M.D UNIVERSITY

SCHEME OF STUDIES AND EXAMINATION

M.TECH 2ND YEAR C.S.E (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)

SEMESTER 3RD

CBCS Scheme effective from 2022-23

Sr. No	Course No.	Subject	Teaching Schedule				Examination Schedule (Marks)				Duration of Exam (Hours)	No of hours /week
			L	T	P	Total Credits	Internal Assesment	Theory	Practical	Total		
1	22MTADC1	Cyber Security & Block Chain Technology	4	0	-	4	50	100	-	150	3	4
2	22MTADC2	Neural Network and Deep Learning	4	0	-	4	50	100	-	150	3	4
3	22MTADC3	Seminar	-		2	2	50	-	-	50	-	2
4	22MTADC4	Literature survey (Dissertation-I)	-	-	2	2	100	-	-	100	-	4
5	22MTADCL1	Deep Learning Lab	-	-	2	2	50	-	50	100	-	2
6	22MTADCL2	Project	-	-	2	2	50	-	50	100	-	2
		Open Elective				3						
			8		8	19	350	200	100	650	6	19

OPEN ELECTIVE

A candidate has to select this paper from the pool of open electives provided by the University.

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SCHEME OF STUDIES AND EXAMINATION

M.TECH 2ND YEAR C.S.E (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)

SEMESTER 4TH

Sl. No	Course No.	Subject	Teaching Schedule				Examination Schedule (Marks)				No of Credits
			L	T	P	Total	Internal Assesment	Theory	Practical	Total	
1.	22MT24C1	Dissertation and viva (Dissertation Stage 2)	-	-	-	-	250	-	500	750	20
		TOTAL	-	-	-	-					

NOTE: 1. **Students have to publish a research paper in a journal / conference of the research work done in the semester.**

22 MTADC1 CYBER SECURITY & BLOCKCHAIN TECHNOLOGY

Marks	credits			
L T P		Exam :	100	4
4 - -		Sessional :	50	
		Total :	150	4

Course Outcomes:

By the end of the course the students will be able to:

CO1: Become familiar with the concepts of cyber threats, cyber crime, cyber security andunderstand the vulnerability scanning.

CO2: Understand network defence tools and web application tools.

CO3: To learn about cyber crime, hacking attacks and cyber laws.

CO4: Understand the concepts of blockchain technology & its need and cryptocurrency.

Note:

Examiner will be required to set NINE questions in all. Question Number 1 will consistof total 8 parts (short-answer type questions) covering the entire syllabus and will carry 20marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV.Examiner will set two questions from each Unit of the syllabus and each question will carry20 marks. Student will be required to attempt FIVE questions in all. Question Number 1 willbe compulsory. In addition to compulsory question, student will have to attempt four morequestions selecting one quest ion from each Unit.

UNIT - I

Introduction to Cyber Security: Overview of Cyber Security, Internet Governance –Challenges and Constraints; Cyber Threats: Cyber Warfare, Cyber Crime, Cyber terrorism,Cyber Espionage; Need for a Comprehensive Cyber Security Policy.

Introduction to Vulnerability Scanning: Overview of vulnerability scanning, Open Port/Service Identification, Banner/Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples,OpenVAS, Metasploit.

Network Vulnerability Scanning: Netcat, Socat; understanding Port and Services tools - Datapipe,Fpipe, WinRelay; Network Reconnaissance – Nmap, THC-Amap and System tools, Network Sniffersand Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping, Kismet.

UNIT - II

Network Defense Tools: Firewalls and Packet Filters - Firewall Basics, Packet Filter VsFirewall; Network Address Translation (NAT) and Port Forwarding; Basics of Virtual Private Networks, Linux Firewall, Windows Firewall.

Web Application Tools: Scanning for web vulnerabilities tools- Nikto, W3af; HTTP utilities- Curl, OpenSSL; and Stunnel, Application Inspection tools – Zed Attack Proxy, Sqlmap.DVWA, Webgoat; Password Cracking and Brute-Force Tools – John the Ripper, L0htcrack,Pwdump, HTCHydra.

UNIT - III

Cyber Crimes and Law: Introduction to Cyber Crimes, Types of Cybercrime, Hacking,Attack vectors, Cyberspace and Criminal Behavior, Digital Forensics, Realms of the Cyberworld, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers asTargets, Contaminants and Destruction of Data, Indian IT ACT 2000.

Cyber Crime Investigation: Firewalls and Packet Filters, password Cracking, Keyloggersand Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOSattack, SQL injection, Buffer Overflow, Attack on wireless Networks.

UNIT - IV

Blockchain Technology: Cryptography - Hash function, Digital Signature - ECDSA,Memory Hard Algorithm, Zero Knowledge Proof; Blockchain Overview: Introduction,Advantage over conventional distributed database, Blockchain Network, Mining Mechanism,Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity,Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Publicblockchain.

Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy andrewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks,Sidechain, Namecoin.

Blockchain Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.

Suggested Readings:

1. Mike Shema: Anti-Hacker Tool Kit, McGraw Hill
2. Nina Godbole and Sunit Belpure: Cyber Security Understanding Cyber Crimes,ComputerForensics and Legal Perspectives, Wiley.
3. Achyut S.Godbole: Data Communication and Networking, McGraw –Hill EducationNew Delhi.
4. Forouzan: Data Communication and Networking (Global Edition) 5/e, McGraw HillEducation India.
5. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and StevenGoldfeder: Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction,Princeton University Press.
6. Wattenhofer: The Science of the Blockchain.
7. Antonopoulos: Mastering Bitcoin - Unlocking Digital Cryptocurrencies.
8. Satoshi Nakamoto: Bitcoin: A Peer-to-Peer Electronic Cash System
9. Forouzan, B.A.: Cryptography & Network Security. Tata McGraw-Hill Education.
10. Kahate, A. Cryptography and Network Security. McGraw-Hill Higher Ed.
11. Peter Szor , The Art of Computer Virus Research and Defense, Symantec Press.
12. Markus Jakobsson and Zulfikar Ramzan, Crimeware, Understanding New Attacksand Defenses, Symantec Press, 2008, ISBN: 978-0-321-50195-0.
13. S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, ‘Blockchain Technology:Cryptocurrency and Applications’, Oxford University Press, 2019.
14. Josh Thompson, ‘Blockchain: The Blockchain for Beginnings, Guild to BlockchainTechnology and Blockchain Programming’, CSI Publishing Platform, 2017.
15. Any other book(s) covering the contents of the paper in more depth

22 MTADC2 NEURAL NETWORKS & DEEP LEARNING

Marks	credits			
L T P		Exam :	100	4
4 - -		Sessional :	50	
		Total :	150	4

Course Outcomes:

By the end of the course the students will be able to:

CO1: To cover the fundamentals of neural networks and deep learning.

CO2: To cover advanced topics such as recurrent neural networks, long short term memorycells.

CO3: To understand Recurrent neural network, convolutional neural network and theorem forGenerative models.

CO4: To implement programming assignments related to neural network's topics.

CO5: To understand the concept of Deep reinforcement learning.

Note:

Examiner will be required to set NINE questions in all. Question Number 1 will consistof total 8 parts (short-answer type questions) covering the entire syllabus and will carry 20marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV.Examiner will set two questions from each Unit of the syllabus and each question will carry20 marks. Student will be required to attempt FIVE questions in all. Question Number 1 willbe compulsory. In addition to compulsory question, student will have to attempt four morequestions selecting one quest ion from each Unit.

UNIT-1

Introduction: Biological neuron, Idea of Computational units, McCulloch-Pitts unit andThresholding logic, Linear Perceptron, Perceptron Learning algorithm, Linear separability;Convergence theorem for Perceptron Learning algorithm.

Feedforward Networks: Empirical Risk Minimization, Regularizing a deep network, modelexploration and hyper parameter tuning.

Deep Learning: Historical context and motivation for deep learning, Basic Supervisedclassification task, Optimizing logistic classifier using gradient descent, Stochastic gradientdescent, Momentum, and adaptive sub-gradient method.

UNIT-II

Deep Neural Networks: Difficulty of training deep neural networks, Greedy layerwisetraining.

Better Training of Neural Networks: Newer optimization methods for neural networks(Adagrad, Adadelta, rmsprop, adam, NAG), second order methods for training, Saddle pointproblem in Neural network, Regularization methods.

Recurrent Neural Network: Bidirectional RNNs, Encoder-Decoder sequence to sequencearchitecture, Backpropagation through time, Long Short Term Memory (LSTM), GatedRecurrent Units, Bidirectional LSTMs, Deep Recurrent networks.

UNIT-III

Convolutional Neural Networks: Basics of convolutional neural networks, stacking,striding and pooling, Applications such as image and text classification, LeNet, AlexNet.

Generative Models: Restrictive Boltzmann Machines (RBMs), Introduction to MCMC andGibbs Sampling, Gradient computations in RBMs, Deep Boltzmann Machines.

Recent Trends: Varitional Autoencoders (Undercomplete autoencoders, regularizedautoencoders, sparse autoencoders, denoising autoencoders), Representational power, layer,size and depth of autoencoders, Stochastic encoders and decoders, Generative AdversarialNetworks, Multi-Task Deep Learning, Multi-view Deep learning.

UNIT-IV

Deep Reinforcement Learning: Basic concepts of Deep Reinforcement Learning (DRL),DRL process and RL approaches, Algorithms of DRL (Value Learning, Policy Learning), QLearning algorithm and its implementation, Digging deeper into Q function, Deep QLearning algorithm and its implementation with Tensorflow, Deep Q-Network, DRL Applications. Policy optimization: Introduction to policy-based methods, Policy Gradient, Model based RL, Recent Advances and Applications.

Suggested Readings:

1. Ian Goodfellow: Deep Learning, MIT Press.
2. Jeff Heaton: Deep Learning and Neural Networks, Heaton Research Inc.
3. Mindy L Hall: Deep Learning, VDM Verlag.
4. Li Deng, Dong Yu: Deep Learning: Methods and Applications (Foundations and Trendsin Signal Processing), Now Publishers Inc.
5. Richard S. Sutton and Andrew G. Barto: Reinforcement Learning: An Introduction,Second Edition, MIT Press.
6. Wiering, Marco, and Martijn Van Otterlo: Reinforcement learning - Adaptation,Learning, and Optimization.
7. Russell, Stuart J., and Peter Norvig: Artificial Intelligence: AModern Approach, PearsonEducation Limited.
8. Goodfellow, Ian, Yoshua Bengio, and Aaron Courville: Deep learning, MIT Press.
9. Any other book(s) covering the contents of the paper in more depth.

22MTADC3 NETWORK PROGRAMMING

Marks	credits			
L T P		Exam :	100	4
4 - -		Sessional :	50	
		Total :	150	4

Course Outcomes:

By the end of the course the students will be able to:

CO1: Understand TCP/IP and Network Architecture.

CO2: Creating sockets and socket implementation.

CO3: Windows Socket API and their programming.

CO4: Web programming and implementing security.

CO5: Performing client side programming and server side programming.

Note:

Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 20 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 20 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT- I

Introduction: Overview of UNIX OS, Environment of a UNIX process, Process control, Process relationships Signals, Interprocess Communication, Overview of TCP/IP, Network architecture, UUCP, XNS, IPX/SPX for LANs, TCP & IP headers, IPv4 & v6 address structures.

Socket Programming: Creating sockets, Posix data type, Socket addresses, Assigning address to a socket, Java socket programming, Thread programming, Berkeley Sockets: Overview, socket address structures, byte manipulation & address conversion functions, elementary socket system calls – socket, connect, bind, listen, accept, fork, exec, close, TCP ports (ephemeral, reserved), Berkeley Sockets: I/O asynchronous & multiplexing models, select & poll functions, signal & fcntl functions, socket implementation (client & server programs), UNIX domain protocols.

UNIT- II

APIs & Winsock Programming: Windows socket API, window socket & blocking I/O model, blocking sockets, blocking functions, timeouts for blocking I/O, API overview, Different APIs & their programming technique, DLL & new API's, DLL issues, Java Beans.

UNIT- III

Web Programming & Security: Java network programming, packages, RMI, Overview of Javascript, WAP architecture & WAP services, Web databases, Component technology, CORBA concept, CORBA architecture, CGI programming, Firewall & security technique, Cryptography, Digital Signature.

UNIT- IV

Client Server Programming: Client side programming:- Creating sockets, implementing generic network client, Parsing data using string Tokenizer, Retrieving file from an HTTP server, Retrieving web documents by using the URL class. Server side programming:- Steps for creating server, Accepting connection from browsers, creating an HTTP server, Adding multithreading to an HTTP server.

Suggested Readings:

1. W.Richard Stevens: Advanced Programming in the UNIX Environment, Addison Wesley.
2. W. Stevens, Bill Fenner, Andrew Rudoff: UNIX Network Programming -Volume 1 (The Sockets Networking API), Pearson Education/Prentice-Hall International.
3. Meeta Gandhi,Tilak Shetty and Rajiv Shah: The 'C' Odyssey Unix –The open Boundless C, BPB Publications.
4. Steven.W.R: UNIX Network Programming (Volume I& II), PHI.
5. Bobb Quinn and Dave Schutes: Window Socket Programming by
6. Davis.R.: Windows Network Programming, Addison Wesley.
7. Baner .P.: Network Programming With Windows Socket, Prentice Hall. 8. Any other book(s) covering the contents of the paper in more depth.

22MTADC3 SEMINAR

		Marks	credits
L T P	Exam :	50	2
0 - 2	Total :	50	2

A candidate has to present a seminar on a recent topic/ technology/ research advancement and has to submit a seminar report. The marks will be given on the basis of seminar report, contents of the presentation, communication and presentation skills.

22MTADC3 Literature Survey (Dissertation Stage 1)

			Marks	**Credits**
LTP	**Exam**	**:**	50	2
- **-2**	**Sessional**	**:**	50	
	Total	**:**	100	2

A candidate has to prepare a report covering identification of research topic, literature review, planning of research scheme and systematic documentation. The marks will be given on the basis of a report prepared covering the above said contents, contents of the presentation, communication and presentation skills.

22MTADCL2 Deep learning Lab

			Marks	**Credits**
LTP	**Exam**	**:**	50	2
- -2	**Sessional**	**:**	50	
	Total	**:**	100	2

A student has to perform10-12 practical based on theory paper.

22MTADCL2 Project

Marks	credits			
L T P		Exam :	50	2
0 - 2		Total :	50	2

Lab content should be chosen as per the Project.

21MT24C1: DESTERTATION

LTP		Marks	Credits
- - -	**External**	**500**	**20**
	Internal:	**250**	
	Total	**750**	20

COURSE OUTCOMES:

By the end of this course every student is expected to be able to

CO1 Handle research problems and use modern research tools/methods.

CO2 Analyse and review the existing literature on a research problem.

CO3 Design and conduct experiments.

CO4 Write dissertation and technical reports.

CO5 Publish research papers.