SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), Vidisha, MP

(An autonomous Institute Affiliated to RGPV, Bhopal)

COMPUTER SCIENCE & ENGINEERING

Course Evaluation Scheme & Syllabus

VIII SEM B.Tech.	Subject Code	Subject Name / Title	Maximum Marks Allotted						Contract Hrs.			Total Credits
			Theory			Practical						
			End Sem	Mid Sem Exam	Quiz/ Assign ment	End Sem	Lab Work & Sessional	Total Marks	L	T	P	
	CS-1881(A)	Soft Computing	70	20	10	-	-	100	3	-	-	3

Prerequisite: Calculus, Differential equations, Linear algebra (Vectors, matrices), Logic, Set theory

Course Objectives:

A) Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.

B) Introduce students to artificial neural networks and fuzzy theory from an engineering perspective

COURSE CONTENTS

UNIT I :

Introduction to Soft Computing: Soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing. Neural Network : Structure and Function of a single neuron: Biological neuron, artificial neuron, Difference and characteristics and applications of ANN, Evolution of Neural Networks, Basic Models of Artificial Neural Network, Important Terminologies of ANNs, McCulloch-Pitts Neuron model.Widrow&Hebb's learning rule/Delta rule.

UNIT II :

Neural Architectures with Supervised Learning: Introduction, Perception Networks, Back-Propagation Network, Radial Basis Function Network, Time Delay Neural Network Single layer network, Perceptron training algorithm, Linear separability, ADALINE, MADALINE. Introduction of MLP, Error back propagation algorithm and its applications, Support Vector Machines, Feedback (Recurrent) Networks and Dynamical Systems

UNIT III:

Neural Architectures with Unsupervised Learning: Principal Component Analysis Networks (PCA), Linear Vector Quantization, Introductionof Competitive learning, Fixed Weight Competitive Nets, Kohonen Self-Organizing Maps, Adaptive Resonance Theory (ART 1,ART 2): Architecture, classifications, Implementation and training Counter propagation network, architecture, functioning & characteristics of counter Propagation network, Hopfield/ Recurrent network, configuration, stability constraints, associative memory, Hopfield v/s Boltzman machine.

UNIT IV:

Fuzzy Logic: Fuzzy set theory, Fuzzy set versus crisp set, Crisp & fuzzy relations, Fuzzy systems: crisp logic, fuzzy logic, , Predicate Logic, introduction & features of membership functions, Fuzzy rule base system:Defuzzification Methods,Fuzzification ,fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.

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UNIT V:

Genetic algorithm : Fundamentals of Genetic Algorithms, its history, Basic Concepts, Creation of Offsprings, Working Principle, encoding, fitness function, reproduction, Genetic modelling: 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 method.

Reference Books:

1. Neural Network, Fuzzy logic,and Genetic Algortihms Synthesis and Applications, S.Rajsekaran ,G.A VijayalakshmiPai
2. Neural Networks: A Comprehensive Foundation (2nd Edition), Simon Haykin, Prentice Hall.
3. Elements of artificial neural networks by KishanMehrotra, Chilukuri K. Mohan and Sanjay Ranka.
4. Neural networks and fuzzy systems by Bart Kosko, Prentice Hall of India.
5. Fundamentals of artificial neural networks by Mohammad H. Hassoun, Prentice Hall of India.

Course Outcomes: The students would be able to-

CO-1: Describe neural network, list the models of NN, and relate them

CO-2: Discuss perception, back propagation networks and explain MLP, its applications

CO-3: Understand and apply unsupervised learning methods in problems.

CO-4: Compare, explain fuzzy logic, fuzzy systems & categorize applications

CO-5: Design genetic algorithms and understand its applications

COs and POs,PSOs Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO_{11}	PO_{12}	PSO1	PSO2
CO1	3	2					1				1	2		
CO 2	3	3	3	1		1						1		
CO3	3	3	3	1	1	1	2					1		
CO4	3	3	2	1	1	1	2					2	2	2
CO5	3	3		1		1	2					2	2	2

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	CS-1881(B)	IoT	70	20	10	-	-	100	3	-	-	3

Course Objectives:

A) Vision and Introduction to IoT.
B) Understand IoT Market perspective.
C) Data and Knowledge Management and use of Devices in IoT Technology
D) Understand State of the Art – IoT Architecture.
E) Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

COURSE CONTENTS

UNIT I:

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics. M2M to IoT – A Market Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains.

UNIT-II:

An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An architecture IoT outline, standards considerations.

UNIT-III:

M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management.

UNIT-IV:

IoT Architecture-State of the Art – Introduction, State of the art, Architecture Reference Model-Introduction, Reference Model and architecture, IoT reference Model. IoT Reference Architecture-Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views

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UNIT-V:

Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control. Industrial Automation- Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things, Commercial Building Automation- Introduction, Case study: phase one-commercial building automation.

Reference Books:

1.Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

2.Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014

3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013

Course Outcomes: The students would be able to

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	2		1	1							2	2	
CO-2	3	2	2		1							2	1	1
CO-3	3	2	2	3								1	1	
CO-4	2	2			2							2	2	2
CO-5			3					2				2	2	

CO-1: To Understand the Architectural Overview of IoT

CO-2: To Understand the IoT Reference Architecture and RealWorld Design Constraints

CO-3: To Understand the various IoT Protocols (Datalink, Network, Transport, Session, Service.

CO-4: Discuss the architecture, operation an business benefits of IOT solution.

CO-5: Design IoT applications in different domain and be able to analyze their performance.

COs and POs,PSOs Mapping:

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	CS-1881(C)	Information Theory and Coding	70	20	10	-	-	100	3	-	-	3

Course Objectives: The student should be made to:

A) Understand error–control coding.
B) Understand encoding and decoding of digital data streams.
C) Be familiar with the methods for the generation of these codes and their decoding techniques.
D) Be aware of compression and decompression techniques.
E) Learn the concepts of multimedia communication.

COURSE CONTENTS

UNIT I:

INFORMATION ENTROPY FUNDAMENTALS

Uncertainty, Information and Entropy – Source coding Theorem – Huffman coding –Shannon Fano coding – Discrete Memory less channels – channel capacity – channel coding Theorem – Channel capacity Theorem.

UNIT II :

DATA AND VOICE CODING

Differential Pulse code Modulation – Adaptive Differential Pulse Code Modulation – Adaptive subband coding – Delta Modulation – Adaptive Delta Modulation – Coding of speech signal at low bit rates (Vocoders, LPC).

UNIT III :

ERROR CONTROL CODING

Linear Block codes – Syndrome Decoding – Minimum distance consideration – cyclic codes – Generator Polynomial – Parity check polynomial – Encoder for cyclic codes – calculation of syndrome – Convolutional codes.

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UNIT IV :
COMPRESSION TECHNIQUES
Principles – Text compression – Static Huffman Coding – Dynamic Huffman coding – Arithmetic coding – Image Compression – Graphics Interchange format – Tagged Image File Format – Digitized documents – Introduction to JPEG standards.

UNIT V :
AUDIO AND VIDEO CODING
Linear Predictive coding – code excited LPC – Perceptual coding, MPEG audio coders – Dolby audio coders – Video compression – Principles – Introduction to H.261 & MPEG Video standards

Reference Books :
1.Simon Haykin, "Communication Systems", 4th Edition, John Wiley and Sons, 2001.
2.Fred Halsall, "Multimedia Communications, Applications Networks Protocols and Standards", Pearson Education, Asia 2002; Chapters: 3,4,5.

Course Outcomes: The students would be able to
CO-1: Discuss encoding and decoding of digital data streams.
CO-2: Define and use compression and decompression techniques.
CO-3: Design an application with error–control.
CO-4: Apply the concepts of multimedia communication.
CO-5: Define Audio and Video coding.

COs and POs,PSOs Mapping:

COs	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	1	2	1	2							2	1	2
CO-2	2	1	1	1	3							1	1	2
CO-3	2	1	2	3	2						3		1	
CO-4	2	2	2	2	3				2			2	2	2
CO-5	2	2	1	1	3						3		3	

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	CS-1882(A)	Ad-Hoc Network	70	20	10	-	-	100	3	-	-	3

Prerequisites: Basic knowledge of Data Communication and Wireless Networks.

Course Objectives: Throughout the course, students will be able to understand Adhoc Networks its applications, design, challenges and routing protocols by being able to do each of the following:

A) Basics of Adhoc architecture, applications and its layered protocols.
B) Understand routing and medium access protocols.
C) Apply and understand different communication performance factors for throughput.
D) Demonstrate some real time application and high speed networks.

COURSE CONTENTS

UNIT I:

Adhoc Wireless Networks: Introduction, Cellular vs Adhoc wireless Networks, Applications of Adhoc wireless Networks, Issues in Adhoc wireless Networks. Heterogeneity in Mobile devices, Wireless Sensor Networks, traffic Profiles, Types of Adhoc Mobile Communications, Types of Mobile Host movements, Challenges facing Adhoc Mobile Networks.

UNIT II:

Adhoc Wireless Media Access Protocols: Introduction Synchronous MAC Protocol and asynchronous MAC protocol, Problems in Adhoc channel Access Receiver Initiated MAC protocols, Sender, Initiated MAC Protocol, and Existing Adhoc MAC Protocol.

UNIT III:

Routing Protocols: Overview of Adhoc Routing Protocols: Table Driver Approaches: DSDV, WRP, CSGR, Source Initiated On demand Approaches: AODV, DSR, TORA, SSR, LAR, PAR, ZRP, RDMAR.

UNIT IV:

Performance: Communication Performance of Adhoc Networks, Route discovery time, End to End Delay Performance, Communication throughput performance, Packet loss performance, Route reconfiguration time, Energy Conservation and Power life issues.

UNIT V:

High Speed Networks High Speed Networks Frame relays, Packet Switching Vs frame relay Networks. Asynchronous transfer mode, ATM protocol architecture, ATM Logical Connection, ATM Cells, AAL, High Speed LANS,FAST Ethernet, Channel wireless LANS

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Reference Books:

1.Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", WILEY lectures and applications (ISBN: 0-470-09510-5).
2. C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols", Prentice Hall, 2004.
3. Feng Zhao and Leonidas J. Guibas, "Wireless Sensor Networks: An Information Processing Approach" (Morgan Kaufmann, 2004).
4. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, "Mobile ad hoc Networking", Wiley-IEEE press, 2004.
5. Mohammad Ilyas, "The handbook of adhoc wireless networks", CRC press, 2002.

Course Outcomes: The students would be able to-

- **CO-1:** Explain ad-hoc networks and its characteristics and differentiate between Ad-hoc networks and cellular networks.
- **CO-2:** Apply different MAC protocol to solve problems in Ad-hoc channel access
- **CO-3:** Discuss and analyze different routing algorithms and their approach to solve problems like shortest path or low cost
- **CO-4:** Evaluate performance of Ad-hoc networks in terms of communication, route discovery time, configuration time etc.
- **CO-5:** Explore high level concept like high speed network

COs and POs,PSOs Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1	3		1			1								
CO-2	3	2	3										2	
CO-3	3	3	2	1						1			3	
CO-4	3	2	2	1									2	2
CO-5	2											2		2

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	CS-1882(B)	Big Data Analysis	70	20	10	-	-	100	3	-	-	3

Course Objectives:

To understand the competitive advantages of big data analytics

A) To understand the big data frameworks
B) To learn data analysis methods
C) To learn stream computing
D) To gain knowledge on Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics

COURSE CONTENTS

UNIT I :

INTRODUCTION TO BIG DATA

Big Data – Definition, Characteristic Features – Big Data Applications - Big Data vs Traditional Data - Risks of Big Data - Structure of Big Data - Challenges of Conventional Systems - Web Data – Evolution of Analytic Scalability - Evolution of Analytic Processes, Tools and methods - Analysis vs Reporting - Modern Data Analytic Tools.

UNIT II:

HADOOP

FRAMEWORK 9 Distributed File Systems - Large-Scale FileSystem Organization – HDFS concepts - MapReduce Execution, Algorithms using MapReduce, Matrix-Vector Multiplication – Hadoop

UNIT III:

DATA ANALYSIS Statistical Methods

Regression modelling, Multivariate Analysis - Classification: SVM & Kernel Methods - Rule Mining - Cluster Analysis, Types of Data in Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Clustering High Dimensional Data - Predictive Analytics – Data analysis using R.

UNIT IV:

MINING DATA STREAMS

Concepts – Stream Data Model and Architecture - Sampling data in a stream - Mining Data Streams and Mining Time-series data - Real Time Analytics Platform (RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

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UNIT V:
BIG DATA FRAMEWORKS

Introduction to NoSQL – Aggregate Data Models – Hbase: Data Model and Implementations – Hbase Clients – Examples – .Cassandra: Data Model – Examples – Cassandra Clients – Hadoop Integration. Pig – Grunt – Pig Data Model – Pig Latin – developing and testing Pig Latin scripts. Hive – Data Types and File Formats – HiveQL Data Definition – HiveQL Data Manipulation – HiveQL Queries

Reference Books:

1. Bill Franks, ―Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Wiley and SAS Business Series, 2012.
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2013.
3. Michael Berthold, David J. Hand, ―Intelligent Data Analysis‖, Springer, Second Edition, 2007.
4. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.

Course Outcomes: Student will be able to

CO-1: Understand how to leverage the insights from big data analytics.

CO-2: Analyze data by utilizing various statistical and data mining approaches.

CO-3: Perform analytics on real-time streaming data.

CO-4: Understand the various NoSql alternative database models.

CO-5: Apply big data analytics .

COs and POs,PSOs Mapping:

COs	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	1	2	1	2							2	1	2
CO-2	2	1	1	1	3							1	1	2
CO-3	2	1	2	3	2						3		1	
CO-4	2	2	2	2	3							2	2	2
CO-5	2	2	1	1	3						3		3	

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	CS-1882(C)	Network Security and Cryptography	70	20	10	-	-	100	3	-	-	3

Prerequisite: Student should have prior knowledge of Discrete structure, Theory of computation and Computer Networks.

Course Objectives:

A) Understand OSI security architecture and classical encryption techniques.
B) Acquire fundamental knowledge on the concepts of finite fields and number theory.
C) Understand various block cipher and stream cipher models.
D) Describe the principles of public key cryptosystems, hash functions and digital signature.

COURSE CONTENTS

UNIT I:

Introduction to network security: Security Needs and Threats, Goals of network security, Types of Computer Crime and Criminals-scavenging, leakage, wire taping etc. Controlling Physical Access: Role of physical Security, Weakness, Types of Identification Badges, security factors. Desktop security: Challenges, security techniques, physical security and procedural methods, Protecting data hardware and software problem and their solutions. Role of Password network security, strength and weakness of password, Administering a password system, Virus, Worms, Trap doors, Trojan horse, Firewall.

UNIT II:

Security: Attacks, Services, Mechanism, OSI security architecture, Symmetric ciphers: Substitution Ciphers: Caesar cipher, Hill cipher, Play fair cipher, Mono-alphabetic Cipher, Poly-alphabetic cipher, Shannon Theorem, One Time pad, Transposition Cipher: Rail fence techniqu, Steganography.

UNIT III:

Block Cipher: Data confidentiality, Simplified DES, Feistal Structure, Blowfish, RC5, Data Encryption Standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design principles, Block Cipher Modes of Operation. Advanced Encryption standard

UNIT IV:

Number Theory: Group, Ring, Field, Modular Arithmetic, Euclidean Theorem, Fermat's Theorem, Euler's Theorem, Chinese Remainder Theorem, Public Key Cryptography: RSA algorithm. Diffie-Hellman Key Exchange Algorithm, Elliptic Curve Cryptography.

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UNIT V:

Cryptographic Data Integrity: Hash Function, Requirement and security, Secure hash algorithm (SHA) and its Version, Message Digest MD-4 and MD-5, RIPMED, Message Authentication Codes, Digital Signature standard, Key Management and Distribution, PKI, User Authentication Protocol: Kerberos. Transport layer Security: SSL, TLS, HTTPS, Email Security: PGP, S/MIME, IP Security.

Reference Books: -

1.William Stallings "Cryptography and Network Security-Principles and Practice Forth Edition", Prentice Hall Publication.
2. Behrouz A. Forouzan, Debdeep Mukhopadhyay "Cryptography and Network Security Second Edition" Tata Macgraw Hill Education.

Course Outcomes: Student will be able to

CO-1: Define basic concepts and algorithms of cryptography, including encryption/decryption and hash functions.
CO-2: Solve and Relate mathematic concepts behind the cryptographic algorithms.
CO-3: Define various network security practice applications.
CO-4: Analyze protocols for various security objectives with cryptographic tools.
CO-5: Apply various security algorithms to solve security related problem.

COs and POs,PSOs Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	3	2		1	1								2	
CO-2	3	2			1								1	
CO-3	3		2	3									2	
CO-4					2								2	2
CO-5			3					2					2	

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	CS-1883	Major Project Final	-	-	-	400	150	550	-	-	16	8

Procedure:

a) Each defined project needs to be from Industry/Research organization/Govt. organization/socio-technical issues.

b) Project identification should be based on Analysis carried out by the students after completion of B.E Semester 6th Examination but before starting of the 7th Semester.

c) Problem definition for the project needs to be submitted by every student in the first week of the 7th Semester to his/her college.

d) Each definition will be evaluated based on merit in the beginning of the 7^{th} semester itself by the College.

Facilitation:

You may contact your Major Project In charge co-ordinator/Faculty /Department Head for skilful Analysis.

Guidelines for the Students:

1. The project work will be in-house industry project, where student need to implement project related to any domain of industry like education, legal, manufacturing, design, pharmaceutical, Ecommerce, etc.

2. Students are required to get approval of project definition from the department.

3. After approval of project definition students are required to report their project work weekly to respective internal guide.
4. Maximum 4 students can allow working in particular project group.

5. The students are required to identify their project within two weeks of the commencement of the classes and they are required to follow all the rules and instructions issued by department.

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6. Each student or student group would work under the guidance of the Faculty from the College. In case any problem/other issue arises for the smooth progress of Inter Departmental project work discovery/Practical Training, it should be immediately brought to the notice of the major project in charge co-ordinator/Faculty.

7. The students are required to submit **Project Report** to their Head of the Department with the remarks of guide in their College during **Eighth week** of the semester.

Major Project CO's **Part-I-VII Semester**

CO1- Identify the problem domain correctly and to represent problem using mathematical structures and logics.

CO2- Analyze possible solution strategies and investigate problem domain and design feasible solutions for it.

Part-II-VIII Semester

CO3- Make use of cutting edge tools and technologies to derive solutions for the problems and carried a detailed studied about the feasibility and societal impact of solutions.

CO4- Acknowledges the previous work and support required in the solution. Justify the role of individual in project work. Demonstrate leadership skills in team work.

CO5- Present and communicate the importance of solutions of problem domain. Conduct and accomplish all the subtasks for project completion in time and cost effective manner and conclude the project work with possible scopes.

Mapping COs-POs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3			2								2	2
CO2	2	3		3		1	2						2	
CO3			3		3	2	3						2	2
CO4								3	3					
CO5					2					3	3	3		2

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