Estd:1980

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)
(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)
All UG Programmes are Accredited by NBA
CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

COMPUTER SCIENCE & ENGINEERING
(Accredited by NBA)

SCHEME OF INSTRUCTION & EXAMINATION
(Regulation R19)
IV/IV B.TECH
I-SEMESTER
(With effect from **2019-2020**Admitted Batch onwards**)**

Course Code	Name of the Course	Category	Cr.	L	T	P	Internal Marks	External Marks	Total Marks
B19CS4101	Cryptography and Network Security	PC	3	3	--	--	25	75	100
B19CS4102	Machine Learning	PC	3	3	--	--	25	75	100
B19CS4103	Internet of Things	PC	3	3	--	--	25	75	100
#PE-III	Professional Elective-III	PE	3	3	--	--	25	75	100
#PE-IV	Professional Elective-IV	PE	3	3	--	--	25	75	100
#OE-II	Open Elective-II	OE	3	3	--	--	25	75	100
B19CS4114	Machine Learning Lab	PC	1.5	--	--	3	20	30	50
B19CS4115	Project Work-I	PR	2	--	--	4	20	30	50
B19MC4101	IPR & Patents	MC	0	3	--	--	--	--	--
		TOTAL	**21.5**	**21**	**--**	**7**	**190**	**510**	**700**

	Course Code	Course
#PE-III	B19CS4104	Mobile Computing
	B19CS4105	Data Science
	B19CS4106	No SQL Data Bases
	B19CS4107	Distributed Systems
	B19CS4108	Software Project Management
#PE-IV	B19CS4109	Web Services
	B19CS4110	Cloud Computing
	B19CS4111	Mean Stack Technologies
	B19CS4112	Cyber Security & Forensics
	B19CS4113	Ad-hoc and Sensor Networks
#OE-II	Student has to study one Open Elective offered by CE or ECE or EEE or ME or S&H from the list enclosed.	

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4101	**PC**	**3**	**--**	**--**	**3**	**25**	**75**	**3 Hrs.**

CRYPTOGRAPHY AND NETWORK SECURITY

(For CSE)

Course Objectives: This course aims at training students to master the

1.	Overview of the computer security and classical encryption techniques.
2.	Working principles and utilities of various cryptographic algorithms including symmetric key cryptography and public key cryptography algorithms.
3.	Design issues and working principles of hashing, message digest algorithms and various authentication protocols.
4.	Various secure communication protocols standards.
5.	Concepts of firewalls and block chain technology.

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Identify Information Security goals, classical encryption techniques and acquire fundamental knowledge on the concepts related to cryptography.	K2
2.	Compare and apply different encryption and decryption techniques to solve problems related to confidentiality.	K3
3.	Apply the knowledge of cryptographic hash functions and Illustrate the performance of different message digest algorithms for verifying the integrity and authentication.	K3
4.	Describe various network security protocols.	K2
5.	Explore the Importance of system security through firewalls and block chain technology.	K2

SYLLABUS

UNIT-I (08 Hrs)	**Introduction to Cryptography**: Security Attacks, Services & Mechanisms, Symmetric Cipher Model, Substitution and Transposition Techniques. **Block Ciphers**: Traditional Block Cipher Structure, Block Cipher Design Principles.
UNIT-II (12 Hrs)	**Symmetric Key Cryptography**: Data Encryption Standard (DES), Advanced Encryption Standard (AES), IDEA, Block Cipher Modes of Operations. **Public Key Cryptography:** Principles, Public Key Cryptography Algorithms, Euler's Theorem, RSA Algorithm, Diffie-Hellman Key Exchange.
UNIT-III (12 Hrs)	**Cryptographic Hash Functions**: Application of Cryptographic Hash Functions, SHA and MD5 Algorithms, Message Authentication Functions, HMAC & CMAC. **Digital Signatures**: DSS, DSS with RSA, Key Management and Distribution **User Authentication**: Remote User Authentication Principles, Kerberos.

UNIT-IV (10 Hrs)	**Electronic Mail Security**: Pretty Good Privacy (PGP) And S/MIME. **IP Security**: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload. **Transport Level Security**: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS).
UNIT-V (10 Hrs)	**Firewalls**: Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration, Trusted Systems. **Blockchain Technology:** Introduction to Blockchain Technology Fundamentals, How blockchain works-Shared Ledger, Permissions, Concensus, Smart contracts.

Text Books:	
1.	Cryptography and Network Security- William Stallings, Pearson Education, 7th Edition.
2.	Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition.
3.	Blockchain Fundamentals- Ravindharvadapalli,https://www.researchgate.net/publication/345045424_
Reference Books:	
1.	Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyaya, Mc-GrawHill, 3rd Edition, 2015.
2.	Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.
e-Resources:	
1.	https://nptel.ac.in/courses/106/105/106105031/ lecture by Dr. DebdeepMukhopadhyayIITKharagpur [Video Lecture]
2.	https://nptel.ac.in/courses/106/105/106105162/ lecture by Dr. SouravMukhopadhyay IIT Kharagpur [Video Lecture]
3.	https://www.mitel.com/articles/web-communication-cryptography-and-network-security web articles by Mitel Power Connections

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4102	PC	3	--	--	3	25	75	3 Hrs.

MACHINE LEARNING

(For CSE)

Course Objectives:

1.	To introduce the basic concepts and techniques of Machine Learning
2.	To demonstrate regression, classification and clustering methods.
3.	To introduce the concepts of dimensionality reduction, artificial neural networks and reinforcement learning
4.	To show the application of machine learning model evaluation and optimization techniques

Course Outcomes: At the end of the course Students will be able to

S. No	Outcome	Knowledge Level
1.	Formulate the concepts of ingredients and preliminaries of machine learning	K3
2.	Apply tree models, linear models and distance based models	K3
3.	Identify and construct features and ensemble models	K3
4.	Demonstrate the concepts of dimensionality reduction techniques, model evaluation and selection techniques	K2
5.	Apply the concepts of artificial neural networks, reinforcement learning	K3

SYLLABUS

UNIT-I (12 Hrs)	**The ingredients of machine learning**: Basic concepts, designing a learning system, Issues in machine learning, Types of machine learning, **Tasks**: the problems that can be solved with machine learning, **Models**: the output of machine learning, Features, the workhorses of machine learning. **Preliminaries:** The curse of dimensionality, Overfitting, Training, Test and Validation sets, The confusion matrix, **The accuracy metrics**: Accuracy, sensitivity, specificity, precision, recall, F1 measure, ROC curve, Unbalanced datasets, Naïve Bayes Classifier, **Some basic statistics:** variance, covariance, bias-variance tradeoff.
UNIT-II (10 Hrs)	**Tree Models**: Decision Trees. **Linear Models**: The least-squares method: Univariate linear regression, Logistic Regression, Support vector machines (Except Logistic regression others Peter Flach) **Distance Based Models**: Introduction, Nearest Neighbours classification, Distance Based Clustering, Hierarchical Clustering.
UNIT-III (10 Hrs)	**Features**: Kinds of feature, Feature transformations: Thresholding and discretisation, Normalisation, Incomplete Features, Feature construction and selection. **Model ensembles**: Bagging, random forests, **Boosting**: AdaBoost, Gradient Boosting. XGBoost

UNIT-IV (08 Hrs)	**Dimensionality Reduc**tion: PCA, LDA **Model Evaluation and Optimization**: Cross Validation, Grid Search, Regularization
UNIT-V (10 Hrs)	**Neurons, NNs, Linear Discriminants**: The Neuron, Neural Networks, The perceptron, **Multilayer perceptrons**: Going forwards, Going backwards: Backpropagation of error, Multilayer perceptron in practice, Examples of using MLP. **Reinforcement Learning:** Overview, Example, Markov Decision Process, Values, Back on Holiday: Using reinforcement learning, Uses of Reinforcement Learning

Text Books:	
1.	Introduction to Machine Learning, Alpaydin E, MIT Press (2014) 3rdEdition
2.	Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge, 2012
3.	Machine Learning: An algorithmic perspective, Stephen Marsland, 2nd edition, CRC press, 2014.
4.	Python Machine Learning Cookbook-Practical Solutions from Preprocessing to Deep Learning, Chris Albon, Oreilly, 2018.
Reference Books:	
1.	The elements of statistical learning, Data Mining, Inference and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Second edition , Springer, 2009.
2.	Machine Learning in Action, Peter Harington, 2012, Cengage.
3.	Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, Tensorflow, Sebastian Raschka, Vahid Mirjalili, Second edition, 2020
Online MOOC Courses:	
1.	"Machine Learning" course by Andrew Ng on Coursera
2.	"Introduction to Machine Learning (IITKGP)" by Prof. Sudeshna Sarkar, on Swayam
3.	"Machine Learning A-Z (Python & R in Data Science Course)" on Udemy
Useful Reference Links:	
1.	"Linear Discriminant Analysis", https://sebastianraschka.com/Articles/2014_python_lda.html
2.	"Principal Component Analysis versus Linear Discriminant Analysis", https://medium.com/analytics-vidhya/illustrative-example-of-principalcomponent-analysis-pcavs-linear-discriminant-analysis-lda-is-105c431e8907
3.	"A gentle introduction to K-fold cross validation", https://machinelearningmastery.com/k-foldcross-validation/
4.	Grid search for model tuning", https://medium.com/analyticsvidhya/illustrative-example-ofprincipal-component-analysis-pca-vs-lineardiscriminant-analysis-lda-is-105c431e8907
5.	"Regularization in Machine Learning", https://towardsdatascience.com/regularization-inmachine-learning76441ddcf99a

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4103	PC	3	--	--	3	25	75	3 Hrs.

INTERNET OF THINGS

(For CSE)

Course Objectives:

1.	To understand building blocks of IoT
2.	To Know various architectures and protocols in IoT
3.	To use cloud services for data analytics in IoT applications
4.	To develop IoT applications using Arduino

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Compare and contrast various IoT architectures	K3
2	Identify the open systems interconnection layers	K2
3	Implement IoT applications using Arduino	K3
4	Apply various communication protocols in IoT	K3
5.	Analyse data in IoT applications using cloud services	K4

SYLLABUS

UNIT-I (9 Hrs)	Fundamentals of IoT: An Overview of Internet of Things,IoT definition, characteristics of IoT, Physical design of IoT, Logical Design of IoT, IoT protocols, IoT levels and deployment templates, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices. Introduction to IoT Architectures:IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures The oneM2M IoT Standardized Architecture.
UNIT-II (9 Hrs)	Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High-level capabilities, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability.
UNIT-III (10 Hrs)	Design Principles**:** Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices. Programming with Arduino: Features of Arduino, Components of Arduino board, Arduino IDE, C programming concepts for Arduino, Traffic control system, DHT Sensor with Arduino, Servo Motor Interface with Arduino.

UNIT-IV (9 Hrs)	Data link layer of IoT, Wireless Communication Technologies, Wired Communication Technologies, Manet Networks: Network Layer of IoT, 6LowPAN adaptation layer for devices with limited resources, Dynamic routing protocols for wireless adhoc networks Communication protocols for IoT, Service oriented protocol(COAP), Communication protocols based on the exchange of messages(MQTT), Service discovery protocols.
UNIT-V (9 Hrs)	Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/ Services/ Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.
Text Books:	
1.	Internet of Things: Architecture, Design Principles and Applications, Rajkamal, McGraw Hill Higher Education. 2017
2.	Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 1st edition, 2014.
Reference Books:	
1.	Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley, 1st edition, 2014.
2.	Getting Started with the Internet of Things CunoPfister,Oreilly. 2011
3.	Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD),2014.
e-Resources:	
1.	Introduction to Internet of Things, https://swayam.gov.in/nd1_noc20_cs66/preview
2.	An Introduction to Programming the Internet of Things(IoT) specialization, https://www.coursera.org/specializations/iot

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4104	PE	3	--	--	3	25	75	3 Hrs.

MOBILE COMPUTING

(For CSE)

Course Objectives:

1.	To study the emerging technologies in the context of wireless networks
2.	To understand the mobile computing environment
3.	To learn about pervasive computing environment

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Discuss fundamental challenges in mobile communications	K2
2.	Demonstrate different Architectures for Mobile communication	K3
3.	Elaborate various IP, TCP protocols for mobile and ad-hoc networks	K3
4.	Illustrate different data delivery methods and synchronization protocols	K3
5.	Identify Wireless local area networks (WLAN) and their protocols	K2

SYLLABUS

UNIT-I (08 Hrs)	**Mobile Communications:** An Overview- Mobile Communication-guided transmission, unguided transmission- signal propagation frequencies, antennae, modulation, modulation methods and standards for voice-oriented data communication standards, modulation methods and standards for data and voice communication, mobile computing- novel applications and limitations, mobile computing architecture, mobile system networks. Mobile devices and systems: Cellular networks and frequency reuse, Limitations of mobile devices.
UNIT-II (12 Hrs)	**GSM and other 2G Architectures**: GSM-services and system architecture, Radio interfaces of GSM, Protocols of GSM, Localization, Call handling, GPRS system architecture. Wireless medium access control, CDMA, 3G, 4G and 5G Communication: Modulation, Multiplexing, Controlling the medium access, Spread spectrum, Coding methods, IMT-20003G wireless communication standards, WCDMA 3G communication standards, CDMA 3G communication standards, Broadband wireless access, 4G networks, 5G Networks.
UNIT-III (10 Hrs)	**Mobile IP Network layer**: IP and Mobile IP network layers: OSI layer functions, TCP/IP and Internet protocol, Mobile internet protocol; Packet delivery and Handover Management; Location Management: Agent Discovery; Mobile TCP Introduction to Mobile Adhoc network: fixed infrastructure architecture, MANET infrastructure architecture; MANET: properties, spectrum, applications; Security in Ad-hoc network;

UNIT-IV (10 Hrs)	**Synchronization:** Synchronization in mobile computing systems, Usage models for Synchronization in mobile application, Domain-dependant specific rules for data synchronization, synchronization and conflict resolution strategies, synchronizer; Mobile agent: mobile agent design, aglets; Application Server.
UNIT-V (10 Hrs)	**Mobile Wireless Short Range Networks and Mobile Internet**: Wireless networking and wireless LAN, Wireless LAN (WLAN) architecture, Wireless application protocol (WAP)-WAP1.1 architecture, wireless datagram protocol (WDP), Wireless Transport Layer Security (WTLS),wireless application environment.
Text Books:	
1.	Mobile Computing, 2nd edition, Raj kamal, Oxford,2011
2.	Mobile Computing, Technology Applications and Service Creation, 2nd Edition, Asoke K Talukder, Hasanahmed, Roopa R Yavagal, McGraw Hill,2017
Reference Books:	
1.	"Principles of Mobile Computing," 2nd Edition, UWE Hansmann, Lother Merk, Martin S. Nocklous, Thomas Stober, Springer.2003
2.	"Mobile Communications" 2nd Edition JOCHEN SCHILLER
e-resources	
1.	A course on Mobile Computing, https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4105	PE	3	--	--	3	25	75	3 Hrs.

DATA SCIENCE

(For CSE)

Course Objectives:

1.	Provide you with the knowledge and expertise to become a proficient data scientist
2.	understanding of statistics and machine learning concepts that are vital for data science
3.	Learn to statistically analyze a dataset
4.	Explain the significance of exploratory data analysis (EDA) in data science
5.	Evaluate data visualizations based on their design and use for communicating stories from data

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Illustrate in basic terms what Statistical Inference means. Identify probability distributions	K3
2.	Use R to carry out basic statistical modeling and analysis using basic tools (plots, graphs, summary statistics)	K3
3.	Describe the Data Science Process and how its components interact	K3
4.	Use APIs and other tools to scrap the Web and collect data	K3
5.	Apply EDA and the Data Science process in a case study	K3

SYLLABUS

UNIT-I (12 Hrs)	**Introduction, The Ascendance of Data, Motivating Hypothetical**: Data Sciencester, Finding Key Connectors, The Zen of Python, Getting Python, Virtual Environments, Whitespace Formatting, Modules, Functions, Strings, Exceptions, Lists, Tuples, Dictionaries defaultdict, Counters, Sets, Control Flow, Truthiness, Sorting, List Comprehensions, Automated Testing and assert, Object-Oriented Programming, Iterables and Generators, Randomness, Regular Expressions, Functional Programming, zip and Argument Unpacking, args and kwargs, Type Annotations, How to Write Type Annotations.
UNIT-II (10 Hrs)	**Visualizing Data**: matplotlib, Bar Charts, Line Charts, Scatterplots. Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Some Other Correlational Caveats, Correlation and Causation. **Gradient Descent**: The Idea Behind Gradient Descent, Estimating the Gradient, Using the Gradient, Choosing the Right Step Size, Using Gradient Descent to Fit Models, Minibatch and Stochastic Gradient Descent.

UNIT-III (10 Hrs)	**Getting Data**: stdin and stdout, Reading Files, Scraping the Web, Using APIs, **Working with Data:** Exploring Your Data Using Named Tuples, Data classes, Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction. **Probability**: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem
UNIT-IV (08 Hrs)	**Machine Learning**: Modeling, Overfitting and Underfitting, Correctness, The Bias-Variance Tradeoff, Feature Extraction and Selection, k-Nearest Neighbors, Naive Bayes, Simple Linear Regression, Multiple Regression, Digression, Logistic Regression
UNIT-V (10 Hrs)	**Clustering:** The Idea, The Model, Choosing k, Bottom-Up Hierarchical Clustering. **Recommender Systems**: Manual Curation, Recommending What's Popular, User-Based Collaborative Filtering, Item-Based Collaborative Filtering, Matrix Factorization, Data Ethics, Building Bad Data Products, Trading Off Accuracy and Fairness, Collaboration, Interpretability, Recommendations, Biased Data, Data Protection, IPython, Mathematics, NumPy, pandas, scikit-learn, Visualization R

Text Books:	
1.	Joel Grus, "Data Science From Scratch", OReilly.
2.	Allen B.Downey, "Think Stats", OReilly.
Reference Books:	
1.	Doing Data Science: Straight Talk From The Frontline, 1st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013
2.	Mining of Massive Datasets, 2nd Edition, Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, v2.1, Cambridge University Press, 2014
3.	"The Art of Data Science", 1st Edition, Roger D. Peng and Elizabeth matsui, Lean Publications, 2015
4.	"Algorithms for Data Science", 1st Edition, Steele, Brian, Chandler, John, Reddy, Swarna, springers Publications, 2016
e-Resources:	
1.	https://github.com/joelgrus/data-science-from-scratch
2.	https://github.com/donnemartin/data-science-ipython-notebooks
3.	https://github.com/academic/awesome-datascience

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4106	PE	3	--	--	3	25	75	3 Hrs.

No SQL DATA BASES

(For CSE)

Course Objectives:

1.	To understand the basic concepts and the applications of database systems. To master the basics of SQL and construct queries using SQL
2.	To understand the relational database design principles
3.	To become familiar with the basic issues of transaction processing and concurrency control
4.	To become familiar with database storage structures and access techniques

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Identify what type of NoSQL database to implement based on business requirements (key-value, document, full text, graph, etc.)	K3
2.	Apply NoSQL data modeling from application specific queries	K3
3.	Use Atomic Aggregates and denormalization as data modelling techniques to optimize query processing	K3

SYLLABUS

UNIT-I (12 Hrs)	**Introduction to NoSQL**: Definition And Introduction, Sorted Ordered Column-Oriented Stores, Key/Value Stores, Document Databases, Graph Databases, Examining Two Simple Examples, Location Preferences Store, Car Make And Model Database, Working With Language Bindings.
UNIT-II (10 Hrs)	**Interacting with NoSQL**: If NoSql Then What, Language Bindings For NoSQL Data Stores, Performing Crud Operations, Creating Records, Accessing Data, Updating And Deleting Data.
UNIT-III (10 Hrs)	**NoSQL Storage Architecture:** Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value Stores In Memcached And Redis, Eventually Consistent Non-Relational Databases.
UNIT-IV (08 Hrs)	**NoSQL Stores:** Similarities Between SqlAndMongodb Query Features, Accessing Data From Column-Oriented Databases Like Hbase, Querying Redis Data Stores, Changing Document Databases, Schema Evolution In Column-Oriented Databases, Hbase Data Import And Export, Data Evolution In Key/Value Stores.
UNIT-V (10 Hrs)	**Indexing and Ordering Data Sets**: Essential Concepts Behind A Database Index, Indexing And Ordering In Mongodb, Creating and Using Indexes In Mongodb, Indexing And

	Ordering In Couchdb, Indexing In Apache Cassandra.
Text Books:	
1.	Pramod Sadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley Professional, 2012.
2.	Dan McCreary and Ann Kelly, Making Sense of NoSQL, Manning Publications, 2013.
Reference Books:	
1.	Shashank Tiwari, Professional NoSQL, Wrox Press, Wiley, 2011, ISBN: 978-0-470-94224-6
2.	Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013.
e-Resources:	
1.	https://www.trustradius.com/nosql-databases

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4107	PE	3	--	--	3	25	75	3 Hrs.

DISTRIBUTED SYSTEMS

(For CSE)

Course Objectives:

1.	To understand the foundations of distributed systems.
2.	To learn issues related to clock Synchronization and the need for global state in distributed systems
3.	To learn distributed mutual exclusion and deadlock detection algorithms
4.	To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems
5.	To learn the characteristics of peer-to-peer and distributed shared memory systems

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Elucidate the foundations and issues of distributed systems	K2
2.	Illustrate the various synchronization issues and global state for distributed systems	K3
3.	Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems	K3
4.	Describe the agreement protocols and fault tolerance mechanisms in distributed systems	K3
5.	Describe the features of peer-to-peer and distributed shared memory systems	K3

SYLLABUS

UNIT-I (12 Hrs)	**Distributed Systems:** Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues and challenges. **A model of distributed computations**: A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Models of process communications. **Logical Time**: A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronization: NTP.
UNIT-II (10 Hrs)	**Message Ordering & Snapshots**: Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order. Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels.

UNIT-III (10 Hrs)	**Distributed Mutex & Deadlock**: Distributed mutual exclusion algorithms: Introduction – Preliminaries – Lamport's algorithm – Ricart-Agrawala algorithm – Maekawa's algorithm – Suzuki–Kasami's broadcast algorithm. Deadlock detection in distributed systems: Introduction – System model – Preliminaries – Models of deadlocks – Knapp's classification – Algorithms for the single resource model, the AND model and the OR model.
UNIT-IV (08 Hrs)	**Recovery & Consensus**: Check pointing and rollback recovery: Introduction – Background and definitions – Issues in failure recovery – Checkpoint-based recovery – Log-based rollback recovery – Coordinated check pointing algorithm – Algorithm for asynchronous check pointing and recovery. Consensus and agreement algorithms: Problem definition – Overview of results – Agreement in a failure – free system – Agreement in synchronous systems with failures.
UNIT-V (10 Hrs)	**Peer-to-peer computing and overlay graphs**: Introduction – Data indexing and overlays – Chord – Content addressable networks – Tapestry. **Distributed shared memory**: Abstraction and advantages – Memory consistency models – Shared memory Mutual Exclusion.

Text Books:	
1.	Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and Tim Kindberg, Fifth Edition, Pearson Education, 2012.
2.	Distributed computing: Principles, algorithms, and systems, Ajay D Kshemkalyani and Mukesh Singhal, Cambridge University Press, 2011.
Reference Books:	
1.	Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall of India, 2007.
2.	Advanced concepts in operating systems. Mukesh Singhal and Niranjan G. Shivaratri, McGraw-Hill, 1994.
3.	Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M.,Pearson Education, 2007.
e-Resources:	
1.	https://nptel.ac.in/courses/106/106/106106168/

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4108	PE	3	0	0	3	25	75	3 Hrs.

SOFTWARE PROJECT MANAGEMENT

(For CSE)

Course Objectives:

1.	To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
2.	To compare and differentiate organization structures and project structures
3.	To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Apply the process to be followed in the software development life-cycle models.	K3
2.	Apply the concepts of project management & planning.	K3
3.	Implement the project plans through managing people, communications and change	K3
4.	Conduct activities necessary to successfully complete and close the Software projects	K3
5.	Implement communication, modeling, and construction & deployment practices in software development.	K3

SYLLABUS

UNIT-I (12 Hrs)	**Conventional Software Management**: The Waterfall Model, Conventional Software Management Performance. **Evolution Of Software Economics**: Software Economics, Pragmatic Software Cost Estimation. **Improving Software Economics**: Reducing Software Product Size, Improving Software Processes, Improving Team Effectiveness, Improving Automation, Achieving Required Quality, Peer Inspections.
UNIT-II (10 Hrs)	**The Old Way and The New**: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process. **Life Cycle Phases**: Engineering and production stages, inception, Elaboration, construction, transition phases. **Artifacts of The Process**: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.
UNIT-III (10 Hrs)	**Model Based Software Architectures**: A Management perspective and technical perspective. **Work Flows of the Process**: Software process workflows, Iteration workflows. **Checkpoints of the Process**: Major mile stones, Minor Milestones, Periodic status

	assessments
UNIT-IV (08 Hrs)	**Iterative Process Planning**: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning. **Project Organizations and Responsibilities**: Line-of-Business Organizations, Project Organizations, evolution of Organizations.
UNIT-V (10 Hrs)	**Process Automation**: Automation Building blocks, The Project Environment. **Project Control and Process Instrumentation**: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation. **Project Estimation and Management**: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach

Text Books:	
1.	Software Project Management, Walker Royce, Pearson Education, 2005.
2.	Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.
Reference Books:	
1.	Software Project Management, Joel Henry, Pearson Education.
2.	Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.
3.	Effective Software Project Management, Robert K.Wysocki, Wiley,2006.

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4109	PE	3	0	0	3	25	75	3 Hrs.

WEB SERVICES

(For CSE)

Course Objectives:

1.	To understand the concept of XML and to implement Web services using XML based standards

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Recite the advantages of using XML technology family	K2
2.	Analyze the problems associated with tightly coupled distributed software architecture	K3
3.	Learn the Web services building block	K3
4.	Implement e-business solutions using XML based web services	K3

SYLLABUS

UNIT-I (12 Hrs)	**XML technology family**: XML, benefits, Advantages of XML over HTML, EDI, Databases, XML based standards, Structuring with schemas, DTD, XML Schemas, XML processing, DOM, SAX, presentation technologies, XSL, XFORMS, XHTML, Transformation, XSLT, XLINK, XPATH, XQuery.
UNIT-II (10 Hrs)	**Architecting Web Services**: Business motivations for web services, B2B, B2C, Technical motivations, limitations of CORBA and DCOM, Service-oriented Architecture (SOA), Architecting web services, Implementation view, web services technology stack, logical view, composition of web services, deployment view, from application server to peer to peer, process view, life in the runtime.
UNIT-III (10 Hrs)	**Web Services Building Blocks**: Transport protocols for web services, messaging with web services, protocols, SOAP, describing web services, WSDL, Anatomy of WSDL, manipulating WSDL, web service policy, Discovering web services, UDDI, Anatomy of UDDI, Web service inspection, Ad-Hoc Discovery, Securing web services.
UNIT-IV (08 Hrs)	**Implementing XML in E-Business**: B2B – B2C Applications, Different types of B2B interaction, Components of e-business XML systems, ebXML, RosettaNet, Applied XML in vertical industry, web services for mobile devices.
UNIT-V (10 Hrs)	**XML Content Management and Security**: Semantic Web, Role of Meta data in web content, Resource Description Framework, RDF schema, Architecture of semantic web, content management workflow, XLANG, WSFL, Securing web services.

Text Books:	
1.	Ron Schmelzer et al. " XML and Web Services", Pearson Education, 2002.
Reference Books:	
1.	Keith Ballinger, ". NET Web Services Architecture and Implementation", Pearson Education, 2003.
2.	David Chappell, "Understanding .NET A Tutorial and Analysis", Addison Wesley, 2002.
3.	Kennard Scibner and Mark C.Stiver, " Understanding SOAP", SAMS publishing.
4.	Alexander Nakhimovsky and Tom Myers, "XML Programming: Web Applications and Web Services with JSP and ASP", Apress, 2002.

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4110	PE	3	0	0	3	25	75	3 Hrs.

CLOUD COMPUTING

(For CSE)

Course Objectives:

1.	To study the important concepts of Network Centric Computing, Parallel, Distributed computing and Cloud Computing.
2.	To Communicate Cloud offerings, this enhances the usage of Cloud. Different applications and Cloud Computing Models.
3.	Understand the concept of cloud computing architectures and implement Task Scheduling algorithms.
4.	To study the Cloud Storage and Security Privacy Preservations.
5.	To Educate the public about the impact of engineering on legal and societal issues.

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Analyze core concepts and fundamentals of Cloud Computing.	K3
2.	Identify Systems, Protocols, and Mechanisms to support Cloud Infrastructure.	K3
3.	Analyze the Software and Hardware necessities for Cloud Computing, Identify the virtualization and Scheduling algorithms to manage the Cloud Environment.	K3
4.	Analyze issues related to the storage file system, protection and security, and needs for capacity building and training in cloud computing.	K3
5.	Different Application services and hosts on Cloud Environment.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Introduction**: Network centric computing, Peer-to–Peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing. **Parallel and Distributed Systems**: Introduction, Architectures, communication protocols, Message delivery rules, concurrency, and model concurrency with Petri Nets.
UNIT-II (10 Hrs)	**Cloud Computing :** Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, HPC &HTC on cloud.
UNIT-III (10 Hrs)	**Cloud Resource virtualization**: Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen. **Cloud Resource Management and Scheduling:** Policies and Mechanisms, Applications of control theory to task scheduling, scheduling algorithms: Fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications,

	Resource management and dynamic application scaling.
UNIT-IV (10 Hrs)	**Storage Systems**: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system. Apache Hadoop, Big Table, Megastore, Amazon Simple Storage Service(S3). **Cloud Security:** Cloud security risks, security – a top concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks.
UNIT-V (10 Hrs)	**Cloud Application Development**: Amazon Web Services: EC2 – instances, connecting clients, security rules, launching, and usage of S3 in Java, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming. **Google:** Google App Engine, Google Web Toolkit. **Microsoft:** Azure Services Platform, Windows live, Microsoft Dynamics CRM.

Text Books:	
1.	Cloud Computing, Theory and Practice,1st Edition, Dan C Marinescu, MK Elsevier publisher ,2013
2.	Cloud Computing, A Practical Approach, 1st Edition, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH,2017
Reference Books:	
1.	Mastering Cloud Computing, Foundations and Application Programming,1st Edition, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH,2013
2.	Essential of Cloud Computing, 1st Edition, K Chandrasekharan, CRC Press, 2014.
3.	Cloud Computing, A Hands on Approach, ArshdeepBahga, Vijay Madisetti, Universities Press, 2014.
e-Resources:	
1.	"Petri nets –Introduction-Examples" https://ptolemy.berkeley.edu
2.	"Microsoft Dynamics 365: Business Applications" *https://dynamics.microsoft.com* › en-us

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4111	PE	3	0	0	3	25	75	3 Hrs.

MEAN STACK TECHNOLOGIES

(For CSE)

Course Objectives:

1.	Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client
2.	Writing optimized front end code HTML and JavaScript
3.	Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution
4.	Design and implementation of Robust and Scalable Front End Applications

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Enumerate the Basic Concepts of Web & Markup Languages	K3
2.	Develop web Applications using Scripting Languages & Frameworks	K3
3.	Make use of Express JS and Node JS frameworks	K3
4.	Illustrate the uses of web services concepts like restful, react Js	K3
5.	Apply Deployment Techniques & Working with cloud platform	K3

SYLLABUS

UNIT-I (12 Hrs)	Introduction to Web: Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. Html5 concepts, CSS3, Anatomy of a web page. XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches.
UNIT-II (10 Hrs)	JavaScript: The Basic of JavaScript: Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions. Angular Java Script Angular JS Expressions: ARRAY, Objects, $eval, Strings, Angular JS Form Validation & Form Submission, Single Page Application development using Angular JS.
UNIT-III (10 Hrs)	Node.js: Introduction, Advantages, Node.js Process Model, Node JS Modules. Express.js: Introduction to Express Framework, Introduction to Nodejs , What is Nodejs, Getting Started with Express, Your first Express App, Express Routing, Implementing MVC in Express, Middleware, Using Template Engines, Error Handling , API Handling , Debugging, Developing Template Engines, Using Process Managers, Security & Deployment.
UNIT-IV (08 Hrs)	RESTful Web Services: Using the Uniform Interface, Designing URIs, Web Linking, Conditional Requests. React Js: Welcome to React, Obstacles and

	Roadblocks, React's Future, Keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, ReactDOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories
UNIT-V (10 Hrs)	Mongo DB: Introduction, Architecture, Features, Examples, Database Creation & Collection in Mongo DB. Deploying Applications: Web hosting & Domains, Deployment Using Cloud Platforms.

Text Books:	
1.	Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2.	Web Technologies, Uttam K Roy, Oxford
3.	Pro Mean Stack Development, ELadElrom, Apress
4.	Restful Web Services Cookbook, Subbu Allamraju, O'Reilly
5.	JavaScript & jQuery the missing manual, David sawyer mcfarland, O'Reilly
6.	Web Hosting for Dummies, Peter Pollock, John Wiley Brand
Reference Books:	
1.	Ruby on Rails up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006).
2.	Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012).
3.	Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
4.	An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning.
5.	Express.JS Guide,The Comprehensive Book on Express.js, AzatMardan, Lean Publishing.
e-Resources:	
1.	http://www.upriss.org.uk/perl/PerlCourse.html

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4112	PE	3	0	0	3	25	75	3 Hrs.

CYBER SECURITY & FORENSICS

(For CSE)

Course Objectives:

1.	Able to identify security risks and take preventive steps
2.	To understand the forensics fundamentals
3.	To understand the evidence capturing process
4.	To understand the preservation of digital evidence

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Enumerate the computer forensics fundamentals	K2
2.	Describe the types of computer forensics technology	K3
3.	Analyze various computer forensics systems	K3
4.	Illustrate the methods for data recovery, evidence collection and data seizure	K3
5.	Identify the Role of CERT-In Security	K3

SYLLABUS

UNIT-I (12 Hrs)	Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.
UNIT-II (10 Hrs)	Tools and Methods : Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration.
UNIT-III (10 Hrs)	Cyber Crime Investigation: Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.
UNIT-IV (08 Hrs)	Computer Forensics and Investigations: Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools: Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware

	Tools, Validating and Testing Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics.
UNIT-V (10 Hrs)	Cyber Crime Legal Perspectives: Introduction, Cybercrime and the Legal Landscape around the World, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario.
Text Books:	
1.	SunitBelapure Nina Godbole "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", WILEY, 2011.
2.	Nelson Phillips and EnfingerSteuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.
Reference Books:	
1.	Michael T. Simpson, Kent Backman and James E. Corley, "Hands on Ethical Hacking and Network Defence", Cengage, 2019.
2.	Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
3.	Alfred Basta, Nadine Basta, Mary Brown and Ravinder Kumar "Cyber Security and Cyber Laws" , Cengage,2018.
e-Resources:	
1.	CERT-In Guidelines- http://www.cert-in.org.in/
2.	https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks [Online Course]
3.	https://computersecurity.stanford.edu/free-online-videos [Free Online Videos]
4.	NickolaiZeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu. License: Creative Commons BY-NC-SA

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4113	PE	3	0	0	3	25	75	3 Hrs.

AD-HOC AND SENSOR NETWORKS

(For CSE)

Course Objectives:

1.	Architect sensor networks for various application setups
2.	Devise appropriate data dissemination protocols and model links cost
3.	Understanding of the fundamental concepts of wireless sensor networks and has a basic knowledge of the various protocols at various layers
4.	Evaluate the performance of sensor networks and identify bottlenecks

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Evaluate the principles and characteristics of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks	K3
2.	Determine the principles and characteristics of wireless sensor networks	K3
3.	Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc sensor networks	K3
4.	Illustrate the various sensor network Platforms, tools and applications	K3
5.	Demonstrate the issues and challenges in security provisioning and also familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs	K3

SYLLABUS

UNIT-I (12 Hrs)	Introduction to Ad Hoc Wireless Networks- Cellular and Ad Hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet, MAC protocols for Ad hoc Wireless Networks-Issues, Design Goals and Classifications of the MAC Protocols.
UNIT-II (10 Hrs)	Routing Protocols for Ad Hoc Wireless Networks- Issues in Designing a Routing Protocol, Classifications of Routing Protocols, Topology-based versus Position-based Approaches, Issues and design goals of a Transport layer protocol, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks, Solutions for TCP over Ad Hoc Wireless Networks, Other Transport layer protocols.
UNIT-III (10 Hrs)	Security protocols for Ad hoc Wireless Networks- Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks, Cooperation in MANETs, Intrusion Detection Systems.
UNIT-IV	Basics of Wireless Sensors and Applications- The Mica Mote, Sensing and Communication

(08 Hrs)	Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks-Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.
UNIT-V (10 Hrs)	Security in WSNs- Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote, Sensor Network Operating Systems–TinyOS, LA-TinyOS, SOS, RETOS, Imperative Language-nesC, Dataflow Style Language- TinyGALS, Node-Level Simulators, NS-2 and its sensor network extension, TOSSIM.
Text Books:	
1.	Ad Hoc Wireless Networks – Architectures and Protocols, C. Siva Ram Murthy, B. S. Murthy, Pearson Education, 2004.
2.	Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P.Aggarwal, World Scientific Publications / Cambridge University Press, March 2006.
3.	Wireless Sensor Networks – Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010.
Reference Books:	
1.	Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp2009.
2.	Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008.
3.	Ad hoc Networking, Charles E.Perkins, Pearson Education, 2001.
4.	Wireless Ad hoc Networking, Shih-Lin Wu, Yu-Chee Tseng, Auerbach Publications, Taylor & Francis Group, 2007.

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4114	PC	0	0	3	1.5	20	30	3 Hrs.

MACHINE LEARNING LAB

(For CSE)

Course Objectives:

1.	Students will be able to implement different mechanisms in preprocessing and model evaluation & implementation
2.	Students will be able to implement different dimensionality reduction techniques
3.	Students will be able to implement different clustering & classification techniques
4.	Students will be able to evaluate the model
5.	Students will be able to implement simple linear, logistic regressions and Feed-Forward Network

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Design Preprocessing model for their own data sets.	K6
2.	Apply dimensional reduction techniques for their own datasets	K3
3.	Develop different clustering & classification techniques	K3
4.	Evaluate the model with Lasso and Ridge Regularization	K6
5	Design neural network for structured, unstructured data classification and regression	K6

SYLLABUS

Experiment 1:	Data preprocessing: Handling missing values, handling categorical data, bringing features to same scale, selecting meaningful features
Experiment 2:	Model Evaluation and optimization: K-fold cross validation, learning and validation curves, grid search
Experiment 3:	Compressing data via dimensionality reduction: PCA, LDA
Experiment 4:	Ensemble Learning, Data Clustering & Classification
Experiment 5:	Write a program to evaluate clustering model
Experiment 6:	Vector addition.
Experiment 7:	Regression model.
Experiment 8:	Write a program to reduce variance of a linear regression model using Lasso and Ridge Regularization
Experiment 9:	Write a program to implement logistic regression for binary classification and multiclass classification
Experiment 10:	Perceptron for digits.
Experiment 11:	Feed-Forward Network for wheat seeds dataset.
Experiment 12:	Write a program to implement a neural network for regression.
Experiment 13:	Write a program to save and load a trained machine learning model

Additional Programs	
Experiment 1:	Image Classifier using CNN.
Experiment 2:	Transfer Learning for cat vs dog.
Experiment 3:	Autoencoder for MNIST
Experiment 4:	Sentiment analysis with RNN and LSTM.

Reference Books:	
1.	Chris Albon, “Machine Learning with Python Cookbook-practical solutions from preprocessing to Deep learning”, O’REILLY Publisher,2018
2.	Sebastian Raschka& Vahid Mirjalili, “Python Machine Learning”, Packt Publisher, 2017
3.	Ian Good Fellow, YoshuaBengio, Aaron Courville, “Deep Learning”, MIT Press, 2017.
4.	Francois Chollet, “Deep Learning with Python”, Manning Publications, 2018.
5.	Phil Kim, “Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence”, Apress , 2017.
6.	Ragav Venkatesan, Baoxin Li, “Convolutional Neural Networks in Visual Computing”, CRC Press, 2018.
7.	Navin Kumar Manaswi, “Deep Learning with Applications Using Python”, Apress, 2018.
8.	.Joshua F. Wiley, “R Deep Learning Essentials”, Packt Publications, 2016
Useful Reference Links:	
1.	https://scikit-learn.org/stable/modules/generated/sklearn.linear_model.Perceptron.html
2.	https://towardsdatascience.com/15-data-exploration-techniques-to-go-from-data-to-insights93f66e6805df
3.	https://medium.com/ml-research-lab/chapter-4-knowledge-from-the-data-and-data-explorationanalysis-99a734792733
4.	https://machinelearningmastery.com/implement-backpropagation-algorithm-scratch-python/
5.	https://www.analyticsvidhya.com/blog/2016/01/guide-data-exploration/
6.	https://towardsdatascience.com/wtf-is-image-classification-8e78a8235acb
7.	https://medium.com/nybles/create-your-first-image-recognition-classifier-using-cnn-keras-andtensorflow-backend-6eaab98d14dd
8.	https://analyticsindiamag.com/learn-image-classification-using-cnn-in-keras-with-code/
9.	https://www.tensorflow.org/tutorials/images/transfer_learning
10.	https://www.pyimagesearch.com/2020/02/17/autoencoders-with-keras-tensorflow-and-deeplearning/
11.	https://d2l.ai/chapter_natural-language-processing-applications/sentiment-analysis-rnn.html
12.	https://towardsdatascience.com/sentiment-analysis-using-lstm-step-by-step-50d074f0994

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4115	PR	--	--	4	2	20	30	3 Hrs.

PROJECT WORK - I

(For CSE)

Course Objectives:

1.	Understand the concepts and planning to execution of project.
2.	Understand the feasibility analysis and network analysis tools for cost and time estimation.
3.	To comprehend the fundamentals of Contract Administration, Costing and Budgeting.
4.	To analyze, apply and appreciate contemporary project management tools and methodologies

Course Outcomes:

S. No	Outcome	Knowledge Level
1.	Identify a current problem through literature/field/case studies	K3
2.	Identify the background objectives and methodology for solving the same	K3
3.	Design a technology/ process for solving the problem	K6
4.	Develop a technology/ process for solving the problem.	K6
5.	Evaluate that technology/ process at the laboratory level.	K5

*The object of Project Work I is to enable the student to take up investigative study in the broad field of Computer Science & Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or a group of students, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work.

The assignment to normally include:

a) Survey and study of published literature on the assigned topic.

b) Working out a preliminary approach to the problem relating to the assigned topic.

c) Conducting preliminary Analysis/Modeling/Simulation/Experiment/Design/ Feasibility.

d) Preparing a written report on the study conducted for presentation to the department.

e) Final Seminar, as oral Presentation before a departmental committee.

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19MC4101	**MC**	**3**	**--**	**--**	**--**	**--**	**--**	**3 Hrs.**

IPR & Patents

(For CSE & IT)

Course Objectives:

1.	To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines
2.	Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Demonstrate IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents	K3
2.	Infer an insight on Copyrights, Patents and Software patents which are instrumental for further advancements	K4

SYLLABUS

UNIT-I (08 Hrs)	Introduction to Intellectual Property Rights (IPR): Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.
UNIT-II (08 Hrs)	Copyrights and Neighboring Rights: Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers **–** Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.
UNIT-III (08 Hrs)	Patents: Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations
UNIT-IV (08 Hrs)	Trademarks: Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under

	Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.
UNIT-V (08 Hrs)	Trade Secrets & Cyber Law and Cyber Crime: Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of Unfair Competition – Trade Secret Litigation – Applying State Law. Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions – E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.
Text Books:	
1.	T. Ramappa, ―Intellectual Property Rights Under WTO, S. Chand, 2008
Reference Books:	
1.	Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2.	Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
3.	PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
4.	Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
5.	Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
6.	Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
7.	R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
8.	M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.

Estd:1980

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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COMPUTER SCIENCE & ENGINEERING

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SCHEME OF INSTRUCTION & EXAMINATION

(Regulation R19)

IV/IV B.TECH

II-SEMESTER

(With effect from **2019-2020**Admitted Batch onwards**)**

Course Code	Name of the Course	Category	Cr.	L	T	P	Internal Marks	External Marks	Total Marks
B19HS4201	Management and Organizational Behavior	HS	3	3	--	--	25	75	100
#PE-V	Professional Elective-V	PE	3	3	--	--	25	75	100
#OE-III	Open Elective-III	OE	3	3	--	--	25	75	100
B19CS4206	IoT Lab	PC	2	--	--	4	20	30	50
B19CS4207	Project-II	PR	7	--	--	14	60	90	150
		TOTAL	**18**	**9**	**--**	**18**	**155**	**345**	**500**

	Course Code	Course
#PE-V	B19CS4201	Deep Learning
	B19CS4202	Quantum Computing
	B19CS4203	Block Chain Technologies
	B19CS4204	Big Data Analytics
	B19CS4205	DevOps
#OE-III	Student has to study one Open Elective offered by CE or ECE or EEE or ME or S&H from the list enclosed.	

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19HS4201	HS	3	--	--	3	25	75	3 Hrs.

MANAGEMENT AND ORGANIZATIONAL BEHAVIOR

(For CSE & IT)

Course Objectives:

1.	To familiarize with the concept of management, functions, and principles
2.	To provide conceptual knowledge on functional management that is on Human resource management and Marketing management
3.	To provide basic insight into contemporary management practices and Strategic Management
4.	To learn theories of motivation and also deals with individual behavior, their attitude and perception of individuals
5	To understand about organizations groups that affect the climate of an entire organizations which helps employees in stress management

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Explain management functions and principles	K2
2.	Describe the concepts of functional management that is HRM and Marketing functions	K2
3.	Discuss about vision, mission, goal, objective and a strategy based on which the corporate planning depends	K2
4.	Recognise strategically contemporary management practices and describe corporate planning process	K2
5.	Discuss about individual behaviour and motivational theories	K2
6.	Explain about ways in managing conflicts and stress	K2

SYLLABUS

UNIT-I (12 Hrs)	**Introduction to Management**: Management: Concept, Nature and importance of Management, Functions of management, Evolution of Management thought, Taylor's Scientific Management, Fayol's principles of Management, Social Responsibility of Business.
UNIT-II (10 Hrs)	**Functional Management**: Human Resource Management (HRM): Concepts of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Compensation & Performance Appraisal. Marketing Management: Concept, Functions of marketing; Marketing Mix - Product, Price, Place & Promotion; Marketing strategies based on Product life cycle, Channels of distribution.
UNIT-III (10 Hrs)	**Strategic Management**: Vision, Mission, Goal, Objective, Policy, Strategy. Elements of Corporate planning process; Environmental scanning; SWOT analysis; steps in Strategy

	formulation, implementation, evaluation & control; Bench Marking; Balanced Score Card.
UNIT-IV (08 Hrs)	**Organizational Behavior**: Individual Behavior: Perception-Perceptual process; Attitude-Attitudinal change, Organizational Change, Factors Influencing Change, Types of Change. Motivation: Meaning, Theories of Motivation - Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation.
UNIT-V (10 Hrs)	**Group Dynamics**: Types of Groups, Stages of Group development; Organizational conflicts -Reasons for Conflicts, Consequences of Conflicts in Organization, Types of Conflicts, Strategies for Managing Conflicts, Stress - Causes and effects, coping strategies of stress.

Text Books:	
1.	SubbaRao.P Management & Organizational Behavior, Himalaya Publishing House. Mumbai
2.	A.R Aryasri - Management Science McGraw Hill Pvt Ltd, New Delhi
Reference Books:	
1.	Fred Luthans Organizational Behavior, TMH, NewDelhi.
2.	Robins, Stephen P., Fundamentals of Management, Pearson,India.
3.	Kotler Philip & Keller Kevin Lane: Marketing Management 12/e, PHI,
4.	Koontz &Weihrich: Essentials of Management, 6/e, TMH

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4201	PE	3	--	--	3	25	75	3 Hrs.

DEEP LEARNING

(For CSE)

Course Objectives:

1.	Understand and recollect basic concepts of machine learning
2.	Understand concepts of deep feed forward network mechanisms
3.	Understand and analyze the concepts of CNN, RNN models
4.	Study the concepts of auto encoders and optimization techniques
5.	Study and analyze the different DNN architectures

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Utilize the basic concept of Machine learning	K3
2.	Apply the concepts of deep feed forward networks.	K3
3.	Apply the concepts of CNN & RNN models	K3
4.	Explain and apply optimization techniques and auto encoders.	K3
5.	Identify different DNN models and apply that knowledge to different applications.	K3

SYLLABUS

UNIT-I (12 Hrs)	**Fundamentals Concepts of Machine Learning** Historical Trends in Deep Learning-Machine Learning Basics: Learning Algorithms-Supervised and Unsupervised Training, Linear Algebra for machine Learning, Testing, Cross-Validation, Dimensionality reduction, Over/Under-fitting, Hyper parameters and validation sets, Bias, Variance, Regularization
UNIT-II (10 Hrs)	**Deep Feed Forward Networks** **Deep feed forward networks:** Introduction, Gradient-Based Learning, Various Activation Functions, error functions, Differentiation algorithms, Regularization for Deep learning, Early Stopping, Drop out.
UNIT-III (10 Hrs)	**Convolutional Neural Networks And Sequence Modeling** **Convolutional Networks**: Convolutional operation, Motivation, Pooling, Normalization, **Sequence Modeling**: Recurrent Neural Networks, Bidirectional RNNs, Deep Recurrent Networks, Encoder-Decoder, Sequence-to-Sequence Architectures, the Long Short-Term Memory.
UNIT-IV (08 Hrs)	**Auto Encoders** **Auto encoders**: under complete, regularized, stochastic, denoising, contractive, Optimization for Deep Learning

UNIT-V (10 Hrs)	**More Deep Learning Architectures & Applications** Alexnet, ResNet, Transfer learning, Image Segmentation, Sentiment Analysis using LSTM

Text Books:	
1.	Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press, 2016 (available at http://www.deeplearningbook.org)
2.	Charu C Agarwal, "Neural Networks and Deep Learning", IBM T. J. Watson Research Center, International Business Machines, Springer, 2018
Reference Books:	
1.	Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012
2.	Michael Nielsen, "Neural Networks and Deep Learning", Online book, 2016 (http://neuralnetworksanddeeplearning.com/)
3.	Li Deng, Dong Yu, "Deep Learning: Methods and Applications", Foundations and Trends in Signal Processing, 2013.
4.	Christopher and M. Bishop, "Pattern Recognition and Machine Learning", Springer Science Business Media, 2006.
5.	Jason Brownlee , "Deep Learning with Python" , ebook, 2016
6.	N. D. Lewis, "Deep Learning Step by Step with Python: A Very Gentle Introduction to Deep Neural Networks for Practical Data Science, 2016.
7.	Chris Albon, "Machine Learning with Python Cookbook-practical solutions from preprocessing to Deep learning", O'REILLY Publisher,2018
Useful Reference Links:	
1.	https://medium.com/nybles/create-your-first-image-recognition-classifier-using-cnn-keras-and-tensorflow-backend-6eaab98d14dd
2.	https://www.analyticsvidhya.com/blog/2017/08/10-advanced-deep-learning-architectures-data-scientists/
3.	https://www.geeksforgeeks.org/cross-validation-machine-learning/
4.	https://www.geeksforgeeks.org/activation-functions-neural-networks/
5.	https://towardsdatascience.com/sentiment-analysis-using-lstm-step-by-step-50d074f09948
6.	https://medium.com/@lamiae.hana/a-step-by-step-guide-on-sentiment-analysis-with-rnn-and-lstm-3a293817e314
7.	https://towardsdatascience.com/common-loss-functions-in-machine-learning-46af0ffc4d23
8.	https://d2l.ai/chapter_natural-language-processing-applications/sentiment-analysis-rnn.html

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4202	PE	3	--	--	3	25	75	3 Hrs.

QUANTUM COMPUTING

(For CSE)

Course Objectives:

1.	This course teaches the fundamentals of quantum information processing, including quantum computation, quantum cryptography, and quantum information theory.

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Analyze the behaviour of basic quantum algorithms	K4
2.	Implement simple quantum algorithms and information channels in the quantum circuit model	K3
3.	Simulate a simple quantum error-correcting code	K3
4.	Prove basic facts about quantum information channels	K3

SYLLABUS

UNIT-I (12 Hrs)	Introduction: Quantum Measurements Density Matrices, Positive-Operator Valued Measure, Fragility of quantum information: Decoherence, Quantum Superposition and Entanglement, Quantum Gates and Circuits.
UNIT-II (10 Hrs)	Quantum Basics and Principles: No cloning theorem & Quantum Teleportation, Bell's inequality and its implications, Quantum Algorithms & Circuits.
UNIT-III (10 Hrs)	Algorithms: Deutsch and Deutsch–Jozsa algorithms, Grover's Search Algorithm, Quantum Fourier Transform, Shore's Factorization Algorithm.
UNIT-IV (08 Hrs)	Performance, Security and Scalability: Quantum Error Correction: Fault tolerance; Quantum Cryptography, Implementing Quantum Computing: issues of fidelity; Scalability in quantum computing.
UNIT-V (10 Hrs)	Quantum Computing Models: NMR Quantum Computing, Spintronics and QED MODEL, Linear Optical MODEL, Nonlinear Optical Approaches; Limits of all the discussed approaches, Future of Quantum computing.

Text Books:

1.	Eric R. Johnston, NicHarrigan, Mercedes and Gimeno-Segovia "Programming Quantum Computers: Essential Algorithms And Code Samples, SHROFF/ O'Reilly.
2.	Dr. Christine Corbett Moran, Mastering Quantum Computing with IBM QX: Explore the world of quantum computing using the Quantum Composer and Qiskit, Kindle Edition Packt

3.	V.K Sahni, Quantum Computing (with CD), TATA McGrawHill.
Reference Books:	
1.	Chris Bernhardt, Quantum Computing for Everyone (The MIT Press).
2.	Michael A. Nielsen and Issac L. Chuang, “Quantum Computation and Information”, Cambridge (2002).
3.	Riley Tipton Perry, “Quantum Computing from the Ground Up”, World Scientific Publishing Ltd (2012).
4.	Scott Aaronson, “Quantum Computing since Democritus”, Cambridge (2013).
5.	P. Kok, B. Lovett, “Introduction to Optical Quantum Information Processing”, Cambridge.
e-Resources:	
1.	https://nptel.ac.in/courses/104104082/
2.	https://swayam.gov.in/nd1_noc19_cy31/preview

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4203	PE	3	--	--	3	25	75	3 Hrs.

BLOCK CHAIN TECHNOLOGIES

(For CSE)

Course Objectives:

1.	Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them,
2.	Design, build, and deploy smart contracts and distributed applications,
3.	Integrate ideas from block chain technology into their own projects.

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Demonstrate the Foundation of the Block Chain Technology and understand the process in payment and funding	K2
2.	Identify the risks involved in building Block Chain applications	K3
3.	Review of local implications using smart contracts	K3
4.	Choose the present landscape of Block Chain implementations and understand crypto currency markets	K3
5	Examine how to profit from trading crypto currencies	K4

SYLLABUS

UNIT-I (12 Hrs)	Introduction, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain. Evolution of Blockchain :Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.
UNIT-II (10 Hrs)	Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.
UNIT-III (10 Hrs)	Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for DesigningBlockchain Applications.

UNIT-IV (08 Hrs)	EthereumBlockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEtherWallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, OpenZeppelin Contracts
UNIT-V (10 Hrs)	HyperledgerBlockchain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application. Advanced Concepts in Blockchain: Introduction, InterPlanetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.
Text Books:	
1.	Ambadas, Arshad SarfarzAriff, Sham “Blockchain for Enterprise Application Developers”, Wiley
2.	Andreas M. Antonpoulos, “Mastering Bitcoin: Programming the Open Blockchain” , O’Reilly
Reference Books:	
1.	Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill.
2.	Blockchain: Blueprint for a New Economy, Melanie Swan, O’Reilly
e-Resources:	
1.	https://github.com/blockchainedindia/resources

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4204	PE	3	--	--	3	25	75	3 Hrs.

BIG DATA ANALYTICS

(For CSE)

Course Objectives:

1.	To optimize business decisions and create competitive advantage with Big Data analytics
2.	To learn to analyze the big data using intelligent techniques
3.	To introduce programming tools PIG & HIVE in Hadoop echo system

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Illustrate big data challenges in different domains including social media, transportation, finance and medicine	K3
2.	Use various techniques for mining data stream	K3
3.	Apply Hadoop concepts	K3
4.	Identify the characteristics of datasets and compare the trivial data and big data for various applications	K2
5.	Explore the various search methods and visualization techniques	K2

SYLLABUS

UNIT-I (12 Hrs)	Introduction: 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.
UNIT-II (10 Hrs)	Stream Processing: 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.
UNIT-III (10 Hrs)	Introduction to Hadoop: 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 Features Hadoop environment.
UNIT-IV (08 Hrs)	Frameworks and Applications: Frameworks: 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.

UNIT-V (10 Hrs)	Predictive Analytics and Visualizations: Predictive Analytics, Simple linear regression, Multiple linear regression, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application
Text Books:	
1.	Tom White, "Hadoop: The Definitive Guide", Third Edition, O'reilly Media, Fourth Edition, 2015.
2.	Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.
3.	AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CUP, 2012
Reference Books:	
1.	Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley& sons, 2012.
2.	Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, "Harness the Power of Big Data:The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.
3.	ArshdeepBahga and Vijay Madisetti, "Big Data Science & Analytics: A Hands On Approach ", VPT, 2016.
4.	Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science nd its Applications (WILEY Big Data Series)", John Wiley & Sons, 2014.

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4205	PE	3	--	--	3	25	75	3 Hrs.

DevOps

(For CSE)

Course Objectives:

1.	DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility	K3
2.	Describe DevOps &DevSecOps methodologies and their key concepts	K3
3.	Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models	K2
4.	Set up complete private infrastructure using version control systems and CI/CD tools	K3

SYLLABUS

UNIT-I (12 Hrs)	Phases of Software Development life cycle. Values and principles of agile software development.
UNIT-II (10 Hrs)	Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.
UNIT-III (10 Hrs)	DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes
UNIT-IV (08 Hrs)	CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits of CI/CD, Metrics to track CICD practices
UNIT-V (10 Hrs)	Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity model, DevOps maturity Assessment

Text Books:

1.	The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois, Jez Humb,1st Edition, O'Reilly publications, 2016.
2.	What is Devops? Infrastructure as code, 1st Edition, Mike Loukides, O'Reilly publications, 2012.

Reference Books:

1.	Building a DevOps Culture, 1st Edition, Mandi Walls, O'Reilly publications, 2013.

2.	The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Microservices, 1st Edition, Viktor Farcic, CreateSpace Independent Publishing Platform publications, 2016
3.	Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation, 1st Edition, Jez Humble and David Farley, 2010.
4.	Achieving DevOps: A Novel About Delivering the Best of Agile, DevOps, andmicroservices, 1st Edition, Dave Harrison, Knox Lively, Apress publications, 2019
e-Resources:	
1.	https://www.javatpoint.com/devops
2.	https://github.com/nkatre/Free-DevOps-Books-1/blob

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4206	PC	--	--	4	2	20	30	3 Hrs.

IoT LAB

(For CSE)

Course Objectives:

1.	To know how to use various hardware components and Protocols in IoT applications
2.	To Know how to develop various IoT applications

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Use sensors, actuators, Arduino and Raspberry pi in IoT applications	K3
2	Design and Develop various IoT applications.	K6

SYLLABUS

1	To interface Bluetooth with Raspberry Pi/Arduino and write a program to send sensor data to smart phone using Bluetooth.
2	To interface Bluetooth with Raspberry Pi/Arduino and write a program to to turn ON/OFF LED when '1'/'0' is received from smart phone using Bluetooth.
3	Application of WiFi in IoT Systems
4	App design for WiFi application to ON/OFF Light
5	Use of various network protocols in IoT systems
6	Application of 802.15.4 Zigbee in IoT Systems.
7	Design a simple IoT System comprising sensor, Wireless Network connection, Data Analytics
8	Design and Interface ESP32 with DC motor using L298 motor driver
9	Experiment on connectivity of Rasberry Pi with existing system components.

Text Books:

1.	Internet of Things: Architecture, Design Principles and Applications, Rajkamal, McGraw Hill Higher Education. 2017
2.	Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 1st edition, 2014.

Reference Books:

1.	Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley, 1st edition, 2014.
2.	Getting Started with the Internet of Things CunoPfister,Oreilly. 2011
3.	Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD),2014.

e-Resources:

1.	Introduction to Internet of Things, https://swayam.gov.in/nd1_noc20_cs66/preview
2.	An Introduction to Programming the Internet of Things(IoT) specialization, https://www.coursera.org/specializations/iot

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS4207	PR	--	--	14	7	60	90	3 Hrs.

PROJECT WORK - II

(For CSE)

Course Objectives:

1	Understand the concepts and planning to execution of project.
2	Understand the feasibility analysis and network analysis tools for cost and time estimation.
3	To comprehend the fundamentals of Contract Administration, Costing and Budgeting.
4	To analyze, apply and appreciate contemporary project management tools and methodologies

Course Outcomes:

S.No	Outcome	Knowledge Level
1	Identify a current problem through literature/field/case studies	K3
2	Identify the background objectives and methodology for solving the same	K3
3	Design a technology/ process for solving the problem	K6
4	Develop a technology/ process for solving the problem.	K6
5	Evaluate that technology/ process at the laboratory level.	K5

* The object of Project Work II & Dissertation is to enable the student to extend further the investigative study taken up under Project Work I, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership.

The assignment to normally include:

a) In depth study of the topic assigned in light of Report prepared under Project Work I.
b) Review and finalization of the approach to the problem relating to the assigned topic.
c) Preparing an Action Plan for conducting the investigation, including team work.
d) Detailed Analysis/ Modeling/Simulation/Design/Problem Solving/Experiment as needed.
e) Final development of product/process, testing, results, conclusions and future directions.
f) Preparing a paper for Conference presentation/publication in Journals, if possible.
g) Preparing a dissertation in the standard format for being evaluated by the department.