

**SCHEME FOR EXAMINATION B.TECH (FOUR YEAR) DEGREE
COURSE , COMPUTER SCIENCE AND ENGINEERING
SCHOOL OF STUDIES IN ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA
FOURTH YEAR, SEMESTER - VII
W.E.F. SESSION 2023-24**

Branch :- Computer Science & Engg.

Year : IV

Sem- VII

S.No.	Code No.	Subject	Periods			Evaluation Scheme			Credits
			L	T	P	IA	ESE	Total	
1	CS207TPEX	Professional Elective-I	3	0	0	30	70	100	3
2	CS207TPEX	Professional Elective-II	3	0	0	30	70	100	3
3	CS207TOEX	Open Elective-I	3	0	0	30	70	100	3
4	CS207TPC14	Compiler Design	3	0	0	30	70	100	3
PRACTICAL									
1	CS207PPC09	Compiler Design Lab	0	0	3	30	20	50	1.5
2	CS207PPR03	Major Project –I	0	0	6	60	40	100	3
3	CS207PPS01	Seminar	0	0	3	50	--	50	1.5
Total									18

Professional Elective-I & II Subject VII Sem.				Open Elective-I Subject VII Sem.			
S.No	Subject Code	Subject	Credits	S.No.	Subject Code	Subject	Credits
1	CS207TPE09	TCP/IP Internetworking	3	1.	EC207TOE02	CMOS Digital VLSI Design	3
2	CS207TPE10	Web Technology	3	2.	CE207TOE02A	Green Building and Sustainable Materials	3
3	CS207TPE11	Data Mining	3	3.	ME207TOE02	Principles of Management	3
4	CS207TPE12	Cyber Crime & Security	3	4.	CH207TOE02	Waste to Energy	3
				5.	IT207TOE01	Machine Learning	3
				6.	CS207TOE01	GIS & Remote sensing	3
				7.	IP207TOE21	Manufacturing Processess-I	3
				8.	IP207TOE31	Production Planning and Control	3

SCHEME FOR EXAMINATION
B.TECH (FOUR YEAR) DEGREE COURSE
COMPUTER SCIENCE AND
ENGINEERING
SCHOOL OF STUDIES IN ENGINEERING &
TECHNOLOGY GURU GHASIDAS VISHWAVIDYALAYA
FOURTH YEAR, SEMESTER - VIII
W.E.F. SESSION 2023-24

Branch :- Computer Science & Engg.

Year : IV

Sem- VIII

S.No.	Code No.	Subject	Periods			Evaluation Scheme			Credits
			L	T	P	IA	ESE	Total	
1	CS208TPEX	Professional Elective-I	3	0	0	30	70	100	3
2	CS208TOEX	Open Elective-I	3	0	0	30	70	100	3
3	CS208TOEX	Open Elective-II	3	0	0	30	70	100	3
PRACTICAL									
1	CS208PPEX	Professional Elective-I Lab	0	0	3	30	20	50	1.5
2	CS208PPR04	Major Project -II	0	0	12	120	80	200	6
Total									16.5

Professional Elective-I Subject VIII Sem.				Open Elective-I Subject VIII Sem.			
S.No	Subject Code	Subject	Credits	S.No.	Subject Code	Subject	Credits
1	CS208TPE13	Network Security	3	1	EC208TOE03	Introduction to IoT	3
2	CS208TPE14	Mobile Application Development	3	2	CE208TOE03	Infrastructure Planning and Management	3
3	CS208TPE15	Cloud Computing	3	3	ME208TOE03	Supply Chain Management	3
4	CS208TPE16	Big Data Analysis	3	4	CH208TOE03	Plant Engineering Economics and Management	3
				5	IT208TOE01	Soft Computing	3
				6	CS208TOE01	Artificial Intelligence	3
				7.	IP208TOE41	Advanced Manufacturing Process	3

				8.	IP208TOE51	Computer Aided Process Planning (CAPP)	3
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Open Elective- II Subject VIII Sem.			
S.No	Subject Code	Subject	Credits
1	CS208TOE09	Enterprise Resource Management	3
2	CS208TOE10	Information Retrieval Systems	3
3	CS208TOE11	Wireless Sensor Network	3
4	CS208TOE12	Machine Learning	3

Professional Elective Subject Lab VIII Sem			
S.No	Subject code	Subject	Credits
1	CS208PPE01	Network Security Lab	1.5
2	CS208PPE02	Mobile Application Development Lab	1.5
3	CS208PPE03	Cloud Computing Lab	1.5
4	CS208PPE04	Big Data Analysis Lab	1.5

Sub Title: TCP/IP INTERNETWORKING		
Sub Code: CS207TPE09	No. of Credits : 3=3: 0: 0(L-T-P)	No of lecture hours/week :03
Exam Duration : 3 hours	IA+ESE=30+70	Total no of contact hours:36

COURSE OBJECTIVE:

Analyse and differentiate networking protocols used in TCP/IP protocol suite.
 Implement the concepts of naming and addressing to IPv4 and their extension to IPv6.
 Categorize problems such as reliable transport, data delay, congestion and flow control and describe congestion control schemes used in TCP.
 Discuss the Internet best-effort type of service and its improvements.
 Discuss the functionality of ATM network and ISDN.

UNIT No	Syllabus Content	No of Hours
1	Introduction: Introduction to internetworking, Overview of OSI Model TCP/IP protocol suite, Basics of switching technologies and switches, Comparisons of different models, Gateways.	8
2	Internet Protocol: Purpose of Internet Protocol, Internet datagram, Options, Checksum, ARP and RARP Routing Methods: Routing Table, ICMP, IGMP. IP Addresses: Introduction, Address Classification, A sample internet with classful addressing, Subnetting, Supernetting, Classless addressing, Security at the IP Layer, IPsec, IPv4 and IPv6 packet formats.	7

3	<p>Routing Protocols: Unicast Routing Protocols: Interior and Exterior routing, RIP, OSPF, BGP, Multicasting: Introduction, Multicast Routing, Multicast Routing Protocols, Multicast Trees, DVMRP, MOSPF, CBT,PIM, MBONE.</p>	7
4	<p>Transmission Control Protocol: TCP:TCP operation, Segment, Sliding window, Silly window, Options, TCP state machine, Karn's Algorithm, Congestion control- Leaky bucket and Token bucket algorithms. UDP: User Datagram, UDP operations, Checksum calculation.</p>	7

5	TCP/IP Over ATM Networks: ATM reference model, ATM Switch, Interconnection Network, Virtual circuit in ATM, Paths, Circuits and identifiers, ATM cell transport and adaptation layers, packet type and multiplexing, IP Address binding in an ATM Network, Logical Subnet Concept and Connection Management. ISDN and B-ISDN.	7
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COURSE OUTCOMES: The students would have learnt

CO1: Understand the functions of each layer of TCP/IP model. CO2: Understand the functions of different Protocols. CO3: Understand the congestion control provided by the protocols. CO4: Understand the Quality of Services mechanism provided by protocol. CO5: Understand the concept of ATM and ISDN Network.

Text Books:

1. Internetworking with TCP/IP by Comer, Vol. 1, PHI Pub.
2. TCP/IP Protocol suite by Behrouz A. Forouzan.,TMH

Pub. Reference Books:

1. Computer Networking by James F. Kurose, Keith W. Ross, Pearson Education
2. TCP/IP Illustrated By Wright and Stevens, Vol.2, Pearson Education
3. An Introduction to Computer Networks by Kenneth C. Mansfield Jr. James L.

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1									3	2	1
CO2	2	2	3	2									1	3	3
CO3	1	2	3	2									1	3	2
CO4	2	3	3	2									2	2	3
CO5	2	2	3	2									2	3	2

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

Sub Title: WEB TECHNOLOGY		
Sub Code: CS207TPE10	No. of Credits : 3=3: 0: 0(L-T-P)	No of lecture hours/week :03
Exam Duration : 3 hours	IA+ESE=30+70	Total no of contact hours:36

COURSE OBJECTIVE:

Become familiar with graphic design principles that relate to web design and learn. How to implement theories into practice.
 Develop skills in analyzing the usability of a web site.
 Understand how to plan and conduct user research related to web usability.
 Learn the language of the web: HTML and CSS.
 To work on VB-Script, Java Script, XML, PHP etc.

UNIT No	Syllabus Content	No of Hours
1	Fundamentals of web, History of the web, Growth of the web in post decade, Web function, Security aspects on the web, Computational features encompassing the web, working web. Browsers, concepts of search Engines, Searching the web, web Servers.	8
2	Internet: Networks, Client & Server, WWW, URL, HTTP, Internet requirements, Internet Services, Internet Java Script introduction, operators, statements, loops, object manipulation, function, object, events handler, always, events.	7
3	HTML: Introduction, cascading style sheets, content positioning HTML content, Downloadable fonts, using Java script with positioned content, Layer object, Handling events using localized scripts, Animating images, VB script, Introduction, Adding VB script to web Range, working with variables, constants, arrays, objects, conditional statements loop statements, Forms.	7
4	Active Server Page (ASP): Introduction , Internet Information System , A authentication, Basic authentication , NT challenge response, active server page, asp objects , server objects, file system objects, session, accessing database with an ASP page, create an ODBC ADO connection object, common methods & Properties events, collection ADO record set object.	7
5	XML : Introduction, To XML, XML schemas, DOM structure model, using XML queries, Building a path, sharing functions. Introduction of personal home page (PHP) design.	7

COURSE OUTCOMES: The students would have learnt

CO1: Have a Good grounding of Web Application Terminologies.

CO2: Improvement the knowledge about the web security in Internet Tools, CO3: Web designing use in E- Commerce and other web services.

CO4: Get introduced in the area of Online Game programming.

CO5: Expertise in the web pages designing for software companies. CO6: Easy in software development etc.

Text Books:

1. Web Technology, Achyut S Goklbole and Atul Khute, Tata McGraw Hill.
2. Web Technology: A Developer's perspective, Gopalan NO Akilandeswari, PHP.

Reference Books:

1. Web Technology & Design, C Xavier, Tata Mc Grarw Hill.

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PS O		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO 6	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3

Weightage: 1-Slightly; 2-Moderately; 3-Strongly;

Sub Title: DATAMINING		
Sub Code: CS207TPE11	No. of Credits : =3: 0: 0(L-T-P)	No of lecture hours/week :03
Exam Duration : 3 hours	IA+ESE=30+70	Total no of contact hours:36

COURSE OBJECTIVE:

To introduce the concept of data Mining as an important tool for enterprise data management and as a cutting edge technology for building competitive advantage.

To enable students to effectively identify sources of data and process it for data mining

To make students well versed in all data mining algorithms, methods of evaluation.

To impart knowledge of tools used for data mining

To provide knowledge on how to gather and analyze large sets of data to gain useful business understanding.

Get in-depth hands-on experience in designing and developing a real operational system

UNIT No	Syllabus Content	No of Hours
1	Data Ware Housing: Introduction, Multidimensional data model, OLAP Operation, Warehouse schema, Data Ware Housing Architecture, Warehouse Server, Metadata, OLAP, engine. Data Mining: Introduction, KDD Vs Data mining, DBMS Vs DM , DM Techniques , Other mining problem, Issues & Challenges in DM,DM Application Areas.	8
2	Association Rules: Introduction, Methods to discover association rules, A Priori Algorithm ,Partition Algorithm, Pincer –Search algorithm , Dynamic Item set counting algorithm , FP-tree Growth algorithm , Incremental algorithm, Border algorithm.	7
3	Clustering Techniques: Introduction, Clustering paradigms, Partitioning algorithms, k-Medoid Algorithm, CLARA ,CLARANS , Hierarchical clustering , DBSCAN , BIRCH, CURE, Categorical clustering algorithms , STIRR, ROCK , CACTUS.	7
4	Decision Trees: Introduction, Tree construction principal, Best spilt splitting indices, Splitting criteria, Decision tree construction algorithm, CART, ID3,C4.5 , CHAID , Decision tree construction with presorting , Rainforest , CLOUDS, BOAT.	7

5	Web Mining: Web mining, Web content mining, Web structure mining, Web usage mining, Text mining, Episode rule discovery for texts, Hierarchy of categories, Text clustering.	7
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COURSE OUTCOMES: The students would have learnt

CO1: Demonstrate an understanding of the importance of data mining and the principles of business intelligence

CO2: Organize and Prepare the data needed for data mining using pre preprocessing techniques
CO3: Perform exploratory analysis of the data to be used for mining.

CO4: Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on large data sets.

CO5: Define and apply metrics to measure the performance of various data mining algorithms.

Text Books:

1. Data Mining techniques, Arun K Pujari Universities press
2. Data Mining concepts & techniques, Jiawei han , Micheline Kamber Morgan Kaufmann publisher Elsevier India

Reference Books:

1. Data Mining methods for knowledge Discovery, Cios , Pedrycz , Swiniarski Kluwer academic publishers London

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	1	2	2	1	1	3						3	3	3	3
CO2	3	1	3	2	1	3						3	3	3	3
CO3	3	2	1	3	2	3						3	3	3	2
CO4	2	3	3	3	1	2						3	3	3	2
CO5	2	2	3	3	3	1						3	3	3	2

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Sub Title: CYBER CRIME AND SECURITY		
Sub Code: CS207TPE12	No. of Credits : 3=3: 0: 0(L-T-P)	No of lecture hours/week :03
Exam Duration : 3 hours	IA+ESE=30+70	Total no of contact hours:36

COURSE OBJECTIVE:

The learner will understand key terms and concepts in cyber law, intellectual property and cyber crimes, trademarks and domain theft.

The learner will be able to examine secure software development practices.

The learner will understand principles of web security.

The learner will be able to incorporate approaches for incident analysis and response

UNIT No	Syllabus Content	No of Hours
1	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.	8
2	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.	7
3	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).	7
4	Electronic Business and legal issues: Evolution and development in E-commerce, paper vs paperless contracts E-Commerce models- B2B, B2C,E security.	7

5	Application area : business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends	7
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COURSE OUTCOMES: The students would have learnt

CO1: Understand the nature and scope of cybercrime.

CO2: Develop knowledge of major incidents of cybercrime and their resulting impact. CO3: Analyze and discuss national and global digital law enforcement efforts.

CO4: Critically consider specific laws and policies governing cybercrime detection

CO5: Identify and evaluate the specific technology that facilitates cybercrime and

Text Books:

1. Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, dominant Publisher
2. Information Security policy & implementation Issues, NIIT, PHI
3. Cyber Crime notorious Aspects of the Humans & net Criminals activity in Cyber World
Barna Y Dayal D P Dominant Publisher

Reference Books:

1. Cyber Crime Impact in the new millennium, Marine R.C. Auther press
2. Spam Attack, Cyber Stalking & abuse, Barna Y, Dayal D P Dominant publisher
3. Frauds & Financial criouses in Cyber space, Barna Y, Dayal D P , Dominant publisher

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1			2				3	3	1	3
CO2	1	2	2			3		2				3	1	1	3
CO3		3	2		1	2		1				2	1	1	3
CO4				3	2	1		1				3	1	1	3
CO5		2	2	2	3	1		1				3	1	1	3

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

Sub Title: COMPILER DESIGN		
Sub Code: CS207TPC14	No. of Credits : 3=3: 0: 0(L-T-P)	No of lecture hours/week :03
Exam Duration : 3 hours	IA+ESE=30+70	Total no of contact hours:36

COURSE OBJECTIVE:

Learn Basic Concept of compiler design.
 To Discuss Six phases of compiler.
 To Learn Basic functions of All Phases of Compiler.
 To Learn Functions of Symbol Table and Error Handler
 Develop ability to analyze a compiler.

UNIT No	Syllabus Content	No of Hours
1	Overview of translation process. , Definition, Phases of Compiler, Lexical analysis: Introduction, Functions of lexical Analysis, automatic generation of lexical analyzers	8
2	Parsing Theory: Introduction, Difference between Top Down and bottom up parser. Different Types of Parsers : Predictive Parser, Shift-Reduce Parser, LR Parsers(SLR, CLR, LALR), Operator Precedence Parser Automatic generation of parsers.	7
3	Intermediate Code Generation: Different intermediate forms: Syntax tree , TAC , Quadruples, Triples, . Indirect Triples, Syntax directed translation mechanism and attributed definition. Code Optimization: Global data flow analyses, A few selected optimizations like command sub expression removal, loop invariant code motion, strength reduction etc.	7
4	Code Generation: DAG, Machine model, order of evaluation, registers allocation and code selection, Code generation algorithm.	7
5	Run Time Theory Management: static memory allocation and stack based memory allocation schemes. Symbol table management.	7

COURSE OUTCOMES: The students would have learnt

CO1: Fundamentals of Compiler Design.

CO2: Translation Mechanism from Input to Output in

Compiler. CO3: To know about compiler generation tools and

techniques CO4: To understand the importance of All phases

of Compiler CO5: To Analyze a compiler for a simple programming language

Text Books:

1. Gulshan Goyal, Compiler Design , sun India publication.
2. Anamika Jain, compiler Design.

Reference Books:

1. A.V.Aho, Ravi Sethi, J.D.Ullman, Compilers tools and Techniques, Addison Wesley, 1987.
2. Waite W.N. and Goos G., Compiler construction' springer verlag, 1983.
3. Tremblay J.P. and Sorenson, P.G. the theory and practice of compiler writing, Mc Graw Hil, 1984.

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	3	2	3	2						3	3	3	3
CO 2	3	3	3	3	2	3						3	3	3	3
CO 3	3	3	3	3	3	3						3	3	3	3
CO 4	3	3	3	2	3	3						3	3	3	3
CO 5	3	2	3	2	2	3						3	3	3	3

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

Sub Title: COMPILER DESIGN LAB	
Sub Code: CS207PPC09	No. of Credits : 1.5=0: 0: 1.5(L-T-P)
Exam Duration : 3 hours	IA+ESE =30+20

Lab OBJECTIVE:

- The understanding of compiler design.
- To learn different phases of compiler and how to implement them.
- To develop an awareness of the function and complexity of modern compilers.
- Provide practical Knowledge and Skills for developing a compiler.
- Develop ability to design and analyze a compiler.

Unit No.	Content	Teaching Hours
I, II, III, IV and V	<ul style="list-style-type: none"> • Write a C/C++ program to implement the design of a Lexical analyzer to recognize the tokens defined by the given grammar. • Write a program to find string is identifier or not. • Write a program for NFA. • Write a program to find all terminal s and non terminal in a given grammer. • Write a program to find the FIRST of all Non Terminal of Given Grammer. • Write a program to find the FOLLOW of all Non Terminal of Given Grammer. • Write a C program to implement Type Checking • Write a Program to implement intermediate Code. • Write a program to optimize an Intermediate code Using Dead Code Elimination • Write a program to optimize an Intermediate code Using Common Sub Expression Elimination 	18

LAB OUTCOMES: The students would have learnt

- CO1: Understanding of basic Concept of Compiler Design.
- CO2: Students will understand the practical approach of Working of compiler.
- CO3: To know about compiler generation tools and techniques
- CO4: To understand the importance of code optimization
- CO5: Design a compiler for a simple programming language

Text Books:

1. Compiler Design, Gulshan Goyal, Sun India publication.
2. Compiler Design, Anamika

Jain Reference Books:

1. Object Oriented Programming with C++ by M P Bhave S,A. Patekar, Pearson Education
2. Compilers tools and Techniques, A.V.Aho, Ravi Sethi, J.D.Ullman, Addison Wesley, 1987.
3. Compiler construction, Waite W.N. and Goos G., springer verlag, 1983.
4. P.G. the theory and practice of compiler writing, Tremblay J.P. and Sorenson, Mc Graw Hil, 1984.

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	3	2	3							1	2	2	2
CO2	1	2	2	2	3							1	1	3	3
CO3	2	2	3	2	1							1	2	3	3
CO4	2	1	2	2	3							1	1	3	1
CO5	3	2	2	2	3							1	3	2	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly;

Sub Title: MACHINE LEARNING		
Sub Code: IT207TOE01	No. of Credits : 3=3: 0: 0(L-T-P)	No of lecture hours/week :03
Exam Duration : 3 hours	IA+ESE=30+70	Total no of contact hours:36

COURSE OBJECTIVE:

1. To expose the applications of machine learning.
2. To study the various algorithms related to supervised and unsupervised learning.
3. To recognize the different types of machine learning models and how to use them.
4. To learn the theoretical and practical aspects of probabilistic graphical models.
5. To acquire the knowledge of various classification techniques.
6. To learn the various neural network algorithms.

UNIT No	Syllabus Content	No of Hours
1	Introduction to Machine Learning: Introduction - examples of machine learning applications - Types of machine learning- Mathematical foundations of machine learning– Introduction to Parametric Models – Non-Parametric Models –Probability Basics	8
2	Supervised Learning: Linear Models for Regression – Linear Basis Function Models - The Bias-Variance Decomposition - Bayesian Linear Regression - Bayesian Model Comparison, Limitations of Fixed Basis Functions - Linear Models for Classification, Discriminant Functions -Probabilistic Generative Models –Probabilistic Discriminative Models - Bayesian Logistic Regression. Neural Networks – Network Training - Feed-forward Network Functions, Back Propagation Network, Bayesian Neural Network	7
3	Unsupervised Learning: Clustering- K-means - EM Algorithm- Mixtures of Gaussians Dimensionality Reduction - Factor analysis - Principal Component Analysis Probabilistic PCA -Independent components analysis - Singular Value Decomposition.	7
4	Probabilistic Graphical Model: Graphical Models - Undirected graphical models - Markov Random Fields-Directed Graphical Models -Bayesian Networks - Conditional independence properties - Inference – Learning - Generalization - Hidden Markov Models -Conditional random fields	7
5	Genetic Algorithms: an illustrative example, Hypothesis space search, Genetic Programming, Models of Evolution and Learning; Learning first order rules-sequential covering algorithms-General to specific beam search-FOIL; REINFORCEMENT LEARNING – The Learning Task, Q Learning.	7

COURSE OUTCOMES: The students would have learnt

- CO1: Describe the concepts and models of machine learning.
 CO2: Design and implement algorithms for supervised and unsupervised learning.
 CO3: Develop skills of using recent machine learning software for solving practical problems.
 CO4: Analyze the efficient clustering techniques for solving real world problems.
 CO5: Implement probabilistic discriminative and generative algorithms for an application and analyze the results.

Text Books:

1. Machine Learning: A Probabilistic Perspective, Kevin Murphy, MIT Press, 2012.
2. Pattern Recognition and Machine Learning, Christopher Bishop. 2e
3. Machine Learning, Tom M. Mitchell, McGraw-Hill Education (India) Private Limited, 2013

Reference Books:

1. Pattern Recognition and Machine Learning, Christopher Bishop, Springer, 1st edition, ISBN-13: 978-0387-31073-2, 2006.
2. Introduction to Machine Learning, Ethem Alpaydin, 3rd Edition, MIT Press, ISBN:9780262028189, 2014.
3. Machine Learning: a Probabilistic Perspective, Kevin Patrick Murphy, 4th edition, MIT Press, ISBN:9780262018029, 2013.
4. Machine Learning for Hackers, Drew Conway, John Myles White, 1st Edition, O'ReillyMedia, 2012.
5. Data Mining: Practical Machine Learning Tools and Techniques, Ian H. Witten, Eibe Frank, Mark A. Hall, 3rd Edition, Morgan Kaufmann, 2011.

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	1	1							3	3	3	3
CO2	3	2	3	2	1							3	3	3	3
CO3	3	3	3	3	2							3	3	3	2
CO4	3	3	3	3	3							3	3	3	2
CO5	3	3	3	3	3							3	3	3	2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
CS207TOE01	3	0	0	3 HOURS	30	70	3

GIS & Remote Sensing

Objective:

1. Understand the basic concept of Remote Sensing and know about different types of satellite and sensors.
2. Illustrate Energy interactions with atmosphere and with earth surface features, Interpretation of satellite and top sheet maps.
3. Understand different components of GIS and Learning about map projection and coordinate system.
4. Develop knowledge on conversion of data from analogue to digital and working with GIS software.

Unit 1: Overview of Information System, GIS Definitions and Terminology , Spatial Data Modeling, Stages of GIS Data Modeling, Graphic Representation of Spatial Data , Raster GIS Models , Vector GIS Models, GIS Data Management, GIS Data File Management , Database Models , Storage of GIS Data, Object Based Data Models

Unit2: GIS Types and Available GIS Software, remote sensing: remote sensing, platforms, sensors, resolution, satellites, multispectral, thermal, hyper spectral and Microwave sensing, GPS and its various terminology.

Unit3: Digital Image Processing: Preprocessing , Image Registration, Image Enhancement Techniques, Spatial Filtering Techniques, Image Transformations, Image Classification,

Unit4 : Working with oracle spatial, Overview of Oracle Spatial, Basic Spatial, Loading, Transporting, and Validating Spatial Data,

Unit5: Oracle Spatial and Network Analysis, Visualization, Spatial in Applications.

TEXT BOOKS:

1. Remote sensing and GIS paperback by Basudeb Bhatta oxford university press.
2. Introduction to Geographic Information Technology, Sujit Choudhary, Deepankar Chakrabarti & Suchandra Choudhary.
3. Pro Oracle Spatial for Oracle Database 11g, Ravikant Kothuri.

REFERENCE BOOKS:

1. ArcPy and ArcGIS – Geospatial Analysis with Python, Packet Publishing Limited, Toms Silas.
2. Developing Mobile Web ArcGIS Applications, Sheehan Matthew.
3. Spatial Analysis, GIS and Remote Sensing, Gesler Albert.
4. Learning ArcGIS for Desktop, Docan Daniela Cristiana Applying and Extending Oracle Spatial, Greener Simon.

Outcome:

On completion of the course, the student should be able to:

1. Explain the basics of geographic information systems (GIS) and related areas such as geodesy and remote sensing.
2. Select and acquire both primary and secondary spatial data for use in GIS.
3. Manage, and analyze digital data in raster and vector formats.
4. Describe how common analytical methods and techniques work.
5. Create and present a GIS project.

Sub Title: NETWORK SECURITY		
Sub Code: CS208TPE13	No. of Credits : 3=3: 0: 0(L-T-P)	No of lecture hours/week :03
Exam Duration : 3 hours	IA+ESE=30+70	Total no of contact hours:36

COURSE OBJECTIVE:

The concepts of classical encryption techniques and concepts of finite fields and number theory.

And explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms

And explore the design issues and working principles of various authentication protocols, PKI standards.

And explore various secure communication standards including Kerberos, IPsec, and SSL/TLS and email.

The ability to use existing cryptographic utilities to build programs for secure communication.

UNIT No	Syllabus Content	No of Hours
1	Services , Mechanisms ,and Attacks , The OSI Security Architecture , A Model for Network Security , symmetric cipher model , substitution techniques Transposition techniques, Steganography.	8
2	Block ciphers and the data encryption standard, Simplified DES, Block cipher principles , The data Encryption Standard ,The Strength of DES. Differential and Linear Cryptanalysis ,Block Cipher Design principles ,Block Cipher Modes of Operation , Evaluation Criteria for AES The AES cipher , Triple DES , blowfish , RC5, Rc4 Stream Cipher	7
3	Principles of public: Key Cryptosystems , Public –Key cryptosystems , Applications for public –Key Cryptosystems , Requirements for public –Key Cryptosystems , Public –Key Cryptosystems , The RSA Algorithm , Computational Aspects , The Security of RSA , Key management , Distribution of public keys , Public –Key Distribution of Secret Keys , Differ –Hellmann Key Exchange.	7
4	Web Security: Web Security Threats , Web Traffic Security Approaches , SSL Architecture , SSL Record Protocol , Change Cipher Spec Protocol ,Alert Protocol , Handshake Protocol , Cryptographic Computations ,Transport Layer Security , Secure Electronic Transaction.	7

5	Intruders: Intrusion Techniques ,Intrusion Detection , Audit Records , Statistical Anomaly Detection ,Rule –Based Intrusion Detection ,The Base – Rate Fallacy , Distributed Intrusion Detection , Honeypots , Intrusion Detection Exchange Format Firewall Design principles , Firewall Characteristics , Types of Firewalls , Firewall Configurations.	7
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COURSE OUTCOMES: The students would have learnt

CO1: Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory.

CO2: Understand, compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication.

CO3: Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes

CO4: Apply different digital signature algorithms to achieve authentication and create secure applications

Text Books:

1. Cryptography And Network Security, Principles And Practice Sixth Edition, William Stallings, Pearson
2. Information Security Principles and Practice By Mark Stamp, Wiley India Edition
3. Cryptography & Network Security, Forouzan, Mukhopadhyay, McGrawHill

Reference Books:

1. Cryptography and Network Security Atul Kahate, TMH
2. Cryptography and Security, C K Shyamala, N Harini, T R Padmanabhan, Wiley-India
3. Information Systems Security, Godbole, Wiley-India
4. Information Security Principles and Practice, Deven Shah, Wiley-India
5. Security in Computing by Pfleeger and Pfleeger, PHI
6. Build Your Own Security Lab : A Field Guide for network testing, Michael Gregg, Wiley India

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PS O		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	3	3	3	3	1	3	1	3	3	3
CO2	3	3	3	3	1	3	3	3	3	1	3	1	3	3	3
CO3	3	3	3	3	1	3	3	3	3	1	3	1	3	3	3
CO4	3	3	3	3	1	3	3	3	3	1	3	1	3	3	3
CO5	3	3	3	3	1	3	3	3	3	1	3	1	3	3	3
CO6	3	3	3	3	1	3	3	3	3	1	3	1	3	3	3

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Sub Title: MOBILE APPLICATION DEVELOPMENT		
Sub Code: CS208TPE14	No. of Credits : 3=3: 0: 0(L-T-P)	No of lecture hours/week :03
Exam Duration : 3 hours	IA+ESE=30+70	Total no of contact hours:36

<p>COURSE OBJECTIVE:</p> <p>To facilitate students to understand android SDK To help students to gain a basic understanding of Android application development To inculcate working knowledge of Android Studio development tool</p>

UNIT No	Syllabus Content	No of Hours
1	Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android, Manifest file.	8
2	Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.	7
3	Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.	7
4	Android Applications: Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.	7
5	Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World..	7

COURSE OUTCOMES: The students would have learnt

CO1: Identify various concepts of mobile programming that make it unique from programming for other platforms.

CO2: Critique mobile applications on their design pros and cons.

CO3: Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.

CO4: Program mobile applications for the Android operating system that use basic and advanced phone features.

CO5: Deploy applications to the Android marketplace for distribution.

Text Books:

1. Android Wireless Application Development, Lauren Darcey and Shane Conder, Pearson Education, 2nd ed. (2011)

Reference Books:

1. Professional Android 2 Application Development, Reto Meier, Wiley India Pvt Ltd
2. Beginning Android, Mark L Murphy, Wiley India Pvt Ltd
3. Android Application Development All in one for Dummies, Barry Burd, 1st Edition.

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PS O		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	1	2	2	1	1							1	3	3	3
CO2	3	1	3	2	1							1	3	3	3
CO3	3	2	1	3	2							1	3	3	2
CO4	2	3	3	3	1							1	3	3	2
CO5	2	2	3	3	3							1	3	3	2

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

Sub Title: CLOUD COMPUTING		
Sub Code: CS208TPE15	No. of Credits : 3=3: 0: 0(L-T-P)	No of lecture hours/week :03
Exam Duration : 3 hours	IA+ESE=30+70	Total no of contact hours:36

<p>COURSE OBJECTIVE:</p> <p>Basics of cloud computing. Key concepts of virtualization. Different Cloud Computing services Cloud Implementation, Programming and Mobile cloud computing Cloud Backup and solutions</p>
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UNIT No	Syllabus Content	No of Hours
1	Introduction: Introduction to Cloud Computing, Evolution of Cloud, Cloud Computing Characteristics, Benefits and Challenges of Cloud Computing, Emergence of Cloud Computing, Cloud Based Service Offerings, Cloud Computing Application.	8
2	Cloud Models: Introduction to Cloud Models, Cloud Models: Public Cloud, Private Cloud, Hybrid Cloud, Community Cloud.	7
3	Standard & Security: Introduction to Cloud Standards, Cloud Security Challenges, Cloud Data Security, Network Security, Host Security, Database Management.	7
4	Cloud Services: Introduction to Service, Infrastructure as a Service (IAAS), Platform as a Service (PAAS), Software as a Service (SAAS), Storage as a Service (StaaS), Database as a Service (DaaS), Process as a Service (PaaS), Security as a Service (SecaaS), Different Security issues of Cloud Computing.	7
5	Virtualization: Introduction, Virtualization Architecture, Types of Virtualization, Pros and Cons of Virtualization, Virtual Machine, Types of Virtual Machine.	7

COURSE OUTCOMES: The students would have learnt

CO1: Understand the concept of Cloud Computing and Cloud service and deployment models

CO2: Apply and design suitable Virtualization concept, Cloud Resource Management and design

scheduling algorithms.

CO3: Use and Examine different cloud computing services

CO4: Understand cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application

CO5: Analyse authentication, confidentiality and privacy issues in cloud computing

Text Books:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya,James Broberg, Andrzej M.Goscinski, Wiley.
2. Cloud Computing by M. N. Rao, PHI.
3. Cloud Computing: A Practical Approach by Toby Velte, Anthony Vote and Robert Elsenpeter,McGraw Hill.

Reference Books:

1. Cloud Computing Bible, Barrie Sosinsky, Wiley India Edition.
2. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz,Russell Dean Vines, Wiley- India,2010

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PS O		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	2	2						3	3	3	3
CO2	3	1	3	1	2	2						3	3	3	3
CO3	3	2	1	1	3	3						3	3	3	3
CO4	3	1	3	2	2	3						3	3	3	3
CO5	3	2	3	1	2	3						3	3	3	3

Weightage: 1-Slightly; 2-Moderately; 3-Strongly;

Sub Title: BIG DATA ANALYSIS		
Sub Code: CS208TPE16	No. of Credits : 3=3: 0: 0(L-T-P)	No of lecture hours/week :03
Exam Duration : 3 hours	IA+ESE=30+70	Total no of contact hours:36

<p>COURSE OBJECTIVE:</p> <p>To formulate the difference between Big data and Data Analytics.</p> <p>To provide the students with the conceptual knowledge of Big Data.</p> <p>To get familiarized with the analytical methods.</p> <p>To explore validation and testing methods for decision making.</p> <p>To gain knowledge on the tools such as MapReduce and hadoop</p>
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UNIT No	Syllabus Content	No of Hours
1	Introduction to Big Data: Introduction to big data : Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting	8
2	Mining data streams: Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis- Stock Market Predictions.	7
3	Hadoop: History of Hadoop- the Hadoop Distributed File System – Components of Hadoop Analysing the Data with Hadoop- Scaling Out-Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce FeaturesHadoop environment.	7
4	Framework: Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams.	7
5	Predictive Analysis: Simple linear regression- Multiple linear regression- Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.	7

COURSE OUTCOMES: The students would have learnt

- CO1: Identify Big Data and its Business Implications.
 CO2: List the components of Hadoop and Hadoop Eco-System
 CO3: Access and Process Data on Distributed File System
 CO4: Manage Job Execution in Hadoop Environment
 CO5: Develop Big Data Solutions using Hadoop Eco System

Text Books:

1. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.
2. Hadoop: The Definitive Guide, Tom White, Third Edition, O’reilly Media, 2012.
3. Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos,, McGrawHill Publishing, 2012.
4. Mining of Massive Datasets, Anand Rajaraman and Jeffrey David Ullman, CUP, 2012.
5. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics Bill Franks, John Wiley& sons, 2012.
6. Making Sense of Data, Glenn J. Myatt, John Wiley & Sons, 2007.
7. Big Data Glossary, Pete Warden, O’Reilly, 2011.

Reference Books:

1. Data Mining Concepts and Techniques, Jiawei Han, Micheline Kamber, 2nd Edition, Elsevier, Reprinted 2008.
2. Intelligent Data Mining, Da Ruan, Guoqing Chen, Etienne E.Kerre, Geert Wets, Springer, 2007.
3. Harness the Power of Big Data The IBM Big Data Platform Paul Zikopoulos, Dirkde Roos, Krishnan Parasuraman, Thomas Deutsch, James, Giles , David Corrigan, Tata McGraw Hill Publications, 2012.
4. Big Data Science & Analytics: A HandsOn Approach, Arshdeep Bahga, Vijay Madiseti, VPT, 2016
5. Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series), Bart Baesens, John Wiley & Sons,2014

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	1	1							3	3	3	3
CO2	3	2	3	2	1							3	3	3	3
CO3	3	3	3	3	2							3	3	3	2
CO4	3	3	3	3	3							3	3	3	2
CO5	3	3	3	3	3							3	3	3	2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Title: SOFT COMPUTING		
Sub Code: IT208TOE01	No. of Credits :3=3: 0: 0(L-T-P)	No of lecture hours/week :03
Exam Duration : 3 hours	IA+ESE=30+70	Total no of contact hours:36

COURSE OBJECTIVE:

To familiarize with soft computing concepts.
 To introduce the fuzzy logic concepts, fuzzy principles and relations.
 To Basics of ANN and Learning Algorithms.
 ANN as function approximation.
 Genetic Algorithm and its applications to soft computing.
 Hybrid system usage, application and optimization.

UNI T No	Syllabus Content	No of Ho urs
1	Introduction to ANS Technology: Elementary Neurophysiology, models of a neuron, neural networks viewed as directed graphs, feedback from neurons to ANS, artificial intelligence and neural networks.	8
2	Learning & Training: Hebbian memory based, competitive, error-correction. Learning Credit Assignment Problem: supervised and unsupervised learning, memory models, recall and adaptation, network architecture, single layered feed forward networks, multilayered feed forward networks, recurrent networks, topologies.	7
3	Activation and Synaptic dynamics, stability and convergence. A suevey of neutral network models: Single layered perception, least mean square algorithm, multi-layered perceptrons, back propagation algorithm XOR- problem, the generalized delta rule, BPN applications, Adalines and Madalines- Algorithm and applications.	7
4	Applications: The traveling salesperson problem, talking network and phonetic typewriter: Speech generation and Speech recognition, character recognition and retrieval, handwritten digital recognition.	7
5	Adaptive fuzzy systems: Introduction to Fuzzy sets, and operations, Examples of Fuzzy logic, Fuzzy Associative memories, fuzziness in neural networks, comparison of fuzzy and neural Truck-Backer upper control systems.	7

COURSE OUTCOMES: The students would have learnt

- CO1: List the facts and outline the different process carried out in fuzzy logic, ANN and Genetic Algorithms.
- CO2: Explain the concepts and meta-cognitive of soft computing.
- CO3: Apply Soft computing techniques the solve character recognition, pattern classification, regression and similar problems.
- CO4: Outline facts to identify process/procedures to handle real world problems using soft computing.
- CO5: Evaluate various techniques of soft computing to defend the best working solutions.
- CO6: Design hybrid system to revise the principles of soft computing in various applications.

Text Books:

1. Artificial Neural Networks by B. Yagna Narayan
2. Neural Networks by James A. Freeman and David

M.Strapetus Reference Books:

1. Neural Networks- A comprehensive foundation by Simon Hay kin (LPE)

Course Outcomes and their mapping with Programme Outcomes:

CO	P O											PO 12	P S O		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11		PS O1	PS O2	PS O3
CO1	3	2	3	2	2	1	1	1	1	1	1	2	2	2	1
CO2	2	2	3	3	3	1	1	1	1	1	1	1	2	2	1
CO3	3	2	2	1	2	1	1	1	1	1	1	2	3	2	1
CO4	3	3	2	3	2	1	1	1	1	1	1	3	2	2	1
CO5	3	2	3	2	2	1	1	1	1	1	1	2	2	2	1
CO6	2	3	3	2	2	1	1	1	1	1	1	2	3	2	1

Weightege: 1-Slightly;, 2-Moderately; 3-Strongly;

SUB CODE	L	T	P	DURATION/WEEK	IA	ESE	CREDITS
CS208TOE01	3	0	0	3 hours	30	70	3

ARTIFICIAL INTELLIGENCE

Course Objectives:

To introduce the fundamentals of Artificial Intelligence and its subfields, including problem-solving, knowledge representation, handling uncertainty and learning, natural language processing, and planning.

2. To familiarize students with various search techniques, including blind search, informed search, and constraint satisfaction, used in solving AI problems.

3. To enable students to understand the importance of knowledge representation and its various techniques, including rule-based systems and semantic nets, in building AI systems.

4. To introduce students to the concepts of uncertainty and learning in AI, including probabilistic inference, fuzzy logic, and machine learning, and their applications in real-world problems.

5. To equip students with the ability to design and develop simple expert systems using AI languages such as Prolog and Lisp.

UNIT I Overview & Search Techniques:

Introduction to AI, Problem Solving, State space search, Blind search: Depth first search, Breadth first search, Informed search: Heuristic function, Hill climbing search, Best first search, A* & AO* Search, Constraint satisfaction. Game tree, Evaluation function, Mini-Max search, Alpha-beta pruning, Games of chance.

UNIT II Knowledge Representation (KR):

Introduction to KR, Knowledge agent, Predicate logic, WFF, Inference rule & theorem proving forward chaining, backward chaining, resolution; Propositional knowledge, Boolean circuit agents. Rule Based Systems, Forward reasoning: Conflict resolution, backward reasoning: Use of Back tracking, Structured KR: Semantic Net - slots, inheritance, Frames- exceptions and defaults attached predicates, Conceptual Dependency formalism and other knowledge representations.

UNIT III Handling uncertainty & Learning:

Source of uncertainty, Probabilistic inference, Bayes' theorem, Limitation of naïve Bayesian system, Bayesian Belief Network (BBN), Inference with BBN, Dempster-Shafer Theory, Fuzzy Logic, Fuzzy function, Fuzzy measure, Non monotonic reasoning: Dependency directed backtracking, Truth maintenance systems. Learning: Concept of learning, Learning model, learning decision tree, Paradigms of machine learning, Supervised & Unsupervised learning, Example of learning, Learning by induction, Learning using Neural Networks.

UNIT IV Natural Language Processing (NLP) & Planning:

Overview of NLP tasks, Parsing, Machine translation, Components of Planning System, Planning agent, State-Goal & Action Representation, Forward planning, backward chaining, Planning example: partial-order planner, Block world.

UNIT V Expert System & AI languages:

Need & Justification for expert systems- cognitive problems, Expert System Architectures, Rule based systems, Non production system, knowledge acquisition, Case studies of expert system. Ai language: Prolog syntax, Programming with prolog, backtracking in prolog, Lisp syntax, Lisp programming.

Text Books:-

1. Artificial Intelligence by Elaine Rich and Kevin Knight, Tata McGraw Hill. 2. Introduction to Artificial Intelligence and Expert Systems by Dan W.Patterson, Prentice Hall of India.

Reference Books:-

1. Principles of Artificial Intelligence by Nils J.Nilsson, Narosa Publishing house.
2. Programming in PROLOG by Clocksin & C.S. Melish, Narosa Publishing house.
3. Rule based Expert Systems-A practical Introduction by M. Sasikumar, S.Ramani, et. al., Narosa Publishing House.

Course Outcome:

1. Students will be able to understand the fundamentals of Artificial Intelligence and its subfields, including their applications in real-world problems.
2. Students will be able to apply various search techniques to solve AI problems and evaluate their effectiveness.
3. Students will be able to design and develop AI systems using knowledge representation techniques, including rule-based systems and semantic nets.
4. Students will be able to understand and apply the concepts of uncertainty and learning in AI, including probabilistic inference, fuzzy logic, and machine learning, in solving real-world problems.
5. Students will be able to design and develop simple expert systems using AI languages such as Prolog and Lisp.

Sub Title: ENTERPRISE RESOURCE MANAGEMENT		
Sub Code: CS208TOE09	No. of Credits : 3=3: 0: 0(L-T-P)	No of lecture hours/week :03
Exam Duration : 3 hours	IA+ESE=30+70	Total no of contact hours:36

COURSE OBJECTIVE:

To discuss the fundamental concepts an enterprise and its integration of major functions

To discuss the various technologies used for an ERP.

To discuss importance of information in an organization.

To discuss Material resource management, forecasting and job scheduling

To discuss Software implementation methods and various other related issues

UNIT No	Syllabus Content	No of Hours
1	Function of Business Organizations: Personnel management, Financial management, marketing management, Sales order Processing , Manufacturing managements , Human Resource Management etc , data and information , Operation of functional areas. Integrated view of ERP	8
2	Technologies of ERP: knowledge based system , Decision support system , Executive information system , Electronic commerce, , Databases system , Business Engineering , Business process Engineering , Networking , 3 tier and 2 tier architecture.	7
3	Management information system: MIS, data & information, levels of Management , information requirement , objectives of information channels, information strategies	7
4	Information and planning: Resource management benefit of management planning process objective and its characteristic , policy and procedures ,forecasting and its varies aspects . Scheduling , MRP , MRP-II	7
5	ERP implement issues: software development life cycle , pre Evaluation schemes , post implement issues, case studies .	7

COURSE OUTCOMES: The students would have learnt

CO1: Basic concepts of an enterprise functions and its integration for

ERP. CO2: Introduction of different technologies related to ERP.

CO3: Importance of an information for all levels of

organization. CO4: Concepts of ERP for the manufacturing perspective

Text Books:

1. Enterprise resource planning by Alexis Leon TMH
2. Management Information System by Jawardekar

Reference Books:

1. Kinematics and Synthesis of linkages –Hartenberg and Denavit– McGrew Hill Book Co
2. ERP by Garg and Ravichandran
3. Management Information Systems : Louden & Louden
4. Information System and MIS : J Kanter

Course Outcomes and their mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	3	2	1	1	3	1	1	1	0	3	3	2	2
CO2	1	3	3	2	3	1	2	1	1	2	0	3	3	3	2
CO3	2	1	3	2	1	1	1	2	2	2	2	3	3	1	2
CO4	2	1	3	2	1	1	3	1	1	1	0	3	3	1	2
CO5	1	1	3	1	3	1	3	1	3	1	2	3	1	2	2

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

Sub Title: INFORMATION RETRIEVAL SYSTEMS		
Sub Code: CS208TOE10	No. of Credits : 3=3: 0: 0(L-T-P)	No of lecture hours/week :03
Exam Duration : 3 hours	IA+ESE=30+70	Total no of contact hours:36

<p>COURSE OBJECTIVE:</p> <p>Demonstrate genesis and diversity of information retrieval situations for text and hyper media.</p> <p>Describe hands-on experience store, and retrieve information from www using semantic approaches.</p> <p>Demonstrate the usage of different data/file structures in building computational search engines.</p> <p>Analyze the performance of information retrieval using advanced techniques such as classification, clustering, and filtering over multimedia.</p> <p>Analyze ranked retrieval of a very large number of documents with hyperlinks between them.</p>
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UNIT No	Syllabus Content	No of Hours
1	Retrieval Strategies: vector space model, Probabilistic retrieval strategies: Simple term weights, Non binary independence model, Language models.	8
2	Retrieval Utilities: Relevance feedback, clustering, N-grams, Regression analysis, Thesauri	7
3	Retrieval Utilities: Semantic networks, parsing Cross – Language: Information Retrieval: Introduction, Crossing the Language barrier.	7
4	Efficiency: Inverted Index, Query processing, Signature files, Duplicate document detection.	7
5	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	7

COURSE OUTCOMES: The students would have learnt

CO1: Describe the objectives of information retrieval systems.

CO2: Describe models like vector-space, probabilistic and language models to identify the similarity of query and document

CO3: Implement clustering algorithms like hierarchical agglomerative clustering and k-means algorithm.

CO4: Understand relevance feedback in vector space model and probabilistic model. CO5: Understand query, document and phrase translation.

Text Books:

1. Information Retrieval – Algorithms and Heuristics, David A. Grossman, Ophir Frieder, Springer, 2nd Edition (Distributed by Universal Press), 2004

Reference Books:

1. Information Storage and Retrieval Systems: Theory and Implementation, Gerald J Kowalski, Mark T Maybury Springer, 2004.
2. Mining the Web: Discovering Knowledge from Hypertext Data, Soumen Chakrabarti, Morgan – Kaufmann Publishers, 2002.
3. An Introduction to Information Retrieval, By Christopher D Manning, Prabhakar Raghavan, Hinrich Schutze, Cambridge University Press, England, 2009.

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	2	2								1	1	1
CO2	3	2	2	1	3								1	1	1
CO3	2	2	3	2	3								2	3	3
CO4	1	1	2	2	1								3	2	3
CO5	3	3	2	3	2								1	1	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Sub Title: WIRELESS SENSOR NETWORK		
Sub Code: CS208TOE11	No. of Credits : 3=3: 0: 0(L-T-P)	No of lecture hours/week :03
Exam Duration : 3 hours	IA+ESE=30+70	Total no of contact hours:36

COURSE OBJECTIVE:

- Understand the fundamentals of wireless networks.
- Understand deployment of sensor in Wireless Sensor Network.
- Understand design considerations for wireless networks.
- Understand the different routing techniques of Wireless Sensor Network.
- Understand the different challenges of Wireless Sensor Network.

UNIT No	Syllabus Content	No of Hours
1	Introduction: Wireless Sensor Network: Introduction, Architecture, Hardware and Software used in Wireless Sensor Network.	8
2	Applications: Sensor network application: Motion monitoring, Environmental monitoring, Generic Architecture, Sensor network Evolution.	7
3	Design And Deployment: Wireless Sensor Network : Design , Goals and Issues , Sensor deployment, Scheduling and coverage issues, self-configuration and topology control, Querying, data collection and processing, Collaborative information processing and group connectivity.	7
4	Routing: Wireless Sensor Routing Protocols: Data Centric, Hierarchical, Location based, Energy efficient routing.	7
5	Challenges: Sensor Network Challenges-Miniaturization, Power management, Scalability, Remote management, Usability, Standardization and security, System Challenges- Tiny OS, Network Sensor Platforms.	7

COURSE OUTCOMES: The students would have learnt

- CO1: Understand the basic concepts of wireless network.
- CO2: Understand the different applications of Wireless sensor network.
- CO3: Understand the designing concept of Wireless Sensor Network.
- CO4: Understand the different challenges of Wireless Sensor Network.
- CO5: Services and layer wise security considerations.

Text Books:

1. Building Wireless Sensor Networks by Robert Faludi Binding: Paperback Publisher: O'reilly Released: 2011
2. Wireless Sensor Networks by Zhao Feng, Guibas Leonidas Binding: Paperback Publisher: Elsevier India Released: 2004

Reference Books:

1. Wireless Sensor Networks by C. S Raghavendra, Krishna M. Sivalingam, Taieb Znati Binding: Paperback Publisher: Springer/bsp Books Released: Rpt.2010

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1									3	2	1
CO2	2	1	3	2									1	2	3
CO3	1	2	3	2									1	3	2
CO4	2	3	3	2									2	2	1
CO5	2	2	3	2									2	3	2

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

Sub Title: MACHINE LEARNING		
Sub Code: CS208TOE12	No. of Credits : 3=3: 0: 0(L-T-P)	No of lecture hours/week :03
Exam Duration : 3 hours	IA+ESE=30+70	Total no of contact hours:36

COURSE OBJECTIVE:

- To expose the applications of machine learning.
- To study the various algorithms related to supervised and unsupervised learning.
- To recognize the different types of machine learning models and how to use them.
- To learn the theoretical and practical aspects of probabilistic graphical models.
- To acquire the knowledge of various classification techniques.
- To learn the various neural network algorithms.

UNIT No	Syllabus Content	No of Hours
1	Introduction to Machine Learning: Introduction - examples of machine learning applications - Types of machine learning- Mathematical foundations of machine learning– Introduction to Parametric Models – Non-Parametric Models –Probability Basics	8
2	Supervised Learning: Linear Models for Regression – Linear Basis Function Models - The Bias-Variance Decomposition - Bayesian Linear Regression - Bayesian Model Comparison, Limitations of Fixed Basis Functions - Linear Models for Classification, Discriminant Functions -Probabilistic Generative Models –Probabilistic Discriminative Models - Bayesian Logistic Regression. Neural Networks – Network Training - Feed-forward Network Functions, Back Propagation Network, Bayesian Neural Network	7
3	Unsupervised Learning: Clustering- K-means - EM Algorithm- Mixtures of Gaussians Dimensionality Reduction - Factor analysis - Principal Component Analysis Probabilistic PCA -Independent components analysis - Singular Value Decomposition.	7
4	Probabilistic Graphical Model: Graphical Models - Undirected graphical models - Markov Random Fields-Directed Graphical Models -Bayesian Networks - Conditional independence properties - Inference – Learning - Generalization - Hidden Markov Models -Conditional random fields	7
5	Genetic Algorithms: an illustrative example, Hypothesis space search, Genetic Programming, Models of Evolution and Learning; Learning first order rules-sequential covering algorithms-General to specific beam search-FOIL; REINFORCEMENT LEARNING – The Learning Task, Q Learning.	7

COURSE OUTCOMES: The students would have learnt

CO1: Describe the concepts and models of machine learning.

CO2: Design and implement algorithms for supervised and unsupervised learning.

CO3: Develop skills of using recent machine learning software for solving practical problems. CO4: Analyze the efficient clustering techniques for solving real world problems.

CO5: Implement probabilistic discriminative and generative algorithms for an application and analyze the results.

Text Books:

1. Machine Learning: A Probabilistic Perspective, Kevin Murphy, MIT Press, 2012.
2. Pattern Recognition and Machine Learning, Christopher Bishop. 2e
3. Machine Learning, Tom M. Mitchell, McGraw-Hill Education (India) Private Limited, 2013

Reference Books:

1. Pattern Recognition and Machine Learning, Christopher Bishop, Springer, 1st edition, ISBN- 13: 978-0387-31073-2, 2006.
2. Introduction to Machine Learning, Ethem Alpaydin, 3rd Edition, MIT Press, ISBN: 9780262028189, 2014.
3. Machine Learning: a Probabilistic Perspective, Kevin Patrick Murphy , 4th edition, MIT Press, ISBN:9780262018029, 2013.
4. Machine Learning for Hackers, Drew Conway, John Myles White, 1st Edition, O'Reilly Media, 2012.
5. Data Mining: Practical Machine Learning Tools and Techniques, Ian H. Witten, Eibe Frank, Mark A. Hall, 3rd Edition, Morgan Kaufmann, 2011.

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	1	1							3	3	3	3
CO2	3	2	3	2	1							3	3	3	3
CO3	3	3	3	3	2							3	3	3	2
CO4	3	3	3	3	3							3	3	3	2
CO5	3	3	3	3	3							3	3	3	2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Title: NETWORK SECURITY LAB	
Sub Code: CS208PPE01	No. of Credits : 1.5=0: 0: 1.5(L-T-P)
Exam Duration : 3 hours	IA+ESE =30+20

Lab OBJECTIVE:

To train more professional in the area of Network Security
 To support in developing vulnerability free web applications
 To support industry in Cyber security research

Unit No.	Content	Teaching Hours
I, II, III, IV and V	<ul style="list-style-type: none"> ● Implement Caesar cipher encryption-decryption. ● Implement Monoalphabetic cipher encryption-decryption. ● Implement Playfair cipher encryption-decryption. ● Implement Polyalphabetic cipher encryption-decryption. ● Implement Hill cipher encryption-decryption. ● To implement Simple DES or AES. ● Implement Diffi-Hellmen Key exchange Method. ● Implement RSA encryption-decryption algorithm. ● Write a program to generate SHA-1 hash. ● Implement a digital signature algorithm. ● Perform various encryption-decryption techniques with cryptool. ● Study and use the Wireshark for the various network protocols. 	18

LAB OUTCOMES: The students would have learnt

CO1: Define the concepts of Information security and their use.
 CO2: Describe the principles of symmetric and asymmetric cryptography. CO3: Understand and apply the various symmetric key algorithms.
 CO4: Understand and apply the various asymmetric key algorithms.

Text Books:

1. Cryptography And Network Security, Principles And Practice Sixth Edition, William Stallings, Pearson
2. Information Security Principles and Practice By Mark Stamp, Willy India Edition
3. Cryptography & Network Security, Forouzan, Mukhopadhyay, McGrawHill

Reference Books:

1. Fundamentals of computer Algorithms, Horowitz, Sahani, Galgotia. 2nd Edition, 1998.ISBN 81- 7515-257-5
2. Cryptography and Network Security Atul Kahate, TMH
3. Cryptography and Security, C K Shyamala, N Harini, T R Padmanabhan, Wiley-India
4. Information Systems Security, Godbole, Wiley-India
5. Information Security Principles and Practice, Deven Shah, Wiley-India
6. Security in Computing by Pfleeger and Pfleeger, PHI
7. Build Your Own Security Lab : A Field Guide for network testing, Michael Gregg, Wiley India

Course Outcomes and their mapping with Programme Outcomes:

CO															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	1	3	3	3	3	1	3	1	3	3	3
CO 2	3	3	3	3	1	3	3	3	3	1	3	1	3	3	3
CO 3	3	3	3	3	1	3	3	3	3	1	3	1	3	3	3
CO 4	3	3	3	3	1	3	3	3	3	1	3	1	3	3	3
CO 5	3	3	3	3	1	3	3	3	3	1	3	1	3	3	3
CO 6	3	3	3	3	1	3	3	3	3	1	3	1	3	3	3

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

Sub Title: MOBILE APPLICATION DEVELOPMENT LAB	
Sub Code: CS208PPE02	No. of Credits : 1.5=0: 0: 1.5(L-T-P)
Exam Duration : 3 hours	IA+ESE =30+20

Lab OBJECTIVE:

To understand the components and structure of mobile application development frameworks for Android and windows OS based mobiles.

To understand how to work with various mobile application development frameworks.

To learn the basic and important design concepts and issues of development of mobile applications.

To understand the capabilities and limitations of mobile devices.

Unit No.	Content	Teaching Hours
I, II, III, IV and V	<ul style="list-style-type: none"> • Develop an application that uses GUI components, Font and Colours • Develop an application that uses Layout Managers and event listeners. • Write an application that draws basic graphical primitives on the screen. • Develop an application that makes use of databases. • Develop an application that makes use of Notification Manager • Implement an application that uses Multi-threading • Develop a native application that uses GPS location information • Implement an application that writes data to the SD card. • Implement an application that creates an alert upon receiving a message • Write a mobile application that makes use of RSS feed • Develop a mobile application to send an email. • Develop a Mobile application for simple needs (Mini Project) 	18

LAB OUTCOMES: The students would have learnt

CO1: Develop mobile applications using GUI and Layouts

CO2: Develop mobile applications using Event Listener.

CO3: Develop mobile applications using Databases.

CO4: Develop mobile applications using RSS Feed, Internal/External Storage, SMS,
Multi- threading and GPS.

CO5: Analyze and discover own mobile app for simple needs

Text Books:

1. Build Your Own Security Lab, Michael Gregg, Wiley India.

Reference Books:

1. Build Your Own Security Lab, Michael Gregg, Wiley India.

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	1	1							2	3	3	3
CO2	3	2	3	2	2							2	3	3	3
CO3	3	3	3	3	2							2	3	3	2
CO4	3	3	3	3	2							2	3	3	2
CO5	3	3	3	3	3							2	3	3	2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Title: CLOUD COMPUTING LAB	
Sub Code: CS208PPE03	No. of Credits : 1.5=0: 0: 1.5(L-T-P)
Exam Duration : 3 hours	IA+ESE =30+20

Lab OBJECTIVE:

- To discuss the fundamental concepts of Cloud Computing
- To learn how to use install and configure Hadoop/MapReduce/HDFS
- To learn how to create application using Hadoop/MapReduce
- To learn Various Cloud services provided by Amazon Web Service etc.

Unit No.	Content	Teaching Hours
I, II, III, IV and V	<ul style="list-style-type: none"> • Installation and configuration of Hadoop/MapReduce/HDFS • Service deployment and usage over cloud. • Create an application using Hadoop/MapReduce • Case Study: Google App Engine/ Microsoft Azure/ Amazon Web Services 	18

LAB OUTCOMES: The students would have learnt

- CO1: Examine the installation and configuration of Hadoop/Map Reduce
CO2: Describe the functioning of Platform as a Service
CO3: Create application using Hadoop/MapReduce
CO4: Analyze and understand the functioning of different components involved in Amazon web services cloud platform.

Text Books:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley.
 2. Cloud Computing” by M. N. Rao, PHI.
 3. Cloud Computing: A Practical Approach” by Toby Velte, Anthony Vote and Robert Elsenpeter, McGraw Hill.
- Reference Books:**
1. Cloud Computing Bible”, Barrie Sosinsky, Wiley India Edition.
 2. Cloud Security: A Comprehensive Guide to Secure Cloud Computing”, Ronald L. Krutz, Russell Dean Vines, Wiley- India, 2010

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PS O		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3
CO1	3	3	3	3	2	3						3	3	3	3
CO2	3	2	3	3	2	3						3	3	3	3
CO3	3	2	2	3	3	3						3	3	3	3
CO4	3	3	3	2	2	3						3	3	3	3

Weightage: 1-Slightly; 2-Moderately; 3-Strongly;

Sub Title: BIG DATA ANALYSIS LAB	
Sub Code: CS208PPE04	No. of Credits : 1.5=0: 0: 1.5(L-T-P)
Exam Duration : 3 hours	IA+ESE =30+20

<p>Lab OBJECTIVE:</p> <p>Learn Injecting data into Hadoop</p> <p>Learn to build and maintain reliable, scalable, distributed systems with Hadoop</p> <p>Able to apply Hadoop ecosystem components.</p> <p>To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.</p> <p>To enable students to have skills that will help them to solve complex real-world problems in for decision support.</p>

Unit No.	Content	Teaching Hours
I, II, III, IV and V	<ul style="list-style-type: none"> • Study of Hadoop ecosystem • Programming exercises on Hadoop • Programming exercises in No SQL • Implementing simple algorithms in Map- Reduce (3) - Matrix multiplication, Aggregates, joins, sorting, searching etc. • Implementing any one Frequent Itemset algorithm using Map-Reduce • Implementing any one Clustering algorithm using Map-Reduce • Implementing any one data streaming algorithm using Map-Reduce • Mini Project: One real life large data application to be implemented (Use standard Datasets available on the web) a) Twitter data analysis b) Fraud Detection c) Text Mining etc. 	18

<p>LAB OUTCOMES: The students would have learnt</p> <p>CO1: Preparing for data summarization, query, and analysis.</p> <p>CO2: Applying data modelling techniques to large data sets</p> <p>CO3: Creating applications for Big Data analytics</p> <p>CO4: Building a complete business data analytic solution</p>
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Text Books:

1. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.

2. Hadoop: The Definitive Guide, Tom White, Third Edition, O'reilly Media, 2012.
3. Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos,, McGrawHill Publishing, 2012.
4. Mining of Massive Datasets, Anand Rajaraman and Jeffrey David Ullman, CUP, 2012.
5. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, John Wiley& sons, 2012.
6. Making Sense of Data, Glenn J. Myatt, John Wiley & Sons, 2007.
7. Big Data Glossary, Pete Warden, O'Reilly, 2011.

Reference Books:

1. Data Mining Concepts and Techniques, Jiawei Han, Micheline Kamber, 2nd Edition, Elsevier, Reprinted 2008.
2. Intelligent Data Mining, Da Ruan, Guoqing Chen, Etienne E.Kerre, Geert Wets, Springer, 2007.
3. Harness the Power of Big Data The IBM Big Data Platform Paul Zikopoulos, Dirkde Roos, Krishnan Parasuraman, Thomas Deutsch, James, Giles , David Corrigan, Tata McGraw Hill Publications, 2012.
4. Big Data Science & Analytics: A HandsOn Approach, Arshdeep Bahga, Vijay Madiseti, VPT, 2016
5. Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series), Bart Baesens, John Wiley & Sons,2014

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	1	1							3	3	3	3
CO2	3	2	3	2	1							3	3	3	3
CO3	3	3	3	3	2							3	3	3	2
CO4	3	3	3	3	3							3	3	3	2
CO5	3	3	3	3	3							3	3	3	2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**