Samrat Ashok Technological Institute (Engg. College), Vidisha (M.P.)
(An autonomous Institute Affiliated to RGPV, Bhopal)
Bachelor of Technology B.Tech in CSE (IOT & Cyber Security with Blockchain Technology)

Semester : VII

VII-SEM B.Tech. ICB	Subject Code	Subject Name / Title	Maximum Marks Allotted						Contract Hrs.			Total Credits
			Theory			Practical						
			End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work & Sessional	Total Marks	L	T	P	
	ICB-2171 (A)	Parallel Computing	70	20	10	-	-	100	3	1	-	4

Prerequisite: Basic Knowledge of CSO, Microprocessor and ACA.

Course Objectives: Students completing this course will be well positioned to:

- Explain the parallelization of branch and bound algorithms.
- Given a combinatorial search problem, give a method for efficiently computing a bound on the optimal solution, and use this to draw the first few levels of the tree.
- Sow the order in which branch and bound algorithms will search this tree.
- Given an algorithm that claims to detect termination, prove or disprove its correctness, and compare its advantages and disadvantages over the one discussed in class.

Course Contents.

UNIT-I: Parallel computing, scope of parallel computing, Abstract model of serial & parallel computation, pipelining, data parallelism, control parallelism, scalability, topologies in processor organization, parallel computing design consideration, parallel algorithms & parallel architectures, applications of parallel computing**.**

UNIT-II: Shared memory multiprocessors (UMA-Uniform memory Access), Distributed memory multiprocessors (NUMA- Non-Uniform memory Access), SIMD, Systolic processor, Cluster computing, Grid computing, Multicore Systems.

UNIT-III: Introduction to parallel algorithms, parallel algorithm models, Decomposition Techniques, characteristics of tasks & interactions, mapping techniques for load balancing, methods for containing interaction overheads.

UNIT-IV: Matrix multiplication, parallel reduction, parallel sorting: bubble, quick sort, Graph algorithm: Minimum spanning tree (prim's algorithm), Fast Fourier transform: serial algorithm, transpose algorithm.

UNIT-V: Paradigms, parallel programming models, shared memory programming, message passing programming, MPI, PVM, Threads. Sources of overhead in parallel programs, performance metrics for parallel systems, effect of granularity &data mapping on performance, scalability of parallel systems, analysis of parallel programs**.**

References Books:

1)"Introduction to Parallel Computing" (2nd Edition) Ananth Grama, George Karypis, Vipin Kumar, Anshul Gupta.
2) "Algorithms and Parallel Computing "(Wiley Series) Fayez Gebali.
3) " Scalable Parallel Computers" Kai Hwang, Zhiwei Xu.
4) "Introduction to parallel processing " M.Sasikumar, Dinesh shikhare, P. Ravi Prakash .
5) "Principles of Grid computing " P. Venkata Krishna, Ane's Student Edition.

Course Outcomes: The students would be able to-

CO-1: To apply knowledge of computing, mathematics, science, and engineering.
CO-2: Design and conduct experiments, as well as to analyze and interpret data.
CO-3: Implement, and evaluate a computer-based system, process, component, or program to meet desired needs, within realistic constraints specific to the field.
CO-4: Function effectively on multi-disciplinary teams.
CO-5: Analyze a problem, and identify, formulate and use the appropriate computing and engineering requirements for obtaining its solution

Mapping of COs and POs:

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

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VII-SEM B.Tech. ICB	Subject Code	Subject Name / Title	Maximum Marks Allotted						Contract Hrs.			Total Credits
			Theory			Practical						
			End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work & Sessional	Total Marks	L	T	P	
	ICB-2171 (B)	Information Retrieval	70	20	10	-	-	100	3	1	-	4

Prerequisite: Must also have the minimal knowledge of Natural language such as thesaurus, synonyms etc. to understand the concept of retrieving the textual information because text is the main data type used in Information Retrieval Systems.

Course Objectives: Students completing this course will be well positioned to:

- Demonstrate genesis and diversity of information retrieval situations for text and hyper media.
- Describe hands-on experience store, and retrieve information from www using semantic approaches.
- Analyze ranked retrieval of a very large number of documents with hyperlinks between them.
- Demonstrate Information visualization technologies like Cognition and perception in the Internet or Web search engine.

Course Contents.

UNIT-I: Introduction: Retrieval strategies: vector space model, Probabilistic retrieval strategies: Simple term weights, Non binary independence model, Language models.

UNIT-II: Retrieval Utilities: Relevance feedback, clustering, N-grams, Regression analysis, Thesauri.

UNIT-III: Retrieval utilities: Semantic networks, parsing Cross –Language: Information Retrieval: Introduction, Crossing the Language barrier.

UNIT-IV: Efficiency: Inverted Index, Query processing, Signature files, Duplicate document detection.

UNIT-V: Integrating structured data and text. A historical progression, Information retrieval as relational application, Semi Structured search using a relational schema. Distributed Information Retrieval: A theoretical Model of Distributed retrieval, web search

References Books:

1. David A. Grossman, OphirFrieder, Information Retrieval – Algorithms and Heuristics, Springer, 2nd Edition(Distributed by Universal Press), 2004.
2. Gerald J Kowalski, Mark T Maybury Information Storage and Retrieval Systems: Theory and Implementation, Springer, 2004.
3. Soumen Chakrabarti, Mining the Web : Discovering Knowledge from Hypertext Data, Morgan – Kaufmann Publishers, 2002.
4. Christopher D Manning, Prabhakar Raghavan, Hinrich Schutze, An Introduction to Information Retrieval By Cambridge University Press, England, 2009.

Course Outcomes: The students would be able to-
CO-1: Describe the objectives of information retrieval systems.
CO-2: Understand relevance feedback in vector space model and probabilistic model.
CO-3: Understand natural language systems to build semantic networks for text.
CO-4: Design the method to build inverted index.
CO-5: Understand Integrating structured, Semi Structured and Distributed Information Retrieval.

Mapping of COs and POs:

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

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VIII-SEM B.Tech. ICB	Subject Code	Subject Name / Title	Maximum Marks Allotted						Contract Hrs.			Total Credits
			Theory			Practical						
			End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work & Sessional	Total Marks	L	T	P	
	ICB-2171 (C)	Ad-Hoc Network	70	20	10	-	-	100	3	1	-	4

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:
1. Basics of Adhoc architecture, applications and its layered protocols.
2. Understand routing and medium access protocols.
3. Apply and understand different communication performance factors for throughput.
4. 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, 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

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.

Mapping of CO and PO:

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-1	PO-11	PO-12	PSO-1	PSO-2
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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			Theory			Practical						
			End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work & Sessional	Total Marks	L	T	P	
	ICB-2172 (A)	Cyber Laws and security policies	70	20	10	-	-	100	3	1	-	4

Prerequisite : Cyber Laws.

Course Objective: The Objectives Of This Course Is To Enable Learner To Understand, Explore, And Acquire A Critical Understanding Cyber Law. Develop Competencies For Dealing With Frauds And Deceptions (Confidence Tricks, Scams) And Other Cyber Crimes For Example, Child Pornography Etc. That Are Taking Place Via The Internet.

UNIT I : Introduction to Cyber Law Evolution of Computer Technology : Emergence of Cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.

UNIT II : Information technology Act : Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

UNIT III : Cyber law and related Legislation : Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).

UNIT IV : Electronic Business and legal issues: Evolution and development in Ecommerce, paper vs paper less contracts E-Commerce models- B2B, B2C,E security. Application area: Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.

UNIT V : Study On Cyber Crimes: Harassment Via E-Mails, Email Spoofing (Online A Method Of Sending E-Mail Using A False Name Or E-Mail Address To Make It Appear That The E-Mail Comes From Somebody Other Than The True Sender, Cyber Pornography (Exm.MMS), Cyber-Stalking.

References Books:

1 .K.Kumar," Cyber Laws: Intellectual property & E Commerce, Security",1 st Edition, Dominant Publisher,2011.
2. Rodney D. Ryder, " Guide To Cyber Laws", Second Edition, Wadhwa And Company, New Delhi, 2007.
3. Information Security policy &implementation Issues, NIIT, PHI.
4. Vakul Sharma, "Handbook Of Cyber Laws" Macmillan India Ltd, 2 nd Edition,PHI,2003.
5. Augastine, Paul T.," Cyber Crimes And Legal Issues", Crecent Publishing Corporation, 2007.

Course Outcomes: The students would be able to:

CO-1: Make Learner Conversant with The Social and Intellectual Property Issues Emerging From 'Cyberspace.
CO-2: Explore The Legal and Policy Developments in Various Countries to Regulate Cyberspace.
CO-3: Develop The Understanding of Relationship Between Commerce and Cyberspace.
CO-4: Give Learners in Depth Knowledge of Information Technology Act and Legal Frame Work Of Right To Privacy, Data Security And Data Protection.
CO-5: Make Study on Various Case Studies on Real Time Crimes.

Mapping of COs and POs:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_{10}	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	3	1	1	3	3	1	3		1		3		2
CO-2	2	2	1	1		3	2	3		1		3		3
CO-3	2	2	1	1	3	3	1	3		1		3		3
CO-4	2	2	1	1		3	1	3		1		3		2
CO-5	2	2	1	1	1	3	1	3		1		3		3

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VII-SEM B.Tech. ICB	Subject Code	Subject Name / Title	Maximum Marks Allotted						Contract Hrs.			Total Credits
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			End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work & Sessional	Total Marks	L	T	P	
	ICB-2172 (B)	Digital Image Processing	70	20	10	-	-	100	3	1	-	4

Prerequisite : Knowledge of Computer Programming Language and MATLAB.

Course Objective:

1.To study the image fundamentals and mathematical transforms necessary for image processing.
2.To study the image enhancement techniques
3.To study image restoration procedures.
4.To study the image compression procedures.

UNIT I : Digital Image Fundamentals A simple image model, Sampling and Quantization. Relationship between pixels. Imaging geometry. Image acquisition systems, Different types of digital images.

UNIT II : Image Transformations Introduction to Fourier transforms, Discrete Fourier transforms, Fast Fourier transform, Walsh transformation, Hadmord transformation, Discrete Cosine Transformation.

UNIT III : Image Enhancement Filters in spatial and frequency domains, Histogram based processing. Image subtraction, Averaging, Image smoothing, Nedion filtering, Low pass filtering, Image sharpening by High pass filtering.

UNIT IV : Image Encoding and Segmentation Encoding: Mapping, Quantizer, Coder. Error free compression, Lossy Compression schemes. JPEG Compression standard. Detection of discontinuation by point detection, Line detection, edge detection, Edge linking and boundary detection, Local analysis, Global processing via Hough transforms and graph theoretic techniques.

UNIT V : Mathematical Morphology Binary, Dilation, crosses, Opening and closing, Simple methods of representation, Signatures, Boundary segments, Skeleton of a region, Polynomial approximation.

References Books:

1. Rafael C Gonzalez, Richard E Woods 3rd Edition, Digital Image Processing Pearson.
2. Sonka, Digital Image Processing & Computer Vision, Cengage Learning.
3. Jayaraman, Digital Image Processing, TMH.
4. Pratt, Digital Image Processing, Wiley India.
5. Annadurai, Fundamentals of Digital Image Processing,Pearson Education.

Course Outcomes: The students would be able to:

CO-1: Ability to apply principles and techniques of digital image processing in applications related to design and analysis of digital imaging systems.
CO-2: Ability to analyze and implement image processing algorithms to real problems.
CO-3: Gaining of hands-on experience in using software tools for processing digital images.
CO-4: Interpret image segmentation and representation techniques.
CO-5: Apply Mathematical Morphology using Polynomial approximation.

Mapping of COs and POs:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	**3**	**3**	**2**	**1**		**1**						**2**	**2**	**1**
CO-2	**2**	**2**	**2**	**1**								**2**	**1**	**1**
CO-3	**2**	**2**	**3**	**2**								**1**	**1**	**2**
CO-4	**2**	**2**	**2**	**2**								**1**	**1**	**1**
CO-5	**1**	**2**	**2**	**2**								**2**		

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			Theory			Practical						
			End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work & Sessional	Total Marks	L	T	P	
	ICB-2172 (C)	Wireless Networks	70	20	10	-	-	100	3	1	-	4

Course Objectives:

To provide an overview of Wireless Communication networks and its applications in communication engineering, enable students to understand the contribution of Wireless Communication networks to overall technological growth, make them understand related terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks.

Course Contents:

UNIT I: Introduction of Wireless Networks: Different Generations of Wireless Networks. Characteristics of the Wireless Medium: Radio Propagation Mechanisms, Path Loss Modeling and Signal Coverage, Effect of Multipath and Doppler, Channel Measurement and Modeling Techniques.

UNIT II: Network Planning: Introduction, Wireless Network Topologies, Cellular Topology, Cell Fundamentals Signal to Interferences Radio Calculations, Network Planning for CDMA Systems. Wireless Network Operations**:** Mobility Management, Radio Resources and Power Management.

UNIT III: Multiple Division Techniques: FDMA, TDMA, CDMA, OFDM, SDMA. Comparison of Multiple Division Techniques, Modulation Techniques – AM, FM, FSK, PSK, QPSK, QAM, 16QAM Mobile Data Networks: Introduction, Data Oriented CDPD Network, GPRS, EDGE and High Data Rates, SMS in GSM, Mobile Application Protocols.

UNIT IV: Introduction to Wireless LAN: Evolution of WLAN, Wireless Home Networking, Technologies for Home Area Network (HAN), Overview of IEEE 802.11, Reference Architecture, PHY and MAC Layer, Wireless ATM, HIPERLAN.

UNIT V: Standards: IEEE 802.15 WPAN, HomeRF, Bluetooth, Interference between Bluetooth and 802.11, Adhoc Networks, Introduction to 2.5 G and 3 G Networks.

Reference Books:

1. Kaveh Pahlavan, Prashant Krishnamurthy, “principles of Wireless Networks”, PHI.
2. Qing- An Zeng, Dharma Prakash Agrawal, “Introduction to Wireless and Mobile Systems”, CENGAGE Learning.
3. Sumit Kasera, Nishit Narang, A P Priyanka, “2.5 G Mobile Networks: GPRS and EDGE”, TMH
4. Dr. Kamilo Feher, “Wireless Digital Communications”, PHI.
5. Jochen Schiller, “Mobile Communications”, PEARSON.

Course Outcomes: The students would be able to-

CO-1: Identify the basic concept of wireless networks.
CO-2: Analyze traffic theories, mobile radio propagation, channel coding, and cellular concepts.
CO-3: Compare and contrast multiple division techniques and mobile Communication systems.
CO-4: Apply wireless ID technologies, in particular RFID work.
CO-5: Explain and differentiate between technologies like 2.5G and 3G.

Mapping of CO and PO:

COs	PO 1	PO2	PO 3	PO4	PO 5	PO6	PO7	PO 8	PO9	PO1 0	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	3	1				2		1					2	1
CO-2	3	3		2	3		3				1		2	
CO-3	3	2	2									3		3
CO-4	2		1	2	1		2				2		2	1
CO-5	2	3											2	

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			Theory			Practical						
			End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work & Sessional	Total Marks	L	T	P	
	ICB - 2173(A)	Smart Contracts and Application Development	70	20	10	-	-	100	3	-	-	3

Prerequisite: Basic concepts in networking in Blockchain.

Course Objectives: An ability to identify, formulate, and solve complex engineering problems.

Course Contents:

Unit-I: Smart Contracts: Definition and Need, Features of Smart Contracts, Life Cycle of a Smart Contract, Introduction to Ethereum, Ethereum Virtual Machine(EVM), Sample examples of working Ethereum Smart Contract.

Unit-II: Issues in Application of Smart Contract: Market Impact and Scientific innovation, Trust, Future resistance features, Security Merkle's Tree, Notable Smart Contract related Hacks & Scandals, Workflow of developing a Smart Contract.

Unit-III: Introduction to Solidity: Contracts, Constructors & Functions, Variables, Getters &Setters, Arrays, Memory vs Storage, Mappings in Solidity. Advanced Solidity: Structs, Error Handling & Restrictions, Libraries, Global Variables in Solidity, Abstract Contracts, Inheritance, And Interfaces, Events.

Unit-IV: Truffle Framework & Ganache: Environment Setup for Truffle & Ganache, Truffle Project Creation, Truffle Compile, Migrate and Create Commands.

Unit-V: Decentralized App Creation: Smart Contract Creation, Front-End Creation, Connecting Smart Contract with Front-End Application, Deploying Dapp, Validation, And Testing of Dapp.

Reference Books:

1. Tiana Laurence, Blockchain for Dummies, 2nd Edition 2019, John Wiley & Sons.
2. Anshul Kaushik, Block Chain & Crypto Currencies, Khanna Publishing House.
3. Building Blockchain Projects, Narayan Prusty, Packt Publishing.
3. Mastering Ethereum: Building Smart Contracts and Dapps Book by Andreas.

Course Outcomes: The students would be able to:
CO-1: To understand the working and importance of smart contracts and Ethereum.
CO-2: To learn the Issues in Application of Smart Contract.
CO-3: To understand and build the working of Solidy.
CO-4: To Analyze the Truffle Framework & Ganache.

CO-5: Analyze the results of the algorithm and convert to appropriate information as per the requirement.

Mapping of COs and POs:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO 2
CO-1	**3**	**2**						**3**		**2**	**2**	**3**		
CO-2	**3**	**2**						**3**	**3**	**3**	**3**	**3**		
CO-3	**3**	**2**	**3**	**3**	**3**	**3**		**3**	**3**		**3**	**3**		
CO-4	**3**	**3**		**3**	**3**			**3**	**3**		**3**	**3**		
CO-5	**3**	**3**	**3**	**3**				**3**	**3**		**3**	**3**		

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			End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work & Sessional	Total Marks	L	T	P	
	ICB - 2173(B)	Data Compression	70	20	10	-	-	100	3	-	-	3

Course Objectives

- Data compression is grounded in information theory and there are many fundamental algorithms. Information transmission and storage tasks.
- Discuss the heretical underpinnings of data compression and cover many fundamental algorithms.

Course Contents:

Unit-I: Introduction to Data Compression, The Data Compression Lexicon, With A History the Two Kingdoms, Data Compression Modeling, Coding, The Dawn Age, Coding An improvement Modeling, Statistical Modeling, Ziv & Lempel LZ77 LZ78, Lossy Compression, Programs to Know. Minimum Redundancy Coding the Sahnnon-Fano Algorithm.

Unit-II: The Huffman Algorithm, Prototypes, Huffman Code, Counting the Symbols, Saving the Counts, Building the Tree, Using the tree**,** Adaptive Huffman Coding Adaptive Coding, Updating Huffman Tree, swapping, The Algorithm, Enhancement, Escape Code, Overflow Bonus, Rescaling Bonus, Initialization of the Array, Compress Main Program, Expand Main Program, Encoding Symbol, Decoding Symbol

Unit-III: Huffman One Better: Arithmetic Coding Difficulties, Arithmetic Coding: A Step Forward, Practical Matters, A Complication, Decoding, Where's the Beef Dictionary-Based Compression An Example, Static vs. Adaptive, Adaptive Methods, A Representative Example, Israeli Roots, History, ARC: MS-DOS Dictionary, Dictionary Compression, Danger Ahead-Patents, Conclusion.

Unit-IV: Sliding Window Compression, The Algorithm, Problems with LZ77, An Encoding Problem, LZSS compression, Data structures, A balancing Act Greedy vs. Best Possible. The expansion Routine, Improvements. Speech Compression, Digital Audio Concepts, Fundamentals, Sampling Variables, PC-Based sound, Lossless Compression of Sound, Problems and Results, Loss compression, Silence Compression, Other Techniques.

Unit-V: Lossy Graphics Compression, Enter Compression, Statistical And Dictionary Compression Methods Lossy Compression Differential Modulation Adaprive Coding, A Standard that Works:JPEG, JPEG Compression Discrete Cosine Transform, DCT Specifics, Implementing DCT. Matrix Multiplication, Cpmtomied Improvements, Output Of The DCT, Quantization, Selecting A Qualtization Matrix. Sample Program, Input Format, Initialization, Forward DCT Routine, Write DCT Data(),File Expansion, Read DCT Data(),Inverse DCT.

Reference Books:

1. “Data Compression”, Mark Nelson
2. “Data Compression”, Khalid shayood, Morgon Kaufmann
3. “Data Compression : The Complete Reference”, David Saloman, Springer

Course Outcomes: The students would be able to:

CO-1: Identify the important issues in data compression.
CO-2: Differentiate and compare variety of data compression techniques.
CO-3: Apply techniques for compression of binary programmes, data, sound and image.
CO-4: Learn techniques for modelling data and the issues relating to modelling.
CO-5: Analyze and implement DCT for compression.

Mapping of COs and POs:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO 2
CO-1	**3**	**3**	**2**	**1**		**1**						**1**	**1**	**1**
CO-2	**2**	**2**	**2**	**1**								**1**	**1**	**1**
CO-3	**2**	**2**	**3**	**2**								**1**	**1**	**1**
CO-4	**2**	**2**	**2**	**2**									**1**	**1**
CO-5	**1**	**2**	**2**	**2**										

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Bachelor of Technology B.Tech in CSE (IOT & Cyber Security with Blockchain Technology)

VII-SEM B.Tech. ICB	Subject Code	Subject Name / Title	Maximum Marks Allotted						Contract Hrs.			Total Credits
			Theory			Practical						
			End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work & Sessional	Total Marks	L	T	P	
	ICB - 2173(C)	Fog and Edge Computing	70	20	10	-	-	100	3	-	-	3

Pre-requisites: Basic knowledge of IoT, Molding & simulations, Concept of data management & security.

Course Objectives: The objectives of this course are:
- To extend the students' knowledge of fog computing & edge computing.
- To enhance their expertise in area of wearable computing enjoinment.
- To carry out real life application of fog computing.

Course Contents:

Unit-I: INTRODUCTION TO FOG COMPUTING: Fog Computing-Definition-Characteristics-Application Scenarios - Issues –Fog. Computing and Internet of Things-Pros and Cons-Myths of Fog Computing -Need and Reasons for Fog Computing Fog Computing and Edge Computing-IoT, FOG, Cloud Benefits.

Unit-II: ARCHITECTURE: Working Procedure -Performance Evaluation Components-Software Systems – Architecture-Modeling and Simulation –Challenges.

Unit-III: FOG PROTOCOLS: Fog Protocol-Fog Kit- Proximity Detection Protocols-DDS/RTPS computing protocols.

Unit-IV: MANAGEMENT OF DATA AND SECURITY ANALYSIS: Smart Management of Big Data-Smart Data-Structure of Smart Data- Smart Data Life. Cycle-System Architecture-Multi-dimensional Payment Plan- -Security and Privacy. Issues-Multimedia Fog Computing-ArchitectureDeduplication-Hybrid Secure. Deduplication- Security Challenges-Security Requirements.

Unit-V: Introduction to Edge Computing Architectures, Edge Computing to support User Applications (5G-Slicing, self-driving cars and more), Concepts of distributed systems in edge computing such as time ordering and clock synchronization, distributed snapshot, etc.

Reference Books:

1. Assad Abbas, Samee U. Khan "Fog Computing: Theory and Practice " wiley India May2020.
2. Stojan Kitanov (Mother Teresa University, Macedonia)"Introduction to Fog Computing" IGI Global Publication.

Course Outcomes: The students would be able to:
CO-1: Understand fog computing.
CO-2: Know architecture of fog computing.
CO-3: Implement fog computing protocols.
CO-4: Do security risk analysis.
CO-5: Know various industry based application of fog computing.

Mapping of COs and POs:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO 2
CO-1	3	2	1	2	3							1		
CO-2	3	2	2	3	3				1		1	1		
CO-3	3	3	3	3	3				2		1	1		
CO-4	3	2	2	3	3				2		3	1		
CO-5	3	2	2	2	3							1		

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	ICB - 2174(A)	Explainable Artificial Intelligence	70	20	10	-	-	100	3	-	-	3

Prerequisites: Students are expected to be fluent in basic linear algebra, probability, algorithms, and machine learning.

Course Objectives:
This course provides an Introduction to Explainable AI through practical applications and real-world examples. Students will gain a basic proficiency in interpreting and explaining the decisions of ML and AI systems, in a transparent and understandable manner to humans.

Course Contents:
UNIT-I: Introduction to Explainability: Course Overview and Introduction, Explaining Explainable, AI Overview of Python Data Stack, ML and AI Refresher, Defining explainability, Overview of Explanations, Known Issues in Explainability.

UNIT-II: Explaining Structured Data: Pre-model Explainability, Partial Dependence Plots, Permutation Feature Importance, Intro to Shapley, More on Shapley: Tree Models and other applications, Rule Based Methods: Anchors, Counterfactual Explanations. Explaining Unstructured Data: Pre-model Explainability on Unstructured Data, Supervised Wrapper for Clustering Models.

UNIT-III: Explaining Text: Lime for Text Data, Shap for Text Classifiers, Sentence Highlighters, Layer Integrated Gradients, Layer-Wise Relevance Propagation.

UNIT-IV: Measuring Performance: Measuring the Performance of Explainers Measuring Trust and Reliability of Explanations.

UNIT-V: Additional Topics in Explainability: Time Series Explainers, LLM, Foundation Models, Feature Selection for Explainability, Explainer Dashboard.

Reference Books:
1. Michael Munn, David Pitman, "Explainable AI for Practitioners", Released October 2022 Publisher(s): O'Reilly Media, Inc. ISBN: 9781098119133.

Course Outcomes: The students would be able to-

CO-1: Understand what Explainable AI is, its scope, and impact on various domains.
CO-2: Understand Global vs Local Explanations and their applications.
CO-3: Identify and evaluate the most used XAI techniques and algorithms.
CO-4: Use Python to apply Explainer algorithms/methods and interpret the results.
CO-5: Critically evaluate and contextualize the performance and reliability of Explanations, and identify their limitations and biases.

Mapping of COs and POs:

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

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			End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work & Sessional	Total Marks	L	T	P	
	ICB - 2173(B)	Data Mining and Knowledge Discovery	70	20	10	-	-	100	3	-	-	3

Prerequisites: Concepts in data base management systems and information retrieval.

Course Objective

To provide students with knowledge, advanced skills and understanding of Data Warehousing, its components, design principles and modelling. This course will also provide students with in-depth concepts in knowledge discovery, data mining, different data mining algorithms and classification techniques.

Course Contents:

UNIT I: Data Warehousing: Introduction to Data warehousing, needs for developing data Warehouse, Data warehouse systems and its Components, Design of Data Warehouse, Dimension and Measures, Data Marts:- Dependent Data Marts, Independents Data Marts and Distributed Data Marts, Conceptual Modelling of Data Warehouses, Star Schema, Snowflake Schema, Fact Constellations. Multidimensional Data Model and Aggregates.

UNIT II: OLAP: Characteristics of OLAP System, Motivation for using OLAP, Multidimensional View and Data Cube, Data Cube Implementations, Data Cube Operations, Guidelines for OLAP Implementation, Difference between OLAP and OLTP, OLAP Servers: ROLAP, MOLAP, HOLAP Queries.

UNIT III: Data Mining: Introduction to Data Mining, Knowledge Discovery, Data Mining Functionalities, Data Mining System categorization and its Issues. Data Processing: Data Cleaning, Data Integration and Transformation. Data Reduction, Data Mining Statistics, Guidelines for Successful Data
Mining.

UNIT IV: Association Rule Mining: Introduction, Basic, The Task and a Naïve Algorithm, Apriori Algorithms, Improving the efficiency of the Apriori Algorithm, Apriori-Tid, Direct Hasing and Pruning (DHP), DynamicItemset Counting (DIC), Mining Frequent Patterns without Candidate Generation (FP-Growth), Performance Evaluation of Algorithms.

UNIT V: Classification: Introduction, Decision Tree, The Tree Induction Algorithm,Split Algorithms Based on Information Theory, Split Algorithm Based on the Gini Index, Overfitting and Pruning, Decision Trees Rules, Naïve Bayes Method. Cluster Analysis: Introduction, Desired Features of Cluster Analysis, Types of Cluster Analysis Methods: Partitional Methods, Hierarchical Methods, Density- Based Methods, Dealing with Large Databases, Quality and Validity of Cluster Analysis Methods.

References:

1. Arun K. Pujari, “Data Mining Techniques”, University Press.
2. Berson, “Data Warehousing and Data Mining and OLAP”, TMH
3. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Elsevier Pub.

Course Outcomes: The students would be able to-

CO1: Explain the functionality of the various data warehousing models and components.
CO2: Apply data pre- processing techniques on different datasets.
CO3: Evaluate the performance of different association rules and classification techniques.
CO4: Compare different association rule mining techniques.
CO5: Identify different advance Classification and Clustering data mining techniques.

Mapping of CO and PO:

COs	PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	3	1											2	1
CO-2	3	3		2	3								2	
CO-3	3	2	2	3	2								3	3
CO-4	2		1	2	1								2	1
CO-5	2	3		1									2	

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	ICB - 2173(C)	Web Technology	70	20	10	-	-	100	3	-	-	3

Prerequisites: Basic Knowledge of Internet Concepts, Software Engineering.

Course Contents:

UNIT I: BASICS OF HTML: Html tags, entities, links, frames, Text Alignment and Lists, Text Formatting, Fonts Control, head, meta, Email Links and link within a Page, creating a Table, rules of web designing, Creating HTML Forms. page design, home page layout, Design concepts, create a Web page with Graphics, Custom Backgrounds and Colors, Creating Animated Graphics, scripts, attributes, events, URL encode.

UNIT II: CASCADING STYLE SHEET: CSS, Defining Style with HTML Tags, Features of Style Sheet, Style Properties, Style Classes, External Style Sheet, Creating Style Sheet, working with block elements and objects, working with list and table, CSS advance.

UNIT III: JAVASCRIPT: Introduction to JavaScript: Writing First JavaScript, External JavaScript, Variables: Rules for variable names, Declaring the variable, Assign a value to a variable, Scope of variable, Arrays, Using Operators, Control Statements, JavaScript loops, JavaScript Functions: Defining a Function, Returning value from function, User defined function, Dialog Box.

UNIT IV: JAVASCRIPT DOM: Introduction Object in HTML, Event Handling, Window Object, Document Object, Browser Object, Form Object, Navigator Object, Screen Object, Built in Object, User defined Objects, Cookies.

UNIT V: PHP BASICS: Origin and Uses of PHP, Overview of PHP, General Syntactic Characteristics, Primitives, Operators and Expressions, Output Statement, Control Statements, Arrays, Built-in Functions, User-defined Validating Data Entry, Form Handling, Cookies, Session Tracking.

References:

1. "HTML & CSS: The complete reference" by Thomas A. Powel, 5th Edition, McGraw Hill, 2017.
2. "JavaScript Bible" by Danny Goodman, 7th Edition, Wiely, 2010.
3. "Beginning PHP 5" by Dave W & others, Wiley-dreamtech, Edition 2004.

Course Outcomes: The students would be able to-
CO1: Apply cascading style sheet concept to design web page.
CO2: Create Web Page with functionalities using Java Script.
CO3: Understand the event handling in web technology.

CO4: Understand and demonstrate the uses of PHP in web page design and Development of websites.
CO5: Apply cascading style sheet concept to design web page.

Mapping of CO and PO:

COs	PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	**1**	**1**	**2**	**2**	**2**	**1**								
CO-2	**3**	**2**	**3**	**2**	**2**	**1**								
CO-3	**3**	**2**	**3**	**2**	**2**	**1**						**1**		**2**
CO-4	**3**	**2**	**3**	**2**	**2**	**1**						**1**		
CO-5	**3**	**2**	**3**	**2**	**2**	**1**								**2**

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	ICB - 2175(A)	Deep Learning	70	20	10	-	-	100	3	-	-	3

Course Objectives: The objective of this course is to introduce students to deep learning algorithms and their applications in order to solve real problems.

UNIT:I Introduction: Historical context and motivation for deep learning; basic supervised classification task, optimizing logistic classifier using gradient descent, stochastic gradient descent, momentum, and adaptive sub-gradient method.

UNIT :II Neural Networks: Feedforward neural networks, deep networks, regularizing a deep network, model exploration, and hyper parameter tuning.

UNIT :III Convolution Neural Networks: Introduction to convolution neural networks: stacking, striding and pooling, applications like image, and text classification.

UNIT :IV Sequence Modeling: Recurrent Nets: Unfolding computational graphs, recurrent neural networks (RNNs), bidirectional RNNs, encoder-decoder sequence to sequence architectures, deep recurrent networks, LSTM networks.

UNIT : V Autoencoders: Undercomplete autoencoders, regularized autoencoders, sparse autoencoders, denoising autoencoders, representational power, layer, size, and depth of autoencoders, stochastic encoders and decoders.

Reference Books:

1. Bunduma, N. (2017). Fundamentals of Deep Learning by oreilly books.
2. Heaton, J.(2015). Deep Learning and Neural Networks, Heaton Research Inc.

Course Outcomes: The students would be able to:

CO-1: Describe the feed-forward and deep networks.
CO-2: Design single and multi-layer feed-forward deep networks and tune various hyper-parameters.
CO-3: Implement deep neural networks to solve a problem.
CO-4: Analyse performance of deep networks.
CO-5: Explain the fundamental knowledge of autoencoders.

Mapping of COs and Pos:

COs	PO 1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	PO1	PO_{11}	PO_{12}	PSO 1	PSO 2
CO-1	3	2	2	1	3	1			1			1	1	1
CO-2	3	3	2	2	3	1			2	1		1	1	3
CO-3	3	3	3	2	3	1		1	2	1		2	1	3
CO-4	3	3	3	3	3	2		1	3	2		3	2	3
CO-5	3	3	3	3	3	2		1	3	3	3	3	3	3

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			End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work & Sessional	Total Marks	L	T	P	
	ICB - 2175(B)	Optimization Technique	70	20	10	-	-	100	3	-	-	3

Course Objectives:
After an adequate introduction to linear algebra and probability theory, students will learn to frame engineering minima maxima problems in the framework of optimization problems.

Course Contents:

UNIT:I Mathematical preliminaries Linear algebra and matrices. Vector space, Eigen analysis. Elements of probability theory. Elementary multivariable calculus.

UNIT :II Linear Programming Simplex method, Introduction to linear programming model, Duality, Karmarkar's method.

UNIT :III Unconstrained optimization Conjugate direction and quasi-Newton methods, Gradient-based methods , One-dimensional search methods .

UNIT :IV Constrained Optimization Lagrange theorem. FONC, SONC, and SOSC conditions.

UNIT : V Projection methods, KKT conditions, Non-linear constrained optimization models Nonlinear problems

Reference Books:
1. An introduction to Optimization by Edwin P K Chong, Stainslaw Zak.
2. Nonlinear Programming by Dimitri Bertsekas.

Course Outcomes: The students would be able to:
CO-1: To implement optimization algorithms and model engineering minima/maxima problems as optimization problems.
CO-2: To understand the theory of optimization methods and algorithms developed for solving various types of optimization problem.
CO-3: To apply the mathematical results and numerical techniques of optimization theory to concrete Engineering problems.
CO-4: To study equality constraint.
CO-5: Explain the fundamental knowledge of Non-linear constrained optimization.

Mapping of COs and Pos:

COs	PO 1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	PO1	PO_{11}	PO_{12}	PSO 1	PSO 2
CO-1	3	2		1	1								2	
CO-2	3	2	2		1								1	1
CO-3	3	2	2	3									2	
CO-4					2								2	2
CO-5			3					2					2	

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	ICB - 2175(C)	OOAD	70	20	10	-	-	100	3	-	-	3

Prerequisite: Having Previous knowledge of Object Oriented Technology and Principle of Programming Languages.

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Object oriented concepts with java by being able to do each of the following:

1 To understand Basic Fundamental concepts of Modeling Techniques.
2 To implement the Programs using Object oriented Concepts with Any Programming Language.
3 To introduce the CORBA, EJB, COM+, DCOM.

Unit-I : Object Oriented Concepts and Modeling Techniques, Modeling, objects and classes, Relationships, Inheritance, Association, aggregation, Containers, Delegation, Metadata, Abstract methods and Classes. Object modeling, Dynamic modeling, Events, Status, Scenarios, Event hate diagrams, Operations, State diagrams, Functional Models, Dataflow diagrams, Constraints specification, Relation of object, Functional and Dynamic models.

Unit-II : Design Methodology,OMT methodology, Analysis, Overview of system design, Subsystem, concurrency, Common architectural frameworks designing algorithm, Design optimization, Implementation of control, Design of Associations, Object design, Class design, Comparison of design methodology with SASD, JSD and others.

Unit-III : Implementation,Programming style, Reusability, Extensibility, Programming in the large, Translating a design into an Implementation class definition, Object oriented Language features, Survey of object-oriented languages, Object storage and relation with database.

Unit-IV : Advanced Topics,Distributed objects, Components development, Introduction to Distributed object system like CORBA, EJB, COM+, DCOM, and other design architectures.

Reference Books:

1.G. Booch, Object-Oriented Analysis and Design, Pearson Education.
2. J. Rumbaugh, Object-Oriented Modeling and Design, Pearson Education.

Course Outcomes: The students would be able to-

CO-1: Illustrate OOAD concepts and various UML diagrams.
CO-2: Select an appropriate design pattern.
CO-3: Illustrate about domain models and conceptual classes.
CO-4: Compare and contrast various testing techniques.
CO-5: Implement projects using UML diagrams.

Mapping of COs and POs:

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

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	ICB - 2178	Major Project Prelim	-	-	-	100	50	150	-	-	4	2

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.
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 synopsis Pre-report** to their Head of the Department with the remarks of guide in their College during **Eighth week** of the semester.