Millia Institute of Technology
Rambagh, Purnea

Affiliated to Purnea University, Purnea

NAAC Accredited & ISO 9001:2015

SYLLABUS

Department of
Master of Computer Applications

4th SEMESTER

SEMESTER – IV										
CC/ CE/ SE/ OE	**Paper Code**	**Paper Title**	**Hours Per Week**			**Credit**	**End-Term Theory Exam Marks**	**Continuous Evaluation Marks**	**End-Term Practical Exam Marks**	**Total Marks**
			L	**T**	**P**					
CC	4MCACCC1	Practical Examination	-	-	-	5	0	0	100	100
	4MCACCC2	Project Work	-	4	1	15	0	100	200	300
CE (Select Any 2)	4MCACCE(A)	Cloud Computing	4	1	0	5	70	30	0	100
	4MCACCE(B)	Artificial Intelligence and Machine learning	3	0	2	5	70	30	0	100
	4MCACCE(C)	Cyber Security	4	1	0	5	70	30	0	100
SE (Select Any 2)	4MCASEC(A)	Programming with Go	3	0	2	5	70	30	0	100
	4MCASEC(B)	Blockchain Technology	3	0	2	5	70	30	0	100
	4MCASEC(C)	Digital Marketing	3	0	2	5	70	30	0	100
	4MCASEC(D)	Data Visualization	4	1	0	5	70	30	0	100
SEMESTER TOTAL						**40**				**800**

Definition of Credit	12 Hr. Lecture (L) = 1 credit	12 Hr. Practical (P) = 0.5 credit
	12 Hr. Tutorial (T) = 1 credit	12 Hrs. Practical (Lab) = 0.5 credit

SEMESTER – IV
4MCACCC1 – PRACTICAL EXAMINATION

CC/CE/ SE/OE	L	T	P	Credit	End-Term Theory Exam Marks	Continuous Evaluation Marks	End-Term Practical Marks	Total Marks
CC	-	-	-	5	0	0	100	100

Practical evaluation will be conducted from below listed papers *(whichever is / are opted by candidates)*:

1. Paper 4MCACCE(B)
2. Paper 4MCASEC(A)
3. Paper 4MCASEC(B)
4. Paper 4MCASEC(C)

SEMESTER – IV
4MCACCC2 – PROJECT WORK

CC/CE/ SE/OE	L	T	P	Credit	End-Term Theory Exam Marks	Continuous Evaluation Marks	End-Term Practical Marks	Total Marks
CC	0	2	6	15	0	100	200	300

4MCACCC2 – PROJECT WORK – PROJECT GUIDELINES FOR MCA

WILL BE ANNOUNCED AT THE END OF THIRD SEMESTER
(I.E., AT THE BEGINNING OF FOURTH SEMESTER)

(Refer ANNEXURE – I)

SEMESTER – IV
4MCACCE(A) – CLOUD COMPUTING

CC/CE/ SE/OE	L	T	P	Credit	End-Term Theory Exam Marks	Continuous Evaluation Marks	End-Term Practical Marks	Total Marks
CE	4	1	0	5	70	30	0	100

COURSE OBJECTIVES

- To get Introduced to various Computing Paradigms
- To Learn Fundamentals of Cloud Computing and managements.
- To Know Various Cloud Computing Technologies
- To Understand and implement Virtualization
- To study Technological Drivers for Cloud Computing
- To learn Data Storage in Cloud
- To Learn Elements and Services in Cloud Computing
- To Learn and implement Application Platform for Cloud Applications.
- To understand Various Cloud Services.
- To Know and implement Tools of Cloud Computing

COURSE OUTCOMES

- Describe the Key concepts, Advantages, Limitations and Applications of Cloud Computing
- Explain the various Models and services of Cloud.
- Understand and Describe the Core Issues and challenges of cloud computing Such as Security, Privacy, and Interoperability.
- Select and Apply Suitable Technologies, Tools and Applications in the Cloud Computing Driven Systems
- Design and develop the efficient solutions of the Cloud Computing problems and issues with consideration of environment and sustainable development.
- Analyze the interface requirement for deploying the Applications in Cloud

UNIT – WISE SYLLABUS

UNIT-I

Introduction to Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Biocomputing, Mobile Computing, Quantum Computing, Optical Computing, Nano-computing, Network Computing.

Cloud Computing Fundamentals: Motivation, Need, Definition, Principles, Characteristics, Four Cloud Deployment Models, Three Service Offering Models, Cloud Ecosystem, Requirements for Cloud Services, Cloud Computing Architecture – User / Client Layer, Network Layer, Cloud Management Layer, Hardware Resource Layer, Network Connectivity in Cloud Computing, Public Cloud Access Networking, Private Cloud Access Networking.

UNIT-II

Cloud Computing Management: Cloud Applications, Managing the Cloud, Managing the Cloud Infrastructure, Managing the Cloud Application, Migrating Application to Cloud, Cloud Deployment Models: Private Cloud, Outsourced Private Cloud, Community Cloud, On-Premise Community Cloud, Hybrid Cloud. Cloud Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service, Introduction to Open-Source Tools for IaaS, PaaS & SaaS.

UNIT-III

Technological Drivers for Cloud Computing: SOA and Cloud, SOA and SOC, Benefits of SOA, Multicore Technology: Multicore Processors and VM Scalability, Memory and Storage Technologies, Cloud Storage Requirements, Networking Technologies, Web 2.0: Characteristics, Difference from Web 1.0, Applications, Social Media, Marketing, Education, Web 3.0: Components, Semantic Web, Web Services, Characteristics, Convergence of Cloud and Web 4.0, Connecting Information: Facebook, Agile Software Models: Agile SDLC for Cloud Computing, Features of Cloud SDLC, Agile Software Development Process, Advantages of Agile, Cloud Application Development Platforms: Windows Azure, Google App Engine, Forcecom, IBM Cloud Computing API

UNIT-IV

Virtualization: Full Virtualization, Para virtualization, Hardware-Assisted Virtualization, Hypervisor, OS Virtualization, Server Virtualization, Memory Virtualization, Storage Virtualization, Network Virtualization, Application Virtualization, Processor Virtualization, Memory Virtualization, Storage Virtualization, Network Virtualization, Data Virtualization, Application

Virtualization, Hypervisors, Types of Hypervisors, Security Issues and Recommendations, From Virtualization to Cloud Computing, VMware, Microsoft Hyper-V, Open Virtualization (Ovirt) overview

UNIT-V

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue Service, Microsoft Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM Smart Cloud, Security in Cloud Computing, Cloud General Challenges.

TEXT & REFERENCE BOOKS

- Essentials of CLOUD COMPUTING, K Chandrasekaran, CRC Press [ISBN: 3: 978-4822-0544-2]
- Raj Kumar Buyya, James Broberg, and RezeiM Goscinski - Cloud Computing: Principles and Paradigms-Wiley.
- Srinivasan, J.Suresh - Cloud Computing - A Practical Approach for Learning and Implementation, Pearson India, [ISBN 978131776513]
- Toby Velte, Anthony Velte, Robert Elsenpeter - Cloud Computing, A Practical Approach - McGraw Hill, ISBN: 0071626948
- Greg Schulz -Cloud and Virtual Data Storage Networking, Auerbach Publications, ISBN: 978-1439851739.
- Marty Poniatowski- Foundations of Green IT, ISBN: 978-0137043750.
- Learning Spring Application Development, Ravi Kant Soni, Packt Publishing.
- Michael Miller, Cloud Computing.
- Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper, Cloud Computing for Dummies.
- Borko Furht, Armando Escalante, Handbook of Cloud Computing, Springer, 2010

LIST OF PRACTICALS

Suggested Practical for development of applications for following tasks / tools:

1. Install Virtual Machine
2. Create Virtual Machine
3. Manage Virtual Machine Images
4. Installing and Configuring Ovirt
5. Creating Managing Data Centers and Clusters
6. Adding Physical Hosts (Configure Hypervisors)
7. Managing User Accounts and Roles
8. Managing Red Hat Virtualization Storage
9. Deploying and Managing Virtual Machines
10. Managing Virtual Machine Images
11. Automating Virtual Machine Deployment

SEMESTER – IV

4MCACCE(B) – ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

CC/CE/ SE/OE	L	T	P	Credit	End-Term Theory Exam Marks	Continuous Evaluation Marks	End-Term Practical Marks	Total Marks
CE	3	0	2	5	70	30	0	100

COURSE OBJECTIVES

- To Understand the Concepts of Artificial Intelligence and Machine Learning such as supervised and unsupervised learning, knowledge representation, Possibility and probability theory and also get update about current and futuristic trends of AI problems and solutions.
- To Gain Knowledge of search space and search strategies, different algorithms of Supervised and Unsupervised Learning
- Understand the various architectures and activation functions, training and testing approach used in Artificial Neural Network and also acquire knowledge of expert systems.
- Understand the concepts of Fuzzy Logic, Genetic Algorithms, and apply them to solve the real-life problems.

COURSE OUTCOMES

- Demonstrate Artificial Intelligence Techniques, Various Types of Production Systems, and Characteristics of Production Systems.
- Design and implement Neural Networks using layers, various activation functions and Various Algorithms to solve real life problems.
- Analyze fuzzy nature problem and Design, implement and test the Fuzzy Inference Systems for vague nature real life problem
- Explain Genetic Algorithms theory, Design and validate the Genetic Algorithms based systems for search space driven problems.

UNIT – WISE SYLLABUS

UNIT-I

AI Introduction, The AI problems, AI technique, Characteristics of AI Applications, Current Trends in AI. Machine Learning: Machine Learning Overview, Design of a Learning system, Types of machine learning, Applications of machine learning, Variables and probabilities - Probability Theory, Probability distributions

UNIT-II

Problem Solving, General Problem Solving, Production Systems, Control Strategies Forward and Backward Chaining, Searching: Searching for Solutions, Uniformed Search Strategies - Breadth First Search, Depth First Search. Heuristic Search, Greedy Best First Search, Knowledge Representations Mapping & Issues

UNIT-III

Soft Computing: Introduction to Soft Computing, Soft Computing vs. Hard Computing, Various Types of Soft Computing Techniques, Applications of Soft Computing. Basic Concepts of Neural Network, Human Brain- Biological Neural Network, Evolution of Artificial Neural Network, Structure and Function of a Single Neuron, Difference Between ANN and Human Brain, Characteristics and Applications of ANN, Learning Methods, Activation Function, Neural Network Architecture.

UNIT-IV

Supervised Learning: Perceptron learning - Single layer, multilayer, Back propagation network, Unsupervised Learning Neural Networks - Competitive Learning Networks - Kohonen Self-Organizing Networks

UNIT-V

Introduction to expert system and application of expert systems, case studies, MYCIN Fuzzy Logic: Fuzzy Set Theory, Crisp Set, Fuzzy Set, Operations on Fuzzy Sets: Compliment, Intersections, Unions, Product, Difference, Properties of Fuzzy set. Genetic Algorithm: Fundamentals, Basic Concepts, Working Principle, Encoding, Fitness Function, Reproduction, Crossover, Mutation

TEXT & REFERENCE BOOKS

- Elaine Rich and Kevin Knight "Artificial Intelligence" - Tata McGraw Hill.
- Dan W. Patterson "Introduction to Artificial Intelligence and Expert Systems" – Prentice India.
- Nils J. Nilson "Principles of Artificial Intelligence", Narosa Publishing House
- Christopher Bishop, "Pattern Recognition and Machine Learning", Springer
- Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press

- Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press
- Tom Mitchell, "Machine Learning", McGraw-Hill
- Stephen Marsland, “Machine Learning - An Algorithmic Perspective”, Chapman and Hall / CRC Press
- S. Rajasekaran & G.A. VijayalakshmiPai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & Applications, PHI publication.
- S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications.

SEMESTER – IV

4MCACCE(C) – CYBER SECURITY

CC/CE/ SE/OE	L	T	P	Credit	End-Term Theory Exam Marks	Continuous Evaluation Marks	End-Term Practical Marks	Total Marks
CE	4	1	0	5	70	30	0	100

COURSE OBJECTIVES

- To understand the importance of taking a multi- disciplinary approach to cyber security
- To understand the cyber threat landscape, both in terms of recent emergent issues and those issues which recur over time
- To understand the roles and influences of governments, commercial and other organisations, citizens and criminals in cyber security affairs
- Identify general principles and strategies that can be applied to systems to make them more robust to attack
- Understand key factors in cyber security from different disciplinary views including computer science, management, law, criminology, and social sciences
- Identify various issues surrounding privacy, anonymity and pervasive passive monitoring
- Understand how to manage security incidents, including digital forensic principles

COURSE OUTCOMES

- Understand the importance of cyber security
- Understand various cyber security threats
- Understand the roles and responsibilities of governments, commercial and other organisations, citizens and criminals in cyber security affairs
- Apply general principles and strategies to systems to make them more robust to attack
- Identify various key factors in cyber security from different disciplinary views including computer science, management, law, criminology, and social sciences
- Identify various issues surrounding privacy, anonymity and pervasive passive monitoring
- Manage & response simple security incidents.

UNIT – WISE SYLLABUS

UNIT-I

Concepts and Definitions - Difference between IT Security, Information Security and Cyber Security, Assets, Cyber Security threats & Vulnerabilities, Likelihood, Consequence and Impact, Inherent Risk, Current Risk and Residual Risk, Cyber Threats — Cyber Warfare-Cyber Crime-Cyber Terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Ethical Hacking, Anonymity in Cyberspace.

Cyber Security Strategy - Supporting Business Goals and Objectives, Cyber Security Policy Framework, Awareness, Training and Education

Risk Management Concepts - Risk Avoidance, Mitigation, Transfer and Acceptance, Risk Appetite and Risk Tolerance

Threats and Opportunities - Assessing the current threat landscape, Advanced Persistent Threats, Bring Your Own Device or Technologies, The Internet of Things, Insourcing and Outsourcing, Controls and Enablers, Business Impact Analysis

UNIT-II

Security Architecture - The key role of security architecture, Concepts and Definitions, Security Architecture Frameworks. Security Architecture Design Principles, Service Models - In-sourcing, Managed Services, Cloud Services, OSI and TCP/IP Models, Cryptography - Symmetric, Asymmetric and Hashing Algorithms, Non- Repudiation, Real-world Use Cases, Overview of Firewalls - Types of Firewalls, User Management, VPN Security, Security Protocols: - security at the Application Layer- PGP and S / MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.

UNIT-III

Implementing Security - Network Security - Routers, switches, firewalls, intrusion detection and prevention, Endpoint Security - Servers, desktop systems, laptops, tablets and mobile devices, Application Security - Software Development Lifecycle, OWASP Top 10, Web Application Firewall, Data Security - Data owners, data classification, labelling, Access control, Data governance and lifecycle, Data remanence

UNIT-IV

Cyberspace and the Law – Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013.

Cybercrime – Various types of cybercrimes, Privacy & Anonymity issues

UNIT-V

Business Continuity and Disaster Recovery Planning - Business Continuity Planning, Disaster Recovery Planning, BCP / DRP Training and Awareness, Testing and Maintenance of the BCP / DRP, Security Assurance - Vulnerability Assessments and Penetration Testing, Minimum Security Baselines

Incident Response – Detection - Auditing, logging and security technologies, Security Information and Event Management System (SIEM), Prevention - Authorisation, encryption, firewalls, intrusion prevention, anti-malware, Response — Security events and incidents, Legal aspects, Incident Response Process, Incident Management Team, Computer Forensics, CERT - In — Roles & Responsibilities.

TEXT & REFERENCE BOOKS

- Mayank Bhushan, Rajkumar Singh Rathore, Aatif Jamshed, Fundamentals of Cyber Security, BPB Publications, ISBN: 9789386551559
- Mark Merkow, Information Security: Principles and Practices, Pearson Education, ISBN: 9788131712887
- Nina Godbole, Sunit Belapure, Cyber Security, Wiley India, ISBN: 9788126521791
- Matt Bishop, Introduction to Computer Security, Pearson Education, ISBN: 8177584251
- Kumar K -Cyber Laws: Intellectual Property & E Commerce, Security, Dominant Publisher
- Information Security Policy & Implementation Issues, NIIT, PHI
- Marine R.C.- Cyber Crime Impact in the New Millennium, Auther Press

SEMESTER – IV

4MCASEC(A) – PROGRAMMING WITH GO

CC/CE/ SE/OE	L	T	P	Credit	End-Term Theory Exam Marks	Continuous Evaluation Marks	End-Term Practical Marks	Total Marks
SE	3	0	2	5	70	30	0	100

COURSE OBJECTIVES

- To learn the fundamental programming concepts and methodologies which are essential to building good Go language programs.
- To Install and run the Go language environment on a PC &Create and execute Go language programs
- To practice the fundamental programming methodologies in the Go programming language via laboratory experiences.
- To code, document, test, and implement a well-structured, robust computer program using the Go programming language.
- To write Go Packages for reuse.

COURSE OUTCOMES

- Install and run the Go language environment on a PC
- Create and execute programs using basic data structures available in Go Language.
- Able to make Go language programs using functions, pointers, Structs and Methods.
- Demonstrate to develop program for file handling, databases and socket in Go language.
- Able to write reusable packages in Go language and use various programming concepts to solve different problems.

UNIT – WISE SYLLABUS

UNIT-I

Development Environment – Installation, Development Tools, Go Packages. Go Programming Language –Hello world in Go, Common Rule, Variables - Declaring & Assigning Variables, Comment, Arithmetic Operations, Mathematical Functions, Increment and Decrement, Getting Input from Keyboard, Comparison Operators, Logical Operators, Decision, if..then, switch..case, Iteration – for, Iteration - while, break and continue. Arrays, Slices and Maps - Array, Slice, Map

UNIT-II

Functions - Creating A Simple Function, Function with Parameters, Function with Returning Value, Function with Multiple Returning Values, Function with Multiple Parameters and Returning Value, Closure Function, Recursion Function, Testing. Pointers - Pointer in Go, Structs and Methods. String Operations, - Concatenating Strings, String To Numeric, Numeric to String, String Parser, Check String Data Length, Copy Data, Upper and Lower Case Characters, Testing A Program

UNIT-III

File Operations, Writing Data Into A File, Reading Data From A File, Writing All Error Handling and Logging - Error Handling, defer, panic(), and recover(), try..catch, Logging, Building Own Go Package - Creating Simple Module, Building Own Package

UNIT-IV

Concurrency, Goroutines, Synchronizing Goroutines, Channels Encoding, Encoding Base64, Hexadecimal, JSON, XML, CSV. Hashing and Cryptography, Getting Started, Hashing, Hashing with MD5, Hashing with SHA256, Hashing with Key Using HMAC, Testing, Cryptography - Symmetric Cryptography, Asymmetric Cryptography

UNIT-V

Database Programming- Database for Go, MySQL Driver for Go, Testing Connection, Querying. Socket Programming - Socket Module, Client / Server Socket, Server Socket, Client Socket, Testing

TEXT & REFERENCE BOOKS

- Guney Tarik Hands-On Go Programming by Paperback, Packt Publishing Limited, ISBN: 9781789531756, 9781789531756
- Alan A. A. Donovan, Brian W. Kernighan, The Go Programming Language by Paperback, Pearson, ISBN: 9789332569713, 9332569711
- Vivien Vladimir, Learning Go Programming by Paperback, Packt Publishing Limited, ISBN: 9781784395438, 9781784395438
- Caleb Doxsey, An Introduction to Programming in GO, Online available at - https://www.golang-ook.com/public/pdf/gobook.3186517259.pdf

- Alan Donovan and Brian Kernighan, The Go Programming Language, Addison-Wesley Professional Computing Series) Kindle Edition
- Agus Kurniawan, Go Programming by Examples, Kindle Edition, PE Press
- William Kennedy, Go In Action, Paperback, Manning Publications
- Mark Summerfield, Programming in Go, Paperback, Addison Wesley

LIST OF ONLINE RESOURCES

- Go Language Download Page - https://golang.org/
- Go Language Official Documentation Page - https://golang.org/doc/
- Golang Tutorial – Learn Go Programming Language = https://www.geeksforgeeks.org/golang- tutorial-learn-go-programming-language/
- https://www.tutorialspoint.com/go/index.htm
- https://gobyexample.com/
- http://www.golangbootcamp.com/book
- https://www.cosmiclearn.com/go/

LIST OF PRACTICALS

1. Create a program with comments that shows your name and address
2. Create a program that holds your name in a string.
3. Get a number and a string from the console and check if the numbers is between 1 and 10 and the string length is not greater than 10.
4. Create a program that calculates the average weight of 5 people.
5. Create an array with the number 0 to 10
6. Create an array of strings with names
7. Make a program with loop that counts from 1 to 10.
8. Check if a file exists on your local disk or on an external disk?
9. Create a new file containing names and read it into an array
10. Write a list of cities to a new file.
11. Write a program which uses the package has the rename function.
12. Create a struct house with variables no, Rooms, price and city
13. Create a method that sums two numbers
14. Create a method that calls another method.
15. Write a program that uses a goroutine

SEMESTER – IV
4MCASEC(B) – BLOCKCHAIN TECHNOLOGY

CC/CE/ SE/OE	L	T	P	Credit	End-Term Theory Exam Marks	Continuous Evaluation Marks	End-Term Practical Marks	Total Marks
SE	3	0	2	5	70	30	0	100

COURSE OBJECTIVES

- To provide conceptual understanding of how blockchain technology
- To provide conceptual understanding of how blockchain technology can be used to innovate and improve business processes
- To acquire skills to develop blockchain based solutions and write smart contract using Hyperledger Fabric and Ethereum frameworks.
- To develop & integrate ideas from various domains and implement them using block chain technology in different perspectives

COURSE OUTCOMES

- Understand block chain technology
- Develop blockchain based solutions and write smart contract using Hyperledger Fabric and Ethereum frameworks.
- Build and deploy block chain application for on premise and cloud-based architecture.
- Integrate ideas from various domains and implement them using block chain technology in different perspectives

UNIT – WISE SYLLABUS

UNIT-I

Distributed computing introduction, Electronic Cash System introduction, The shortcomings of current, transaction systems, Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Crypto currency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain

UNIT-II

Cryptography- encryption and decryption model, services-Confidentiality, Integrity, Authentication, Non-repudiation and Accountability, Symmetric cryptography, Asymmetric cryptography, Cryptographic Hash Function, Properties of a hash function, SHA-256, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.

UNIT-III

Bitcoin and Block chain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay. Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) - basic introduction, Hashcash PoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

UNIT-IV

Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for permissioned block chain- Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.

Enterprise application of Block chain: Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, Identity on Block chain

UNIT-V

Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda

TEXT & REFERENCE BOOKS

- Mastering Blockchain by Imran Bashir, Packt Publishing Ltd. ISBN 978-1-78883-904-4
- Mastering Bitcoin by Andreas M. Antonopoulos, O'Reilly Media, Inc.
- Blockchain For Dummies, IBM Limited Edition by Manav Gupta, John Wiley & Sons, Inc., ISBN: 978-1-119-37123-6 (pbk); ISBN: 978-1-119-37139-7 (ebk)
- BLOCKCHAIN E-BOOK by Cybrosys Limited Edition

- Melanie Swan, "Block Chain: Blueprint for a New Economy", O'Reilly, 2015
- Josh Thompsons, "Block Chain: The Block Chain for Beginners - Guide to Block Chain Technology and Leveraging Block Chain Programming"
- Daniel Drescher, "Block Chain Basics", Apress; 1st edition, 2017
- Anshul Kaushik, "Block Chain and Crypto Currencies", Khanna Publishing House, Delhi
- Imran Bashir, "Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Packt Publishing
- Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Block Chain", Packt Publishing
- Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, "Hands-On Block Chain with Hyperledger: Building Decentralized
- Applications with Hyperledger Fabric and Composer", Import, 2018

LIST OF PRACTICALS

1. Install and understand Docker container, Node.js, Java and Hyperledger Fabric, Ethereum and perform necessary software installation on local machine / create instance on Cloud to run.
   https://github.com/hyperledger/
   https://docs.docker.com/get-started/
   https://console.ng.bluemix.net/docs/services/blockchain/index.html
   https://console.bluemix.net/docs/containers/container_index.html#container_index
2. Create and deploy a block chain network using Hyperledger Fabric SDK for Java Set up and initialize the channel, install and instantiate chain code, and perform invoke and query on your block chain network
   (https://developer.ibm.com/patterns/create-and-deploy-blockchain-network-using-fabric-sdk-java/)
3. Interact with a block chain network. Execute transactions and requests against a block chain network by creating an app to test the network and its rules
   (https://developer.ibm.com/patterns/interacting-with-a-blockchain-network/)
4. Deploy an asset-transfer app using block chain. Learn app development within a Hyperledger Fabric network
   (https://developer.ibm.com/patterns/deploy-an-asset-transfer-app-using-blockchain/)
5. Use block chain to track fitness club rewards. Build a web app that uses Hyperledger Fabric to track and trace member rewards
   (https://developer.ibm.com/patterns/fitness-club-rewards-points-iot-and-retail-integration/)
6. Car auction network: A Hello World example with Hyperledger Fabric Node SDK and IBM Block chain Starter Plan. Use Hyperledger Fabric to invoke chain code while storing results and data in the starter plan
   (https://developer.ibm.com/patterns/car-auction-network-hyperledger-fabric-node-sdk-starter-plan/)
7. Develop an IoT asset tracking app using Block chain. Use an IoT asset tracking device to improve a supply chain by using Block chain, IoT devices, and Node-RED
   (https://developer. ibm.com/patterns/develop-an-iot-asset-tracking-app-using-block chain/)
8. Secure art using block chain digital certificates. Node.js - based auction application can help democratize the art market
   (https://developer.ibm.com/patterns/securing-art-using-blockchain-digital-certificates/)
9. Mini projects such as:
   - Block chain for telecom roaming, fraud, and overage management. See how communication service providers use block chain to enhance their value chains
     https://developer.ibm.com/patterns/blockchain-for-telecom-roaming-fraud-and-overagemanagement/
   - Use IoT dashboards to analyze data sent from a Block chain network. Build an IoT app and IoT dashboards with Watson IoT Platform and Node-RED to analyze IoT data sent from a Block chain network
     https://developer.ibm.com/patterns/iot-dashboards-analyze-data-blockchain-network/)
   - Create an Android app with Block chain integration. Build a Block chain enabled health and fitness app with Android and Kubernetes
     https://developer.ibm.com/patterns/create--an-android-app-with-blockchain-integration/
   - Create a global finance block chain application with IBM Block chain Platform Extension for VS Code. Develop a Node.js smart contract and web app for a Global Finance with block chain use case
     https://developer.ibm.com/patterns/global-financing-use-case-for-blockchain/
   - Develop a voting application using Hyperledger and Ethereum. Build a decentralized app that combines Ethereum's Web3 and Solidity smart contracts with Hyperledger's hosting Fabric and Chain code EVM
     https://developer.ibm.com/patterns/voting-app-hyperledger-ethereum/
   - Create a block chain app for loyalty points with Hyperledger Fabric Ethereum Virtual Machine. Deploy Fabric locally with EVM and create a proxy for interacting with a smart contract through a Node.js web app
     https://developer.ibm.com/patterns/loyalty-points-fabric-evm/

SEMESTER – IV
4MCASEC(C) – DIGITAL MARKETING

CC/CE/ SE/OE	L	T	P	Credit	End-Term Theory Exam Marks	Continuous Evaluation Marks	End-Term Practical Marks	Total Marks
SE	3	0	2	5	70	30	0	100

COURSE OBJECTIVES

- The Digital Marketing career track is a program that gives the opportunity to understand the balance between the Creative, Technology and Analytical part of Digital Marketing.
- The Marketing landscape is changing and Digital is playing an integral part in how brands grow.
- It will be learning practical skills on how to create and execute and effective Digital Marketing strategy by leveraging a range of digital marketing tools, tactics and techniques.

COURSE OUTCOMES

- Develop an effective Digital Strategy
- Understand the role of Digital Marketing in integrated marketing communications
- Target and grow the right audience for your brand
- Optimize a multi-channel marketing campaign using web Analytics
- Create engaging and high-impact marketing content
- Search Engine Optimization and Pay-Per Click Advertising
- Develop Email Marketing Strategies that convert
- Understand Growth Hacking
- Data Analytics
- Roll-Out and Take to Market Strategy

UNIT – WISE SYLLABUS

UNIT-I

Digital Marketing - Introduction, Key terms and concepts, understanding marketing strategy, The building blocks of marketing strategy, Crafting a digital marketing strategy, Case study: Nike digital strategy

Market Research - Introduction, importance of market research, Key terms & concepts in market research, Online research methodologies, Justifying the cost of research, Tools of the trade, Advantages and challenges, Case Study: Rocking the Daisies – 2011 & 2012

Content Marketing Strategy - Introduction, Defining Content marketing, Key terms and concepts, Strategic building blocks, Content creation, Content channel distribution, Tools of the trade, Advantages and challenges, Case study: Coca-Cola Company.

UNIT-II

User Experience Design - Introduction, Key terms and concepts, Understanding UX design, Core principles of UX design, Mobile UX, Step in UX design, Tools of the trade, Case study: Rail Europe

Web Development and Design - Introduction, Key terms and concepts, Web design, Web development, Mobile development, Steps in building a website, Case study – The Boston Globe

Writing for Digital - Introduction, Key terms and concepts, Writing for your audience, Types of web copy, HTML for formatting, SEO copywriting, Best practices for online copywriting, Tools of the trade, Case study: Encyclopaedia Britannica Online

UNIT-III

Customer Relationship Management - Introduction, Key terms and concepts, A CRM model, Understanding customers, CRM and data, The benefits of CRM, Social CRM, Steps in implementing a CRM strategy, Tools of the trade, Case study: Fuji Xerox

Search Engine Optimisation (SEO) - Introduction, Key terms and concepts, Understanding SEO, Search engine friendly website structure, SEO and key phrases, Link popularity, User insights, What not to do, Tools of the trade, Benefits and challenges, Case study: Viewpoints.com and the Panda update

Search Advertising - Introduction, Key terms and concepts, Advertising in search, The elements of a search ad, Targeting options, Bidding and ranking for search ads, Tracking, Planning and setting up a search advertising campaign, Tools of the trade, Advantages and challenges, Case study – 'Sister Act' on Broadway

UNIT-IV

Online Advertising - Introduction, Key terms and concepts, Online advertising objectives, The key differentiator, Types of display adverts, Payment models for display advertising, Getting your ads online, Targeting and optimising, Tracking, Steps in online advertising, The future of online advertising, Advantages and challenges, Case study: Toyota Prius

Affiliate Marketing - Introduction, Key terms and concepts, The building blocks of affiliate marketing, Setting up a campaign, Tools of the trade, Advantages and challenges, Case study.

Video Marketing - Introduction, Key terms and concepts, Video content strategy, Video production step by step, Video promotion, Tools of the trade, Advantages and challenges, Case study – Woolworths: 'Cook like a MasterChef' for MasterChef South Africa

UNIT-V

Social Media Channels - Introduction, Key terms and concepts, Social media channels, Social networking, Content creation, Bookmarking and aggregating, Location and social media, Tracking social media campaigns, Social media marketing: Rules of engagement, Tools of the trade, Advantages and challenges, Case study - Col'Cacchio #PriceSlice

Social Media Strategy - Introduction, Key terms and concepts, Using social media to solve business challenges, Step-by-step guide to creating a social media strategy, Documents and processes, Dealing with opportunities and threats, Step-by-step guide for recovering from an online brand attack, Social media risks and challenges, Case study – Super Bowl Social Media Command Center

Email Marketing - Introduction, Key terms and concepts, Email strategy and planning, Step by-step process, Tools of the trade, Advantages and challenges, Case study - Zando

Mobile Marketing - Introduction, Key terms and concepts, The role of mobile in personal communication, Mobile messaging channels, Location and mobile, Mobile commerce, Integrating mobile into online marketing, Augmented reality, Mobile analytics, Advantages and challenges, Case study – Carling Black Label's "Be the Coach"

TEXT & REFERENCE BOOKS

- eMarketing: The Essential Guide to Marketing in a digital world, 5th Edition, Rob Stokes and the Minds of Quirk, Availbale online at https://www.redandyellow.co.za/content/uploads/woocommerc_uploads/2017/10/emar
- keting_textbook_download.pdf
- Ryan Deiss, Russ Henneberry - "Digital Marketing for Dummies", John Wiley & Sons.
- AhujaVandana- "Digital Marketing", Oxford University Press.
- Ira Kaufman, Chris Horton-"Digital Marketing: Integrating Strategy and Tactics with Values, A Guidebook for Executives, Managers, and Students", Routledge,
- Matt Chiera- "Digital Marketers Sound Off: Tips, Tactics, Tools, and Predictions from 101 Digital Marketing Specialists", Matt Chiera,
- Puneet Bhatia- "Fundamentals of Digital Marketing", Pearson India
- Dan Zarrella- "The Social Media Marketing Book", O'Reilly Media.
- Krista Neher- "Visual Social Media Marketing: Harnessing Images, Instagram, Infographics and Pinterest to Grow Your Business Online", Boot Camp Digital.
- Damian Ryan, Understanding Digital Marketing Strategies for Engaging the Digital Generation

SEMESTER – IV

4MCASEC(D) – DATA VISUALIZATION

CC/CE/ SE/OE	L	T	P	Credit	End-Term Theory Exam Marks	Continuous Evaluation Marks	End-Term Practical Marks	Total Marks
SE	4	1	0	5	70	30	0	100

COURSE OBJECTIVES

- Acquire and develop the skills for both design and critique visualizations through Conducting Exploratory and Explanatory analysis of data using visualization.
- Understand the importance data visualization, type of data and its impacts on data visualization.
- Understand and learn the principles of perception for Crafting visual presentations of data for effective communication and evaluation of visual design alternatives.

COURSE OUTCOMES

- Prepare data for visualization and analysis.
- Demonstrate and apply Exploratory and Explanatory analysis skills for data visualization and evaluation of visual alternatives.
- Explain the importance data visualization, type of data and its impacts on data visualization.
- Demonstrate the color palettes, principles of perception and cognition and apply them for crafting visual presentations of data for effective communication and evaluation of visual design alternatives.

UNIT – WISE SYLLABUS

UNIT-I

Introduction to data visualization, The data visualization process, Importance of Data visualization, Model of communication systems, Types of Communication Problems- technical, semantic and effectiveness, Data types, relationships, and visualization formats, Basic principles for data visualization - Principles of Communicating Data- Know your goal, use the right data, select suitable visualizations, design for aesthetics, choose an effective medium and channel, check the results, Data story telling for social and market communication, Trends in market research and data visualization dashboards

UNIT-II

Tableau - Introduction, Features, Tableau Products, Tableau Architecture, Download and Installation of Tableau, Using Workspace Control, Tableau User Interface, Workspace, Toolbar, Menu, Sheets, Dashboards, Data Window, Data Types, File Types

UNIT-III

Data Connection with Data Sources like Text File and Microsoft Excel Tableau Calculation-Function, Field, Operator, Literal, Parameter, and Comment, Tableau Operators- General operators, Arithmetic operators, Relational operators and Logical operators. Tableau functions- Number functions, String functions, Date functions, Logical functions and Aggregate functions, Tableau Basic Filters

UNIT-IV

Visual displays of information- Simple text, Tables, Graphs, Points, Lines, Bars, Area Tableau Charts& Graphs- Bar Chart, Line, Pie, Bubble, Bump, Gantt, Crosstab, Motion, Scatterplot, Heatmap, Waterfall Etc.

UNIT-V

Clutter, Gestalt Principles of Visual Perception - proximity, similarity, enclosure, closure, continuity, and connection. Types of visual clutter- Lack of visual order, Alignment, White space and Non- strategic use of contrast, pre-attentive attributes.

TEXT & REFERENCE BOOKS

- Visualize It!: A Comprehensive Guide to Data Visualization by Netquest Available online at https://www.netquest.com/en/download-ebook-data-visualization
- Data Visualization Techniques Angie Ficek Available online at https://www.cehd.umn.edu/OLPD/MESI/spring/2015/Ficek-DataVis.pdf
- Ben Jones, Communicating Data with Tableau O'Reilly Media, Inc. Publication, ISBN: 978-1-449-37202-6
- Claus O. Wilke, Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures, O'Reilly Media, Inc. Publication, ISBN: 9781492031086
- Cole Nussbaumer-knaflic, Storytelling with Data, John Wiley Publication, ISBN: 9781119002062 (ePub)
- Interactive Data Visualization - Foundations, Techniques, and Applications by Matthew Ward, Georges Grinstein, Daniel Keim, CRC Press, Taylor & Francis Group