Professional 2018, 2nd Edition
Reference Books	
1	Blockchain revolution, Don andAlex Tapscott, 1st Edition
2	The Basics of Bitcoin and Blockchain, Antony Lewis, 1st edition
Useful Links	
1	https://nptel.ac.in/courses/106/104/106104220
2	https://nptel.ac.in/courses/106/105/106105184

	Course Outcomes	CL	Class Sessions
MCA32302.1	Understand the basics of Blockchain and Etherium	3	9
MCA32302.2	Apply security features in Blockchain technologies	4	9
MCA32302.3	Analyze the smart contracts and virtual machine counterparty	4	9
MCA32302.4	Analyze the crypto currency and its security	5	9
MCA32302.5	Apply to learn recent advances in Blockchain technology	6	9

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Program: Master in Computer Applications

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA32303	Data Science	3	-	-	3

Pre-Requisites:

Course Objectives:

1.	To understand ethical practices in everyday business activities and make well-reasoned ethical business and data management decisions.
2.	Gain practical, hands-on experience with TABLEAU through coursework and applied research experiences.
3.	To analyse principles of Data Science to the analysis of business problems.
4.	Apply algorithms to detect and diagnose common data issues
5.	Data science and business analytics: visualization techniques, predictive modeling

Course Contents

Unit I	**Introduction:** What is Data Science? -The steps in Doing Data Science-Skills needed to do Data Science Storing data- Combining bits into larger structures-Identifying Data Problems
Unit II	**Introduction to Tableau:** BI Concepts, What is TABLEAU? Why Data Visualization, Unique Features compared to Traditional BI Tools, TABLEAU Overview & Architecture, File Types & Extensions, **Tableau Products:** DESKTOP, SERVER, PUBLISHER, PUBLIC, and READER.
Unit III	**Data In Tableau Interface**: Data Connections in the Tableau Interface, Connecting to Tableau Data Server, Types of Join, When to Use Joining, What is Data Blending, When to Use Data Blending, Joining vs. Blending, Creating Data Extracts in Tableau, Establishing a Connection and Creating an Extract, How does Tableau Optimize Performance, Shadow Extracts, Prepare your Data for Analysis
Unit IV	**Data Curation**: Query languages and Operations to specify and transform data, Structured/schema based systems as users and acquirers of data Semi-structured systems as users and acquirers of data, Unstructured systems in the acquisition and structuring of data, Security and ethical considerations in relation to authenticating and authorizing access to data on remote systems, Software development tools, Large scale data systems, Amazon Web Services (AWS).
Unit V	**Layered Framework**: Definition of Data Science Framework, Cross-Industry Standard Process for Data Mining (CRISP-DM), Homogeneous Ontology for Recursive Uniform Schema, The Top Layers of a Layered Framework, Layered Framework for High-Level Data Science and Engineering Business Layer: Business Layer, Engineering a Practical Business

	Layer Utility Layer: Basic Utility Design, Engineering a Practical Utility Layer, **Three Management Layers**: Operational Management Layer, Processing-Stream Definition and Management, Audit, Balance, and Control Layer, Balance, Control, Yoke Solution, Cause-and-Effect, Analysis System, Functional Layer, Data Science Process
Text Books	
1	Jeffrey S.Saltz,Jeffre M. Stanton,"An Introduction to Data Science",Sage Publications,2018
2	Andreas François Vermeulen ,Practical Data Science, APress,2018
Reference Books	
1	Nina Zumal, John Mount (2014). Practical Data science in R, Managing Publication Company
2	V. Bhuvaneswari, T. Devi, (2016). Big Data Analytics: A Practitioner's Approach, Bharathiar University
Useful Links	
1	https://www.digimat.in/nptel/courses/video/106107220/
2	https://nptel.ac.in/courses/106/106/106106179/

	Course Outcomes	CL	Class Sessions
MCA32303.1	Apply Data Evolution and analyze the data.	3	9
MCA32303.2	Analyze the basic concepts of TABLEAU.	4	9
MCA32303.3	Apply the measures of TABLEAU in real time environment	4	9
MCA32303.4	Analyze the basic concepts of data science.	5	9
MCA32303.5	Apply real world business problems of data science.	6	9

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA32304	Natural Language Processing	3	-	-	3

Pre-Requisites: **Machine Learning, Python Programming**

Course Objectives:

1.	To understand the basic principles and history of Natural Language Processing
2.	To apply the statistical concept of N-Grams to natural language to study its structure
3.	To understand and apply different natural language algorithms for syntax processing
4.	To understand and apply different methodologies to capture context in natural language
5.	To illustrate different case studies of natural language processing

Course Contents

Unit I	**Introduction:** Historical background. Challenges in Natural Language Processing. Ambiguity, Morphology: Words & Transducers, Stemming, Lemmatization, Tokenization. Inflectional Morphology, Derivational Morphology, Cliticization. Non-concatenative Morphology. Sequential transducers and determinism. Application: Detecting and correcting spelling error. The minimum edit distance.
Unit II	**N-Grams**: Unigrams, Bi-grams, Tri-grams, *N*-gram probability, N-gram sensitivity, Perplexity**.** N-gram smoothing methods. Word Classes and Part-of-Speech Tagging, Disambiguation Tasks, Models and Algorithms for speech and language processing. Phonetics, Speech Synthesis, Text analysis algorithms, Automatic Speech Recognition.
Unit III	**Syntax:** Formal Grammars of English, Parsing with Context-Free Grammars: top-down or goal-directed search, bottom-up or data-directed search, Addressing attachment ambiguity and coordination ambiguity. Partial-parsing, efficiently parsing ambiguous sentences using the CKY, Earley, and Chart-Parsing algorithms. Statistical Parsing. probabilistic context-free grammar (PCFG). Language and Complexity, Features and Unification.
Unit IV	**Semantics and Pragmatics**: Representing Meaning, formal meaning representations, meaning representation languages, First Order Predicate Calculus: Capturing different classes of meaning, including categories, events, and time. Capturing semantic networks and frames. Computational Semantics, Lexical Semantics, Computational Lexical Semantics.
Unit V	**Case Studies:** Information Extraction, Question Answering and Summarization. Using Python APIs for implementation. Discussion on other APIs, Dialogue and Conversational Agents, Machine Translation.

Text Books

1	An Introduction to Natural Language Processing, 2Ed, Daniel Jurafsky and James H. Martin
2	Natural Language Processing Recipes-Akshay Kulkarni, Adarsha Shivananda - APress

Reference Books

1	Natural Language Processing in Action – O'Reilly Publication, Hobson Lane, Cole Howard
2	

Useful Links	
1	https://nptel.ac.in/courses/106101007
2	https://nptel.ac.in/courses/106105158

	Course Outcomes	CL	Class Sessions
MCA32304**.1**	To understand and recall the basic principles and history of Natural Language Processing	3	9
MCA32304**.2**	To apply the statistical concept of N-Grams to natural language to study its structure	3	9
MCA32304**.3**	To understand and apply different natural language algorithms for syntax processing	3	9
MCA32304**.4**	To understand and apply different methodologies to capture context in natural language	3	9
MCA32304**.5**	To illustrate different case studies of natural language processing	6	9

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA32305	Soft Computing	3	-	-	3

Pre-Requisites: Basics knowledge of Artificial Intelligence , Fuzzy logic

Course Objectives:

1.	Artificial Intelligence, Various types of production systems, characteristics of production systems.
2.	Neural Networks, architecture, functions and various algorithms involved.
3.	Fuzzy Logic, Various fuzzy systems and their functions.
4.	Genetic algorithms, its applications and advances.

Course Contents

Unit I	Soft Computing: Introduction to soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing. Artificial Intelligence: Introduction, Various types of production systems, characteristics of production systems, breadth first search, depth first search techniques, other Search Techniques like hill Climbing, Best first Search, A* algorithm, AO* Algorithms and various types of control strategies. Knowledge representation issues, Prepositional and predicate logic, monotonic and non monotonic reasoning, forward Reasoning, backward reasoning, Weak & Strong Slot & filler structures, NLP.
Unit II	Neural Network: Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference b/w ANN and human brain, characteristic and applications of ANN, single layer network.
Unit III	Perceptron: Perceptron training algorithm, Linear separability , Widrow & Hebb's learning rule/Delta rule, ADALINE, MADALINE, AI v/s ANN. Introduction of MLP, different activation functions, Error back propagation algorithm, derivation of BBPA, momentum, limitation, characteristics and application of EBPA. Counter propagation network: architecture , functioning & characteristics of counter Propagation network, Hop field/ Recurrent network, configuration, stability constraints, associative memory, and characteristics, limitations and applications. Hopfield v/s Boltzman machine. Adaptive Resonance Theory: Architecture, classifications, Implementation and training. Associative Memory.
Unit IV	Fuzzy Logic: Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Fuzzy systems: crisp logic, fuzzy logic, introduction & features of membership functions. Fuzzy rule base system : Fuzzy propositions, formation, decomposition & aggregation of fuzzy Rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.
Unit V	Genetic algorithm: Fundamental, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator ,Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.

Text Books

1	S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications, 2nd Edition, 2011.
2	S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications, PHI Publication, 1st Edition, 2009.
3	N.K.Bose, Ping Liang, Neural Network fundamental with Graph, Algorithms & Applications, TMH, 1st Edition, 1998.
Reference Books	
1	Bart Kosko, Neural Network & Fuzzy System, PHI Publication, 1st Edition, 2009.
2	Rich E, Knight K, Artificial Intelligence, TMH, 3rd Edition, 2012.
3	George J Klir, Bo Yuan, Fuzzy sets & Fuzzy Logic,Theory & Applications, PHI Publication, 1st Edition, 2009.
4	Martin T Hagen, Neural Network Design, Nelson Candad, 2nd Edition, 2008.
Useful Links	
1	https://youtu.be/K9gjuXjJeEM

	Course Outcomes	CL	Class Sessions
MCA2305.1	Learn about soft computing techniques and their applications	3	9
MCA2305.2	Analyze various neural network architectures	4	9
MCA2305.3	Understand perceptrons and counter propagation networks.	4	9
MCA2305.4	Define the fuzzy systems	5	9
MCA2305.5	Analyze the genetic algorithms and their applications.	6	9

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Program: Master in Computer Applications

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA32306	Information Security	3	-	-	3

Pre-Requisites: **Computer networking, Internet Technology, Cloud Computing**

Course Objectives:

1.	To understand the fundamental concepts of information security.
2.	To understand the risk management framework and its applications in building policies
3.	To understand different security threats and attacks
4.	To apply and build secure web applications
5.	To understand different security policies and international standards

Course Contents

Unit I	**Introduction:** Fundamentals of Information Security, CIA Triad: Confidentiality, Integrity, Availability, Types of Information Systems and Their Security Needs, Threats, Vulnerabilities, and Risk Management. Overview of Cybersecurity and Its Importance. Legal, Ethical, and Professional Issues in Information Security.
Unit II	**Risk Management Framework**: Identification, Assessment, Treatment (Avoidance, Mitigation, Transfer, Acceptance). Security Policies, Standards, and Procedures: Development, Implementation, and Enforcement. Security Awareness and Training. Business Continuity Planning (BCP) and Disaster Recovery Planning (DRP).
Unit III	**Security Threats and Attacks:** Malware: Viruses, Worms, Trojans, Phishing, Denial of Service (DoS), and Distributed DoS Attacks. Social Engineering Techniques, Intrusion Detection and Prevention Systems (IDS/IPS), Firewalls and Honeypots.
Unit IV	**Application and Web Security:** Web Application Vulnerabilities: SQL Injection, Cross-Site Scripting (XSS), Cross-Site Request Forgery (CSRF), Secure Software Development Life Cycle (SDLC), Security in E-commerce Applications, Mobile Application Security, Security Testing and Code Review Practices.
Unit V	**Security Policies and Standards:** Information Security Policies and Procedures, Compliance Standards: ISO/IEC 27001, NIST, HIPAA, PCI DSS, COBIT, Sarbanes-Oxley Act, and GDPR. Overview of Information Security Management System (ISMS). Legal and Ethical Aspects of Information Security, Data Privacy Laws and Regulations.

Text Books

1	Principles of Information Security- A Dimensional Approach, Michael Whitman, Herbert Mattord, Course Technology Inc, 6th Edition, 2017
2	Fundamentals of Information Security, Sanil Nadkarni, 2020, BPB Publication, 2020

Reference Books

1	Information Security: Principles and Practices, 1St Edition, Mark Merkow, Jim Breithaupt, Pearson publication

2	The Basics of Information Security: Understanding the Fundamentals of InfoSec in Theory and Practice, Jason Andress, Syngress Media,U.S.
Useful Links	
1	https://www.iso.org/standard/27001
2	https://www.nist.gov/cybersecurity

	Course Outcomes	CL	Class Sessions
MCA32306.1	To apply the fundamental concepts of information security.	3	9
MCA32306.2	To understand the risk management framework and its applications in building policies	3	9
MCA32306.3	To plan policies for different security threats and attacks	3	9
MCA32306.4	To apply and build secure web applications	3	9
MCA32306.5	To analyze international standards and apply them to build appropriate security policies	6	9

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Program: Master in Computer Applications

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA32307	Cyber Security	3	-	-	3

Pre-Requisites: Basic knowledge of Computer Networking, Internet technology

Course Objectives:

1.	To understand basic concepts of cybersecurity. Analyze cyber-attacks, types of cybercrimes, cyber laws.
2.	To analyze the security incidents and understand cyber forensics
3.	To apply policies and procedures to manage Privacy issues and protect from cyber crimes
4.	To analyze social media content and do mobile analytics, which creates various cyber crimes.
5.	To understand basic data privacy issues. Discussion through case studies.

Course Contents

Unit I	**Introduction**: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.
Unit II	**Cyberspace and the Law & Cyber Forensics**: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics
Unit III	**Cybercrime**: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Organizational security Policies and Measures in Mobile Computing Era, Laptops.
Unit IV	**Cyber Security-Organizational Implications**: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.
Unit V	**Privacy Issues**: Basic Data Privacy Concepts - Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc Cybercrime: Examples and Mini-Cases Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. Mini-Cases: The Indian Case of Online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in the Cyber Domain.

Text Books

1	Nina Godbole and Sunit Belpure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley

2	B.B.Gupta, D.P. Agrawal, HaoxiangWang, Computer and Cybersecurity:Principles, Algorithms, Applications, and Perspectives, CRC Press,
Reference Books	
1	Cyber Security Essentials, James Graham, Richard Howard, and Ryan Otson, CRC Press.
2	Introduction to Cyber Security, Chwan-Wu. David Irwin, CRC Press T&F Group.
Useful Links	
1	https://nptel.ac.in/courses/106104467
2	https://nptel.ac.in/courses/106106248

	Course Outcomes	**CL**	**Class Sessions**
MCA32307.1	Analyze cyber-attacks, types of cybercrimes, cyber laws, and how to protect themselves and the entire Internet community from such attacks.	3	9
MCA32307.2	Interpret and forensically investigate security incidents	3	9
MCA32307.3	Apply policies and procedures to manage Privacy issues	3	9
MCA32307.4	Design and develop secure software modules	3	9
MCA32307.5	Justify social media content and do mobile analytics, which creates various cyber attacks.	6	9

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA32308	Communication & Personal Development	2	0	-	2

Pre-Requisites: Basic Communication skills

Course Objectives:

1.	Understand the fundamentals of communication in technical and professional settings.
2.	Explore key **communication models** and differentiate between various types of communication (verbal, non-verbal, visual, written).
3.	3. Identify and overcome **barriers to effective communication** within IT and technical teams.

Course Contents

Unit I	**Communication Fundamentals in a Technical Environment** Importance of Communication for IT Professionals, Communication Process and Models (Shannon-Weaver, SMCR, etc.), Types of Communication: Verbal, Non-verbal, Written, Visual, Technical Communication vs. General Communication, Barriers to Communication in Tech Teams & Solutions
Unit II	**Interpersonal and Team Communication** Developing Listening and Empathy Skills, Assertive vs. Passive Communication, Conflict Resolution Techniques in Project Teams, Effective Communication in Agile/Scrum Environments, Cultural Sensitivity in Global Tech Teams
Unit III	**Personal Development and Career Readiness** Self-assessment and SWOT Analysis, Time and Stress Management for Developers, Group Discussions and Mock Interviews, Leadership, Decision-Making, and Ethics in IT, Building Confidence, Mindfulness, and Adaptability.

Text Books

1	Technical Communication: Principles and Practice"** by Meenakshi Raman & Sangeeta Sharma
2	Business and Professional Communication: KEYS for Workplace Excellence"** by Kelly M. Quintanilla & Shawn T. Wahl
3	Communicating in the Technical Workplace"** by David F. Beer & David McMurrey

Reference Books

1	Emotional Intelligence 2.0"** by Travis Bradberry & Jean Greaves
2	Interpersonal Communication"** by Kory Floyd

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_hs02/preview
2	https://onlinecourses.nptel.ac.in/noc22_hs77/preview

	Course Outcomes	CL	Class Sessions
MCA32308.1	Explain the principles of effective communication and apply appropriate communication models (e.g., Shannon-Weaver, SMCR) in technical contexts.	3	9
MCA32308.2	Distinguish between technical and general communication and effectively use verbal, non-verbal, written, and visual communication channels.	4	9
MCA32308.3	Analyze and solve common **communication barriers** in tech teams using practical solutions.	4	9

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA32309	Software Testing and Quality Assurance (STQA) Lab	-	-	4	2

Pre-Requisites: Software Development Cycle, Basic knowledge of Java programming.

Course Objectives:

1.	To apply the software testing techniques for test case design
2.	To analyze the project and to test the entire computer-based system at all levels.
3.	To understand the applications in the specialized environment using variousautomation tools.
4.	To evaluate the web applications using bug tracking tools.
5.	To apply quality and reliability metrics to ensure the performance ofthe software

Sr. No.	List of Experiment	CO
1	Write a program in any programming language to accept a number and generate a table. Draw a flow chart and design various test cases for testing all possible paths.	CO1
2	Write and test a program to log in to a specific web page.	CO1
3	Write and test a program to update 10 student records into a table into Excel file.	CO2
4	Write and test a program to select the number of students who have scored more than 60 in any one subject (or all subjects)	CO2
5	Write and test a program to provide the total number of objects present/available on the page.	CO3
6	Write and test a program to get the number of list items in a list/combo box.	CO3
7	Write and test a program to count the number of check boxes on the page checked and unchecked.	CO4
8	Write a program to find the sum of the matrices. Write all the test cases so as to verify the correctness of the logic.	CO4
9	Write the code for binary and linear search. Find the cyclomatic complexity of the two by drawing the flow graph.	CO5
10	Write a program to compute the factorial of a number and create du and dc graph for the same.	CO5

Text Books	
1	Adithya P. Mathur, “Foundations of Software Testing – Fundamental’s algorithms and techniques”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008
2	Boris Beizer, “Software Testing Techniques” , Dream Tech Press, 2009
Reference Books	
1	Dale H. Besterfiled, “Total Quality Management”, Pearson Education Asia, Third Edition, Indian Reprint (2011).
2	Edward Kit, “ Software Testing in the Real World – Improving the Process”, Pearson Education, 1995
Useful Links	
1	https://nptel.ac.in/courses/106/105/106105150
2	http://www.asknumbers.com/QualityAssuranceandTesting.aspx

	Course Outcomes	**CL**	**Lab Sessions**
MCA32309.1	Apply the software testing techniques for test case design	2	4
MCA32309.2	Analyze the project and to test the entire computer-based systems at all levels.	2	4
MCA32309.3	Use the applications in the specialized environment using various automation tools.	2	4
MCA32309.4	Evaluate the web applications using bug tracking tools.	2	4
MCA32309.5	Apply quality and reliability metrics to ensure the performance of the software	2	4

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA32310	Mobile Application Lab Using Android	-	-	4	2

Pre-Requisites: Knowledge of Web Application Development, preferably using Java

Course Objectives:

1. Use of tools for mobile applications in various sectors and their functionality.
2. Demonstrate technical constraints relative to storage capacity, processing capacity, display screen, and communication interfaces.
3. Design and implement feature-rich mobile applications for smartphones.
4. Create various Android applications with standard tools and mechanisms.
5. Determine the Application for mobile computing and installation using Android

Sr. No.	List of Experiments	CO
1	Input checking: Create an application that examines a phone number.	CO1
2	Create an application for the Quiz interface.	CO1
3	Create an application by taking input and showing a message on the screen along with the input.	CO2
4	Create a screen user information window.	CO2
5	Design an Android application to create a page using Intent and one Button and pass the Values from one Activity to the second Activity	CO3
6	Design an Android application to send SMS	CO3
7	Create an Android application with Fragments	CO4
8	Design an Android application using various objects	CO4
9	Design an Android application for the menu.	CO5
10	Create a user registration application that stores the user details in a database table.	CO5

Text Books	
1	Mobile App Development: Android Programs Using Eclipse Indigo by Dr. Ashok Kumar, Vayu Education of India, by Dr. Ashok Kumar
2	Head First Android Development, Dawn Griffiths and David Griffiths, O'Reilly Publications, 2021
Reference Books	
1	Android Programming Unleashed, by Harwani, Pearson publication
2	Flutter for Jobseekers: Learn Flutter and take your cross-platform app development skills to the next level, by Hans Kokx, BPB Publication
2	ANDROID APPLICATIONS DEVELOPMENT PRACTICAL APPROACH by Er. Abhishek Bajaj
Useful Links	
1	https://developer.android.com/
2	https://kotlinlang.org/

	Course Outcomes	CL	Lab Sessions
MCA32310.1	Use tools for mobile applications development.	2	4
MCA32310.2	Demonstrate technical constraints relative to storage capacity, processing capacity, display screen, and communication interfaces.	2	4
MCA32310.3	Design and implement feature-rich mobile applications for smartphones.	2	4
MCA32310.4	Apply standard tools and mechanisms to build various applications.	2	4
MCA32310.5	Releasing mobile apps in play store.	2	4

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA32311	Tableau Lab based on Data Science	-	-	4	2

Pre-Requisites: Data science concepts. Knowledge of programming

Course Objectives:

1.	To understand the installation and the features of the Tableau Tool
2.	To apply the core concepts of Data Science using Tableau
3.	To perform EDA using sample data
4.	To perform a Trend analysis using Tableau using sample data
5.	To perform classification and forecasting using Tableau

Sr. No.	List of Experiments	CO
1	**Concept:** Exploratory Data Analysis **Dataset:** [Sample Superstore (available in Tableau)] **Task:** Perform a comprehensive EDA of the sales data. **In Tableau:** • Create dashboards showing total sales, profit, quantity by region, category, and segment. • Use filters and parameters to explore different combinations. • Add scatter plots and bar charts with tooltips	CO1
2	**Concept:** Data Cleaning **Dataset:** A messy Excel dataset with missing values, duplicates, and inconsistent date formats. **Task:** Clean and prepare the data before analysis. **In Tableau:** Use Tableau Prep to: ○ Remove duplicates ○ Handle nulls (filter or fill) ○ Convert date strings to date format ○ Standardize categories (e.g., city names) Show before/after snapshots of cleaned data in Tableau dashboards	CO1
3	**Concept:** Trend Analysis Using Time Series Data **Dataset:** Monthly stock prices or sales data (e.g., Yahoo Finance CSV Export) **Task:** Analyze trends and seasonal patterns in time-series data. **In Tableau:** • Plot time series line charts. • Use moving averages. • Add trend lines and forecast using Tableau's built-in forecasting.	CO2

	• Create a parameter to change granularity (month/quarter/year).	
4	**Concept:** Statistical Relationships **Dataset:** Health or student performance data (e.g., Kaggle – Student Performance) **Task:** Identify correlations between numerical variables. **In Tableau:** • Create scatterplots between different scores (math vs reading, etc.). • Use color/size to encode other variables like gender or lunch type. Calculate correlation using Tableau's calculated fields or show statistical summaries	CO2
5	**Concept:** Classification **Dataset:** Titanic dataset (Kaggle Titanic) **Task:** Visualize survival probabilities and key features affecting survival. **In Tableau:** Preprocess model in Python or Excel (optional). • Use Tableau to: o Create survival probability heatmaps. o Visualize age, gender, class distributions of survivors vs non-survivors. o Show tree-like dashboard layout explaining decisions	CO3
6	**Concept:** Linear Regression **Dataset:** Advertising Sales Dataset (Kaggle: Advertising) **Task:** Identify how different ad channels impact sales. **In Tableau:** • Build scatterplots of TV, Radio, and Newspaper vs Sales. • Add trend lines and show R^2 values. • Use parameters to change the independent variable dynamically. • Summarize insights in a clean dashboard.	CO3
7	**Concept:** Clustering **Dataset:** Customer data with RFM (Recency, Frequency, Monetary) values **Task:** Segment customers using K-means or other clustering techniques. **In Tableau:** • Use the clustering feature in Tableau to define clusters. • Visualize cluster distributions by geographic region, segment, or category. • Create a customer segmentation dashboard with filters to explore clusters	CO4
8	**Concept:** Outlier Detection **Dataset:** Bank transactions or Superstore with injected anomalies **Task:** Detect and visualize anomalous transactions. **In Tableau:** • Create box plots to identify outliers. • Use Z-score or IQR to flag anomalies. • Highlight anomalies on a map or timeline. Build an "Anomaly Dashboard" for monitoring	CO4
9	**Concept:** KPI Monitoring **Dataset:** Business KPI dataset (revenue, churn, conversion rate, etc.) **Task:** Create a real-time KPI monitoring dashboard.	CO5

	In Tableau: • Show KPIs with indicators (up/down, color). • Use filters (e.g., region, time period). • Add dynamic goals using parameters. Include sparklines for trend visualization	

10	**Concept:** Data Integration
	Dataset:
	• Customer table
	• Orders table
	• Returns table (can use Sample Superstore or mock data)
	Task: Combine multiple datasets to analyze return rates by customer.
	In Tableau:
	• Use inner, left joins or data blending between Orders and Returns.
	• Create a calculated field for return rate.
	• Build dashboards showing:
	  ○ Top customers by returns
	  ○ Return rates by category and region
	  ○ Filters to switch between join types
		CO5

Text Books	
1	Information Dashboard Design: Displaying Data for At-a-glance Monitoring by Stephen Few, 2nd Edition, Perceptual Edge
2	Beautiful Visualization, Looking at Data Through the Eyes of Experts by Julie Steele, Noah Iliinsky, O'Reilly Publication
Reference Books	
1	The Functional Art by Alberto Cairo
2	The Visual Display of Quantitative Information by Edward R.Tufte
Useful Links	
1	https://public.tableau.com/app/discover
2	https://community.tableau.com/

	Course Outcomes	CL	Lab Sessions
MCA32311.1	To understand the installation and the features of the Tableau Tool	2	4
MCA32311.2	To apply the core concepts of Data Science using Tableau	2	4
MCA32311.3	To perform EDA using sample data	2	4
MCA32311.4	To perform a Trend analysis using Tableau using sample data	2	4
MCA32311.5	To perform classification and forecasting using Tableau	2	4

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA32312	Google Cloud for NLP	-	-	4	2

Pre-Requisites: Knowledge of NLP, Python programming, and Cloud computing basics

Course Objectives:

1.	To understand the features of Google Cloud AP.
2.	To apply the API to analyze data from different sources for sentiment analysis, trend analysis
3.	To apply the API for text summarization.
4.	To apply the API for Content classification
5.	To apply the API for the entity extraction

Sr. No.	List of Experiments	CO
1	Use the Cloud Natural Language API to analyze **customer reviews data** to understand customer sentiments and opinions.	CO1
2	Use the Cloud Natural Language API to analyze **social media posts and other text data** to understand customer sentiments and opinions.	CO1
3	**Text Summarization:** Generate concise summaries of long documents to grasp the main points quickly.	CO2
4	**Brand Reputation Monitoring**: Track mentions of a brand across different platforms and analyze the sentiment of those mentions to assess brand reputation.	CO2
5	**Trend spotting:** Aggregate news with text to find the trend and extract relevant content about the brands from online news, articles, and other data sources. (Take any one brand)	CO3
6	**News Aggregation:** Summarize news articles to provide users with a quick overview of current events. (Consider any source of news.)	CO3
7	**Content Classification:** Classify documents by common entities or 700+ general categories available through the Google API, like sports, entertainment, education, etc. Consider any document of your choice.	CO4

8	**Receipt and Invoice Understanding:** Extract entities to identify common entries in receipts and invoices, like dates or prices, to understand the relationship between the request and payment.	CO4
9	**Document Analysis:** Use custom entity extraction to identify domain-specific entities within documents without spending time on manual analysis.	CO5
10	**Data Analysis:** Analyze large volumes of text data to identify trends and patterns. Use Key GCP Services for NLP.	CO5

Text Books	
1	**Practical AI on the Google Cloud Platform, by** Micheal Lanham, Release: October 2020 Publisher(s): O'Reilly Media, Inc., ISBN: 9781492075813
2	The Definitive Guide to Google Vertex AI**, Packt,** Dec 2023 publication, Kartik Chaudhary, Jasmeet Bhatia
Reference Books	
1	Hands-On Machine Learning on Google Cloud Platform, Packt publication, 2018, Giuseppe Ciaburro, Alexis Perrier, V. Kishore Ayyadevara
Useful Links	
1	https://cloud.google.com/natural-language#documentation
2	

	Course Outcomes	CL	Lab Sessions
MCA32312.1	To understand the features of Google Cloud AP.	2	4
MCA32312.2	To apply the API to analyze data from different sources for sentiment analysis, trend analysis	2	4
MCA32312.3	To apply the API for text summarization.	2	4
MCA32312.4	To apply the API for Content classification	2	4
MCA32313.5	To apply the API for the entity extraction	2	6

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA32313	AWS(Amazon Web Services) Lab	-	-	3	2

Pre-Requisites: Basic knowledge of computer networks, operating systems, virtualization, and web technologies.

Course Objectives:

1.	To understand the fundamentals of cloud computing and AWS architecture.
2.	To learn how to set up and configure AWS services such as EC2, S3, and RDS.
3.	To develop skills in deploying and managing web applications on AWS.
4.	To understand IAM, monitoring, and automation on AWS.
5.	To work on real-world scenarios using AWS cloud services.

Sr. No.	List of Experiment	CO
1	**Getting Started with AWS**: Set up AWS Free Tier and explore the AWS Management Console.	CO1
2	**Create and Use EC2 Instances**: Launch and access a virtual server on AWS (EC2).	CO1
3	**Store Files with S3**: Upload, store, and manage files using Amazon S3.	CO2
4	**Manage Users with IAM**: Create users and roles to control access using IAM.	CO2
5	**Use AWS Databases (RDS)**: Create a database and connect it with your EC2 instance.	CO3
6	**Host a Website on AWS**: Host a basic website using EC2 or S3.	CO3
7	**Monitor with CloudWatch**: Monitor resources and create alarms using CloudWatch.	CO4
8	**Automate with AWS Lambda**: Run code without servers using AWS Lambda.	CO4

9	**Secure Your AWS Resources**: Apply security settings like VPC and security groups.	CO5
10	**Final Project: Deploy a Cloud App**: Build and deploy a cloud-based application using multiple AWS services.	CO5

Text Books	
1	Amazon Web Services in Action by Michael Wittig and Andreas Wittig (Manning Publications)
2	AWS Certified Solutions Architect Official Study Guide by Ben Piper and David Clinton (Sybex)
Reference Books	
1	Cloud Computing: Concepts, Technology & Architecture by Thomas Erl
2	Learning AWS by Aurobindo Sarkar and Amit Shah
Useful Links	
1	https://aws.amazon.com/training/
2	https://docs.aws.amazon.com/
3	https://www.aws.training/

	Course Outcomes	**CL**	**Lab Sessions**
MCA32313.1	Understand the AWS environment and core services like EC2 and S3.	2	4
MCA32313.2	Manage storage, compute, and user access control with IAM.	2	4
MCA32313.3	Use AWS databases and deploy web applications in the cloud.	2	4
MCA32313.4	Monitor and automate cloud resources using AWS tools.	3	4
MCA32313.5	Design and implement a secure cloud-based solution.		4

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108

NAAC Accredited (A+ Grade)

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

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA32314	Generative AI Lab	-	-	4	2

Pre-Requisites: Python Programming

Course Objectives:

1.	Build and deploy an application for text summarization using large language models.
2.	Outcome: Understand and apply AI for evaluating AI-generated data reliability and automating software test case generation.
3.	Design and implement AI for database automation (schema/queries) and personalized recommendation engines.
4.	Develop skills to build voice assistants and implement generative AI for visual content creation.
5.	Apply GANs for time-series prediction and build AI-based intrusion detection systems.

Sr. No.	List of Experiment	CO Mapping
1	Debug generated code using AI-based tools to find and fix errors.	CO1
2	Create an application that converts written text into a summarized report using **GPT-3** or similar models.	CO1
3	Evaluate the performance of models trained on AI-generated data and compare it with real-world data.	CO2
4	Develop an automated **test case generator** using AI that can create different input combinations to test a software program.	CO2
5	Integrate **AI models** to automate database schema design or suggest optimized queries based on large datasets.	CO3
6	Use **collaborative filtering** or **content-based filtering** methods with AI algorithms to build a recommendation engine.	CO3
7	Implement **voice-based assistants** to interact with users in web or mobile applications.	CO4
8	Implement **video generation** or **image editing** using Generative AI models to create new visuals for games, advertisements, or simulations.	CO4
9	Use **Generative Adversarial Networks (GANs)** to generate future time-series data points and improve model predictions.	CO5

10	Build an **AI-based intrusion detection system** using machine learning algorithms to classify network traffic and identify anomalies.	CO5
Text Books		
1	Hands-On Generative Adversarial Networks with Keras" by Rafael Valle	
2	Transformers for Natural Language Processing" by Denis Rothman	
Reference Books		
1	Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play" by David Foster	
Useful Links		
1	https://openai.com/	
2	https://huggingface.co/	

	Course Outcomes	**CL**	**Class Sessions**
MCA32314.1	Apply concepts of AI for code debugging and build a text summarization application.	3	9
MCA32314.2	Evaluate AI model performance on synthetic vs. real data and develop an AI-powered automated test case generator.	3	9
MCA32314.3	Integrate AI for database automation (schema/queries) and build AI-powered recommendation engines.	4	9
MCA32314.4	Implement voice assistants for applications and utilize generative AI for video/image creation.	5	9
MCA32314.5	Apply GANs for time-series forecasting and build AI-based intrusion detection systems.	6	9

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA32315	Power BI Lab	-	-	4	2

Pre-Requisites: Basic knowledge of databases, SQL, Microsoft Excel, and data visualization principles.

Course Objectives:

1.	To introduce students to Power BI and its components.
2.	To develop skills for importing, transforming, and modeling data.
3.	To design interactive dashboards and reports.
4.	To integrate Power BI with various data sources.
5.	To publish, share, and collaborate on Power BI reports using the Power BI Service.

Sr. No.	List of Experiment	CO
1	**Introduction to Power BI:** Installation and introduction to Power BI Desktop. Understanding interface and basic navigation.	CO1
2	**Data Loading and Cleaning:** Load data from Excel/CSV into Power BI. Perform data cleaning using Power Query Editor.	CO1
3	**Data Transformation:** Perform data transformation – filtering, sorting, merging, and appending queries.	CO2
4	**Data Modeling using DAX:** Create data models – relationships, calculated columns, and measures using DAX.	CO2
5	**Data Visualization:** Visualize data using charts, tables, slicers, and maps.	CO3
6	**Dashboard Creation:** Build interactive dashboards with filters, drill-downs, and bookmarks.	CO3
7	**External Data Source Integration:** Connect Power BI to external data sources like SQL Server or web data.	CO4

8	**Publishing to Power BI Service:** Publish reports to Power BI Service. Set up dashboards, share reports, and manage workspace access.	CO4
9	**Implementing Row-Level Security:** Implement row-level security to restrict data access per user.	CO5
10	**Mini Project – Business Dashboard:** Create a mini-project: End-to-end business dashboard using real-world data.	CO5

Text Books	
1	Analyzing Data with Power BI and Power Pivot for Excel by Alberto Ferrari & Marco Russo (Microsoft Press)
2	Power BI for the Excel Analyst by Wyn Hopkins (Holy Macro! Books)
Reference Books	
1	The Definitive Guide to DAX by Marco Russo & Alberto Ferrari
2	Mastering Microsoft Power BI by Brett Powell
Useful Links	
1	https://learn.microsoft.com/en-us/power-bi/
2	https://www.sqlbi.com/
3	https://www.kasperonbi.com/

	Course Outcomes	**CL**	**Lab Sessions**
MCA32315.1	Understand Power BI interface and perform basic data loading and cleansing.	2	4
MCA32315.2	Apply data transformation and modeling techniques.	2	4
MCA32315.3	Develop interactive data visualizations and dashboards.	2	4
MCA32315.4	Connect and manage various data sources, and publish reports to Power BI Service.	2	4
MCA32315.5	Demonstrate security features and complete a practical business data project.	2	4