

**CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS),
HYDERABAD-75**

Department of Computer Science and Engineering

Stake Holder Feedback For 2020-21

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**CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS),
HYDERABAD-75**

Stakeholders Feedback Analysis and Action Taken Report-(AY:2020-2021)

1. Students Feedback Analysis

Table 1: Responses related to Student Feedback (No. of Responses: 202)

S. No	Parameters	Avg Rating	%
1	Placement	3.40	68
2	Higher Studies	3.55	71
3	Association-	3.65	73
4	Internships	2.56	51
5	Grievances	3.23	65
6	Infrastructure-Common->Laboratory facilities	3.23	65
7	Infrastructure-Common->Computing facilities	3.24	65
8	Infrastructure-Common->Library facilities	3.38	68
9	Infrastructure-Common->Internet and Wi-Fi facilities	3.32	66
10	Infrastructure-Common->Games and Sports facilities	3.01	60
11	Infrastructure-Common->Admin. and Accounts Section Services	3.15	63
12	Infrastructure-Common->Academics & Examination Cell(AEC)	2.61	52
13	Infrastructure-Common->Controller of Examinations(CoE)	2.77	55
14	Infrastructure-Common->Transport facilities(if applicable)	3.18	64
15	Infrastructure-Common->Canteen facilities	2.67	53
16	Infrastructure-Common->Health Center facilities	3.55	71
17	Infrastructure-Common->Basic amenities including washrooms	2.83	57
18	Infrastructure-Common->Hostel facilities(if applicable)	3.16	63
19	Infrastructure-Common->Overall facilities	2.97	59
20	Placement and Training Cell->Training provided for placements.	3.20	64
21	Placement and Training Cell->Training and Placement Office provided on/off campus placement opportunities.	3.40	68
22	Placement and Training Cell->Career Counselling & Guidance for higher studies provided.	3.55	71
23	Placement and Training Cell->Co and Extra Curricular opportunities provided.	3.65	73

24	Placement and Training Cell->Motivation towards Research & Development(R&D)	2.56	51
25	Curriculum and Syllabus->	3.23	65
26	Suggestions-Curriculum Courses on IoT, Block Chain, Devops Lab		

Action Taken: Many students suggested to add labs for Professional Electives, and upgrade the subjects to latest technologies. Added Labs for Professional electives and included courses on latest technology like Augmented Reality and Virtual Reality, Big Data Analytics, Data Science.

2. Teachers Feedback Analysis

Table 3: Average Response of Faculty from all the departments (No. of Responses:)

S. No	Parameters	Avg. Rating	%
1	The design of the curriculum addresses the holistic development of student.	4.5	90
2	The curriculum is well balanced with knowledge, skills and employability.	4.625	93
3	The syllabus suitable to the course.	4.625	93
4	The course/courses are relevant to the present scenario.	4.625	93
5	Course objectives and outcomes are well defined.	4.75	95
6	Prescribed books/suggested readings and other references appropriate.	4.75	95
7	BoS members from Academia and Industry constructive in updating the syllabi according to the changing educational challenges and requirements in line with regulating bodies like AICTE, UGC etc.	4.625	93
8	The scheme and evaluation schedules satisfy the Teaching Learning Process.	4.5625	91
9	Freedom to suggest/propose/modify/incorporate new topics in the syllabus during the revision of curriculum?	4.6875	94
10	Institute/Department gives the freedom to adopt new technologies/strategies of innovative teaching?	4.5625	91
11	The environment in the department is conducive to learning, teaching, and research.	4.5625	91
12	Provisions for professional development are non-discriminatory and fair.	4.5625	91

13	Adequacy of infrastructure (class/staff rooms, labs, library, and ICT facilities) in the institute.	4.625	93
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Action Taken: Teachers recommended to include NodeJS and Hadoop. Internet and Web Technologies course is revised to include NodeJS and Big Data Analytics has been offered to students.

3. Parent Feedback Analysis

Table 4: Responses related to Theory Courses (No. of Responses: 22)

S. No	Parameters	No. of Responses	Avg. Rating	%
1	The Teaching-Learning Environment	22	4.27	85
2	Infrastructure Facilities (Laboratories and Class rooms)	22	4.27	85
3	Library, Internet, Computer, Wi-Fi etc.	22	4.20	84
4	Monitoring of Student's Progress	22	3.87	77
5	Participation by your wards in technical events (workshops and conferences).	22	3.87	77
6	Participation in personality development activities by your ward.	22	3.80	76
7	Response and communication with the college authorities.	22	4.13	83
8	Support Services like Bank and Post office	22	3.80	76
9	Canteen facility in the campus.	22	3.73	75
10	Student activity centres in the college (clubs and fests)	22	4.13	83
11	Facility for sports, games and transport facility for the students.	22	3.80	76
12	Training and placement activities in the campus.	22	4.13	83
13	Quality of Curriculum	22	4.00	80

Action Taken: Parents recommended for Practical Oriented courses. Added labs for the Professional Electives.

4. Employer Feedback Analysis

Table 5: Responses related to Theory Courses (No. of Responses: 08)

S. No	Parameters	Avg. Rating	%
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1	Domain Knowledge and Aptitude Levels	2.375	79
2	Problem analysis and design of appropriate solutions	2.25	75
3	Attitude towards Research based approach	2	67
4	Adaptability to new technology/tools and zeal to be a constant learner	2.25	75
5	Commitment to work, managerial skills and ability to meet deadlines	2	67
6	Work towards sustainable development, Societal improvements and Environmental Benefits	1.875	63
7	Professional ethics	2.375	79
8	Communication Skills	2.5	83
9	Team spirit, interpersonal relations and leadership skills	2.25	75
10	How do you rate capability to analyze, synthesize, design, develop and test systems/processes	2.125	71
11	Overall Job performance	2.25	75

Action Taken: Employers recommended to include Application oriented courses. In syllabus, Machine Learning, Deep learning, IoT based courses are offered in R20 syllabus.

5. ALUMNI Feedback Analysis

Table 6: Summary of Alumni Feedback Report (No. of Responses: 64)

S. No	Parameters	Avg. Rating	%
1	What is your satisfaction level in associating with CBIT?	4.14	83
2	Laboratory facilities	3.96	79
3	Computing facilities	4.07	81
4	Library facilities	4.26	85
5	Internet and Wi-Fi facilities	2.53	51
6	Games and Sports facilities	3.43	69
7	Admin. and Accounts Section Services	3.56	71
8	Academics & Examination Cell(AEC) Services	3.75	75
9	Controller of Examinations(CoE)	3.75	75

10	Canteen facilities	3.46	69
11	Health Center facilities	3.6	72
12	Basic amenities including washrooms	2.81	56
13	Overall facilities	3.59	72
14	Training provided for placements	2.98	60
15	Training and Placement Office provided on/off campus placement opportunities.	4.09	82
16	Career Counseling & Guidance for higher studies provided.	3.18	64
17	Co and Extra Curricular opportunities provided.	3.39	68
18	Motivation towards Research & Development(R&D)	3.25	65
19	How do you rate the Curriculum/Syllabus that you have undergone?	3.73	75
20	How far the acquired knowledge of mathematics, science and engineering fundamentals helped you in solving complex mechanical engineering problems? (PO1)	3.56	71
21	How confident are you in identifying, formulating and analysing complex engineering problems reaching to substantial conclusions by using first principles of mathematics and sciences? (PO2)	3.64	73
22	How adequate is the knowledge you gained, helped in providing solutions for complex engineering problems and design/develop systems to meet the societal needs as per standards? (PO3)	3.68	74
23	How competent are you in conducting investigations of complex problems using research-based knowledge/methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions?(PO4)	3.75	75
24	How acquainted are you in using modern IT tools in modeling of complex engineering problems? (PO5)	3.75	75
25	How informed are you with the contextual knowledge of the engineer and society relevant to the professional engineering practice? (PO6)	3.82	76
26	How well versed are you in understanding the impact of professional Engineering solutions in the context of environment and sustainable development? (PO7)	3.79	76
27	How equipped are you with the ethical principles and responsibilities in accordance with the Engineering practices? (PO8)	3.92	78
28	How managerial are you in effective functioning with the team?(PO9)	4.03	81

29	How effective are you in communicating for comprehension, documentation and presentation of engineering activities? (PO10)	3.92	78
30	How entrepreneurial are you in identifying, acquiring and allocating the finance and other resources for an effective project management? (PO11)	3.65	73
31	How adaptable are you to engage in lifelong learning approaches in the of context of technological changes?(PO12)	3.78	76
32	How far the programme enabled you demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments(PSO1)	3.75	75
33	How far you are able to recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.?(PSO2)	3.89	78
Average Response			

Action Taken: Alumni recommended to remove unnecessary subjects and add DSA. Data Structures and Algorithms has been offered to students of all the streams.

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**Consolidated Action taken report on the Feedback obtained from Stake Holders AY
: 2020-2021**

S.No	Suggestions from	Suggestions	Action Taken	Remarks
1	Student	More lab related subjects.	Labs for professional electives were offered from V Semester	Syllabus R20 , Professional Electives Labs
2	Student	Trying to upgrade with latest technical subjects.	Courses on latest technologies like Augmented Reality and Virtual Reality, Big Data Analytics, Data Science are offered from the academic year 2022-2023.	BOS 2021 Augmented Reality and Virtual Reality , Big Data Analytics , Data Science
4	Alumnus (2021)	Make the curriculum more practical with more industrial interactions.	Labs are introduced with professional electives from V Semester	Professional Electives Labs , Internet of Things Lab , Soft Computing Lab , Enterprise Application Development

5	Alumnus	More emphasis on Data Structures and Algorithms and industry interaction and following the curriculum which is in trend.	Basics of Data Structures course is offered for all the branches	Data Structures
6	Alumnus	Add new technologies to curriculum Remove unnecessary subjects Better DSA coaching Labs for electives	New courses like Data science, fundamentals of cyber security with lab are offered in III Semester – R20 regulations	Fundamentals of Cyber Security with Lab, Fundamental of Data Science lab
7	Faculty	Introduce nodeJS , jason parsing in IWT	Internet and Web Technologies course syllabus updated	BOS 2021 Internet and Web Technologies
8	Faculty	Include Hadoop	Big data Analytics Course is being offered in VII Semester R18 and R20 Syllabus	Big data Analytics
9	Employer	More Application oriented courses to build Systems of Scale and perfect.	Application Oriented Courses Machine Learning, Deep Learning, IOT based , cyber security courses are offered in R20 Syllabus from IV Semester to VIII Semester	Cyber Security, Machine Learning, Deep Learning

10	Parent	Practical Oriented courses	Labs for Professional Electives are introduced from V Semester onwards in R20 Curriculum	Professional Electives Labs, Internet of Things Lab, Soft Computing Lab, Enterprise Application Development
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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
SCHEME OF INSTRUCTIONS AND EXAMINATION
Model Curriculum (R-20)

B.E. (Computer Science and Engineering)

SEMESTER - V

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1.	20CSC19	Formal Language and Automata Theory	3	1	-	3	40	60	4
2.	20CSC20	Operating Systems	3	-	-	3	40	60	3
3.	20CSC21	Data Communication and Computer Networks	3	-	-	3	40	60	3
4.	20CSC22	Software Engineering	3	-	-	3	40	60	3
5.	20CSEXX	Professional Elective-I	3	-	-	3	40	60	3
6.	20XXXXXX	Open Elective-I	3	-	-	3	40	60	3
PRACTICAL									
7.	20CSC23	Operating Systems Lab	-	-	3	3	50	50	1.5
8.	20CSC24	Data Communication and Computer Networks Lab	-	-	3	3	50	50	1.5
9.	20CSC25	Case Studies using UML Lab	-	-	2	3	50	50	1
10.	20CSI02	Internship-II (Industrial / Rural Internship)	3 to 4 weeks / 90 Hours			-	50	-	2
Total			18	1	8	-	440	510	25

L: Lecture

T: Tutorial

D: Drawing

P: Practical

CIE - Continuous Internal Evaluation

SEE - Semester End Examination

Professional Elective – I		Open Elective - I	
20CSE01	Image Processing and Computer Vision	20ECO10	Fundamentals of Wireless Communication
20CSE02	Advanced Databases	20EEO05	Waste Management
20CSE03	System Modelling and Simulation	20MEO09	Organizational Behaviour
20CSE04	Free and Open Source Technologies	20MTO03	Quantum Computing
20CSE05	Optimization Techniques	20BTO04	Bioinformatics

20CSE06

SOFT COMPUTING
(Professional Elective – II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Linear Algebra & Calculus, Differential Equations and Transform Theory.

Course Objectives: The objectives of this course are,

1. To learn various types of soft computing techniques and their applications.
2. To acquire the knowledge of neural network architectures, learning methods and algorithms.
3. To understand Fuzzy logic, Genetic algorithms and their applications.

Course Outcomes: On Successful completion of this course, student will be able to,

1. Understand various soft computing concepts and techniques.
2. Analyze and design various learning models.
3. Apply the Neural Network Architecture for various Real time applications.
4. Examine and approximate reasoning using fuzzy logic.
5. Design Genetic algorithms in different applications.
6. Develop soft computing techniques to solve different applications.

UNIT - I

Soft computing vs. Hard computing, Various types of soft computing techniques.

Artificial Neural Networks: Fundamental concepts, Evolution of neural networks, Basic models of artificial neural network, important terminologies of ANNs. McCulloch-Pitts neuron, linear separability, Hebb network.

UNIT - II

Supervised Learning Neural Networks: Perceptron networks, Adaptive linear neuron (Adaline), Multiple Adaptive linear neuron (Madaline), Back propagation network.

UNIT - III

Unsupervised Learning Neural Networks: Kohonen Self Organizing networks, Adaptive resonance theory.

Associate Memory Networks: Bidirectional associative memory network, Hopfield networks.

UNIT - IV

Fuzzy Logic: Introduction to classical sets and Fuzzy sets, Fuzzy relations, Tolerance and equivalence relations, Membership functions, Defuzzification.

UNIT - V

Genetic Algorithms: Introduction, Basic operators and terminology, Traditional algorithm vs. genetic algorithm, Simple genetic algorithm, General genetic algorithm, Classification of genetic algorithm, Genetic programming, Applications of genetic algorithm.

Text Books:

1. S.N. Sivanandam & S.N. Deepa, "Principles of soft computing", Wiley publications, 2nd Edition, 2011.
2. Soft Computing – Ikvinderpal Singh, Khanna Book Publishing 2015.

Suggested Reading:

1. S. Rajasekaran, G.A. Vijayalakshmpai, "Neural Networks, Fuzzy logic & Genetic Algorithms, Synthesis & Applications", PHI publication, 2008.
2. LiMin Fu, "Neural Networks in Computer Intelligence", McGraw-Hill edition, 1994.
3. K.L. Du & M.N.S Swamy, "Neural Networks in a Soft Computing Framework", Springer International edition, 2008.
4. Simon Haykins, "Neural Networks a Comprehensive Foundation", PHI, second edition.
5. Goldberg, David E., "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, New Delhi, 2002.
6. Learning and Soft Computing by Kecman, Pearson Education, 2001.

7. N.P. Padhy and S.P. Simon, "Soft Computing: With Matlab Programming", Oxford University Press, 2015.
8. Neuro fuzzy and soft computing by Jang, Pearson Education, 1996.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_cs13/preview.
2. <https://archive.nptel.ac.in/courses/106/105/106105173/>

20CSE07**INTERNET OF THINGS
(Professional Elective – II)**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Computer architecture and microprocessor, Programming for problem solving.

Course Objectives: The objectives of this course are,

1. To understand the architecture, basics and applications of IoT.
2. To impart practical knowledge on components of IoT.
3. To develop skills required for building real-time IoT based projects.

Course Outcomes: On successful completion of the course, students will be able to,

1. Understand IoT, its hardware and software components.
2. Comprehend I/O interface and programming APIs.
3. Analyze the use of communication protocols in IoT.
4. Explore Solution framework for IoT applications.
5. Illustrate unstructured data storage.
6. Develop real time IoT based projects.

UNIT - I

Introduction to IoT: Architectural Overview, Design principles and requirements of IoT, IoT Applications.

Elements of IoT: Basics of networking, sensors, actuators, computing devices, software, data management and processing environment and Security issues.

UNIT - II

IoT Hardware Components: Computing (Arduino, Raspberry Pi), Communication modules, Sensors, Actuators, I/O interfaces, Programming APIs.

UNIT - III

IoT Data Protocols: MQTT, CoAP, AMQP, DDS, HTTP, WebSocket

Network Protocols for IoT: 6LowPAN, RPL, IPV6, WiFi, Bluetooth, ZigBee, Z-Wave, LoRaWan, MQTT, XMPP

UNIT - IV

IoT Application Development: Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT - V

IoT Case Studies: IoT case studies based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation.

Text Books:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2018.
3. Arshdeep Bahga and Vijay Madiseti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Suggested Reading:

1. Dr. SRN Reddy, Rachit Timkral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs, 2018.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013.
3. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill, 2017.

4. Cuno Pfister, "Getting Started with the Internet of Things", O' Reilly Media, 2011.

Online Resources / Weblinks / NPTEL Courses:

1. Li Da Xu, Wu He, and Shancang Li, "Internet of Things in Industries: A Survey", IEEE Transactions on Industrial Informatics, Vol. 10, No. 4, Nov. 2014.
2. T. Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik, JP. Vasseur, R. Alexander, "RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks", IETF, Standards Track, Mar. 2012.
3. Z. Shelby, K. Hartke, C. Bormann, "The Constrained Application Protocol (CoAP)", Internet Engineering Task Force (IETF), Standards Track, 2014.
4. L.Fenzel, "What's The Difference Between IEEE 802.15.4 And ZigBee Wireless?", Electronic Design (Online), Mar. 2013.
5. S. N. Das and S. Misra, "Information theoretic self-management of Wireless Sensor Networks", Proceedings of NCC 2013.
6. F. Luo *et al.*, "A Distributed Gateway Selection Algorithm for UAV Networks," in IEEE Transactions on Emerging Topics in Computing, vol. 3, no. 1, pp. 22-33, March 2015.
7. https://onlinecourses.nptel.ac.in/noc19_cs31/
8. <https://www.nabto.com/guide-iot-protocols-standards/>

20CSE08**ENTERPRISE APPLICATION DEVELOPMENT
(Professional Elective – II)**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Internet and web technologies, OOPs, Database management systems.

Course Objectives: The objectives of this course are,

1. To provide good understanding of latest web technologies on client side components like ReactJS and Angular2
2. To acquire knowledge on web frameworks, develop server side web applications like Node.js and Express
3. To develop innovative web applications using various technologies.

Course Outcomes: On successful completion of the course, students will be able to,

1. Understand the database connectivity and application servers.
2. Explore the type of forms with validations using ReactJS.
3. Utilize Express framework to develop responsive web applications.
4. Demonstrate the architecture and file system of NodeJs.
5. Identify the significance of component intercommunication with Angular2.
6. Adapt MEAN or MERN stack to implement a real-time web application.

UNIT - I

Introduction to Full stack development and NoSQL

MongoDB: Basics, Configuring Server and Client, MongoDB Compass, Creating Database, MongoDB Commands, MongoDB CRUD Operations.

REST: Introduction to REST and API, REST Constraints, Representations, Resource Identifier, REST Actions, Status Codes.

UNIT - II

NodeJs: Introduction, NodeJS Features and Drawbacks, setup Environment for NodeJs, NodeJS Program architecture, NodeJS Web Server, NodeJS Global Objects, NodeJS OS Objects, NodeJS Error Handling, Node JS Event Loop, NodeJS File System, Async and Sync, Connecting with Database, Handling CRUD Operations.

UNIT - III

Building an Express web application: Introduction to Express, Installation of Express, Create first Express application, the application request and response objects, configuring an Express application, rendering views, Authentication, Authorization.

UNIT - IV

Introduction to ReactJS: React Components, React State and Props

Component intercommunication: Component Composition, pass data from parent to child, pass data from child to parent, Fetching data API using axios, Types of forms, Form Validations, Posting Data, React Router, Building & Deploying React App.

UNIT - V

Introduction to Angular2: Angular2 Architecture (Component-Based Architecture), Consuming API, State Management, Validation, Routing. Passing data from parent to child and Passing data between siblings.

Angular2 Specific: Directives, Modules, Components, Observables, Binding, Pipes, Dependency Injection.

Text Books:

1. Amos Q. Haviv, MEAN Web Development, Second Edition, Packt Publications, November 2016.
2. Vasan Subramanian, "Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node", 2nd Edition, APress.
3. Fernando Doglio, "REST API Development with Node.js", 2nd Edition, APress.

Suggested Reading:

1. Shelly Powers, "Learning Node: Moving to the Server-Side", 2nd Edition, O'REILLY, 2016.
2. Simon D. Holmes and Clive Harber, "Getting MEAN with Mongo, Express, Angular, and Node", Second Edition, Manning Publications, 2019
3. Brad Dayley, "Node.js, MongoDB and Angular Web Development", 2nd Edition, Addison-Wesley Professional, 2017.

Online Resources:

1. <https://www.mongodbtutorial.org/mongodb-crud/>
2. <https://reactjs.org/tutorial/tutorial.html>
3. <https://www.javatpoint.com/expressjs-tutorial>
4. <https://www.javatpoint.com/nodejs-tutorial>
5. <https://angular-training-guide.rangle.io/>

20CSE09**MACHINE LEARNING
(Professional Elective – II)**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Linear Algebra and Calculus, Artificial Intelligence.

Course Objectives: The objectives of this course are,

1. To understand the need and elements of Machine Learning
2. To study various machine learning techniques.
3. To design solutions for real world problems using machine learning techniques.

Course Outcomes: On successful of the course student will be able to,

1. Define the basic concepts related to Machine Learning.
2. Recognize the underlying mathematical relationships across ML algorithms and their paradigms.
3. Determine the various applications of Machine Learning.
4. Model, design and develop solutions to real world problems using Machine Learning Algorithms.
5. Evaluate and interpret the results of the various machine learning tools.

UNIT - I

Introduction to Machine Learning: Introduction, Classic and Adaptive machines, learning Types-Supervised, Unsupervised, deep learning, bio-inspired adaptive systems, Machine Learning, and big data.

Elements of Machine Learning: Data formats, Learnability, Statistical learning concepts, Class balancing, Elements of Information theory.

UNIT - II

Feature Selection and Feature Engineering: Data sets, creating training and test sets, managing categorical data, missing features, data scaling and normalization, whitening, Feature selection and filtering, PCA, Visualization of high-dimensional datasets.

Regression Algorithms: Linear regression, Regression types: Ridge, Lasso, ElasticNet, Robust, Polynomial and Isotonic.

UNIT - III

Classification Algorithms: KNN, Linear classification, logistic regression, grid search, classification metrics, ROC curve.

Naïve Bayes and Discriminant Analysis: Bayes theorem, Naïve Bayes classifiers, Discriminant analysis.

Decision Trees and Ensemble Learning: Binary Decision trees, Introduction, to Ensemble Learning-Random Forests, AdaBoost, Gradient Tree Boosting, Voting classifier.

UNIT - IV

Support Vector Machines: Linear SVM, Kernel based Classification.

Clustering Fundamentals: Basics, K-means, Evaluation methods, DBSCAN, Spectral Clustering, and Hierarchical Clustering.

UNIT - V

Machine Learning Architectures: Data collection, Normalization and regularization, Dimensionality reduction, Data augmentation, Modeling/Grid Search/Cross-validation, Visualization, GPU support, introduction to distributed architectures, Scikit-learn tools for ML architectures.

Text Books:

1. Giuseppe Bonaccorso, "Machine Learning Algorithms", 2nd Edition, Packt, 2018,
2. Tom Mitchel "Machine Learning", Tata McGraW Hill, 2017.

Suggested Reading:

1. Abhishek Vijavargia "Machine Learning using Python", BPB Publications, 1st Edition, 2018
2. ReemaThareja "Python Programming", Oxford Press, 2017

3. Yuxi Liu, "Python Machine Learning by Example", 2nd Edition, PACT, 2017

Online Resources:

1. <https://www.guru99.com/machine-learning-tutorial.htm>
2. https://www.tutorialspoint.com/machine_learning_with_python/index.htm

20CSE10**DEVOPS**
(Professional Elective – II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Database management systems, Operating systems, OOPs.

Course Objectives: The objectives of this course are,

1. To describe the agile relationship between development and IT operations.
2. To understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
3. To implement automated system update and DevOps lifecycle.

Course Outcomes: On successful completion of this course, students will be able to,

1. Identify components of Devops environment.
2. Describe Software development models and architectures of DevOps.
3. Apply different project management, integration, testing and code deployment tools.
4. Investigate different DevOps Software development models.
5. Assess various Devops practices.
6. Collaborate and adopt Devops in real-time projects.

UNIT - I

Introduction: Software development models, Introduction to DevOps, Why DevOps, DevOps process and Continuous Delivery, Delivery pipeline, Release management, Scrum, Kanban DevOps Architecture, DevOps Workflow DevOps Lifecycle for Business Agility, and Continuous Testing.

UNIT - II

Introduction to project management: The need for source code control, the history of source code management, Git - **A version control tool**, Version Control System and Types, CVCS and DVCS.

Git Essentials: Creating repository, Cloning, check-in and committing, Fetch pull and remote, Branching.

UNIT - III

Jenkins - Continuous integration: Introduction to Continuous Integration, Build & Release and relation with DevOps Why continuous integration, Nodes/Slaves, Managing plugins, Managing Software Versions.

Build Tools: Overview of Maven, Virtualization, and Virtualization in DevOps Understand Containers Docker - A containerization technology.

UNIT - IV

Testing Tools and automation: Testing Tools and automation: Various types of testing, Automation of testing Pros and cons, Selenium -Introduction, Selenium features, Testing backend integration points, Test-driven development, REPL-driven development.

Deployment Tools: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, SaltStack.

UNIT - V

Code monitoring and Issue Tracking: Code monitoring tools Nagios, Munin, Ganglia, Log handling. Introduction to issue trackers, Need of issue tracker: Workflows and issues.

Trackers tools: Bugzilla, GitLab tracker, and Jira.

Text Books:

1. Joakim Verona, "Practical Devops", Second Edition. Ingram short title; 2nd edition, 2018.
2. Deepak Gaikwad, Viral Thakkar, "DevOps Tools from Practitioner's Viewpoint". Wiley publications, 2019.

Suggested Reading:

1. Len Bass, Ingo Weber, Liming Zhu, "DevOps: A Software Architect's Perspective". Addison Wesley, 1st Edition, 2015.

Online Resources:

1. <https://www.coursera.org/learn/intro-to-devops>
2. <https://www.tutorialspoint.com/introduction-to-devops/index.asp>

20CSE11**NATURAL LANGUAGE PROCESSING
(Professional Elective – III)**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Artificial Intelligence, Compiler Design.

Course Objectives: The objectives of this course are,

1. To learn the fundamentals of natural language processing.
2. To understand the various text processing techniques in NLP.
3. To understand the role Text Classification Deep Learning for Text Classification techniques of NLP
4. To use Topic Modelling, Case Studies and apply the NLP techniques to IR applications.

Course Outcomes: On successful completion of the course, students will be able to,

1. Understand the basic concepts of Natural language processing pipeline and applications of NLP.
2. Illustrate various text representation techniques in NLP.
3. Analyse text classification techniques and deep learning basics to process natural language text.
4. Explore text summarization methods and example systems.
5. Demonstrate levels of NLP for several case studies.
6. Apply NLP Pipe lines to solve real world applications.

UNIT - I

NLP: A Primer, NLP in the Real World, NLP Tasks, NLP Levels, What Is Language? Building Blocks of Language, Why Is NLP Challenging? Machine Learning and Overview Approaches to NLP, Heuristics-Based, Machine Learning, Deep Learning for NLP.

NLP Pipeline: Data Acquisition, Pre-Processing Preliminaries Frequent Steps, Advanced Processing Feature Engineering Classical NLP/ML Pipeline DL Pipeline Modeling, Evaluation of Models, Post-Modeling Phases.

UNIT - II

Text Representation Vector Space Models Basic Vectorization Approaches, One-Hot Encoding Bag of Words, Bag of N-Grams, TF-IDF, Distributed Representations, Word Embedding, Going Beyond Words, Distributed Representations.

UNIT - III

Text Classification Applications One Pipeline, Many Classifiers, Using Neural Embeddings in Text Classification Deep Learning for Text Classification Interpreting Text Classification Models.

Deep Learning for Text Classification CNNs for Text Classification, LSTMs for Text Classification

UNIT - IV

Topic Modelling Text Summarization, Use Cases Setting Up a Summarizer: An Example Recommender Systems for Textual Data Machine Translation Question-Answering Systems, Social Media, E-Commerce and Retail, Healthcare, Finance, and Law.

UNIT - V

Case Study on NLP Pipeline, Text Classification: Ticketing, Ecommerce, Social media, health care, Recommender systems and other applications of NLP

Text Books:

1. Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta & Harshit Surana "Practical Natural Language Processing: A Comprehensive Guide to Building Real world NLP Systems", O'Reilly Media, Inc., 1st Edition, 2020.
2. James Allen, "Natural Language Understanding", Benjamin Cummings, 2nd edition, 1995.

Suggested Reading:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

Online Resources:

1. <https://nptel.ac.in/courses/106101007/>
2. <http://www.cs.colorado.edu/~martin/sp2.html>
3. <https://web.stanford.edu/~jurafsky/sp3/>

20CSE12**EMBEDDED SYSTEMS
(Professional Elective – III)**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Computer architecture and microprocessor, Digital logic design, Programming for problem solving.

Course Objectives: The objectives of this course are,

1. To be aware of general computing system, embedded system and classification of embedded system.
2. To analyze the core concepts of embedded system and its architecture.
3. To analyze the RTOS for embedded systems.
4. To learn embedded system development environment.
5. To learn to use tools in embedded software development process.

Course Outcomes: On successful of the course student will be able to,

1. Understand the basics of embedded systems.
2. Analyze the core concepts of Embedded System and Embedded System Architecture.
3. Design and develop Embedded System hardware and software using Embedded C.
4. Analyze the operating system for embedded systems.
5. Analyze the embedded system development environment and tools used in embedded software development process.

UNIT - I

Introduction to Embedded Systems: Embedded Systems, Processor embedded into a system, Embedded hardware units and devices in a system, Embedded software in a system, Examples of embedded systems, Design process in Embedded system, Formalization of system design, Design process and design examples (smart card, digital camera, mobile phone), Classification of Embedded Systems, Skills required for embedded system designer.

UNIT - II

Inter process communication and synchronization of processes, Threads and Tasks. Multiple processes in an application, Multiple threads in an application, Tasks, Task states, Task and data, Clear cut distinction between functions, ISRs and tasks and their characteristics. Concept of semaphores, Shared data, Inter process communication, Signal function, Semaphore functions, Message queue functions, Mailbox functions, Pipe functions, Socket functions, RPC functions.

UNIT - III

Real time operating systems: OS services, Process management, Timer functions, Event functions, Memory management, Device, File, IO subsystems management, Interrupt routine in RTOS environment and handling of Interrupt source calls, RTOS, RTOS task scheduling models, Interrupt latency, Response of tasks as performance metrics, OS security issues.

UNIT - IV

8051 interfacing with displays (LED, 7 segment display, LCD), Switch, Relay, Buzzer, D/A and A/D converters, Stepper motor.

Networked Embedded systems, Serial communication protocols, I2C bus, CAN bus, RS232, Introduction to advanced architectures: ARM and SHARC.

UNIT - V

Embedded software Development process tools: Introduction to embedded software development process and tools, Host and Target machines, linking and locating software, Getting embedded software into target system, Issues in hardware - software design and Co-design.

Testing, simulation and debugging techniques and tools: Testing on host machine, Simulators, Laboratory tools.

Text Books:

1. Raj Kamal, "Microcontrollers: Architecture, Programming, Interfacing and System Design", Pearson Education India, 2009.

Suggested Reading:

1. David E. Simon, "An Embedded Software Primer", Pearson Education, 1999.
2. Wayne Wolf, "Computers as Components: Principles of Embedded Computing System Design", Elsevier, 2008.

20CAE04

ALGORITHMIC GAME THEORY
(Professional Elective – III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Linear Algebra and Calculus, Design and analysis of algorithms.

Course Objectives: The objectives of this course are,

1. To understand how to design systems with strategic participants that has good performance guarantees.
2. To understand the study of games from the perspective of algorithms and theoretical computer science.
3. To study the complexity-theoretic hardness of computing equilibria, focusing on Nash equilibria.
4. To study the categories of topics at a basic level: combinatorial games, zero-sum games, non-zero sum games and cooperative games.
5. To obtain familiarity how to Model and analyze conflicting situations using game theory.

Course Outcomes: On successful of this course student will be able to,

1. Acquire knowledge about the real world problems and formulate mathematical models of these problems.
2. Identifying the algorithmic Models for finding the optimal solutions for real world examples.
3. Analyze the major limitations and capabilities of game theory problems.
4. Design and analyze problems using game theory approaches.
5. Explore the real world scenarios of economic and algorithmic interactions using game theory solutions.

UNIT - I

Introduction to Stable Matchings, Men-Optimality of the Men-Proposing Gale-Shapley Algorithm, GS: Cheating, Strategies for Men, GS: Cheating Strategies for Women, Problem, Popular, Strategic Behavior in Popular Matchings, Stable Roommates: Matchings in the Non-bipartite Setting.

UNIT - II

An Introduction to Voting, The Game of Trust - Nicky Case's Interactive Essay, Arrow's Theorem, Gibbard-Satterthwaite Theorem, Domain Restrictions and Multi-winner Elections, Incentive Design in Crowd sourcing Applications, Adversarial Approaches in Deep Learning.

UNIT - III

Algorithmic for computing Market Equilibrium, Tournament fixing and superkings, Tournament Fixing Parameterized by FAS, Tournament Fixing with Bribery, An Introduction to Cake-Cutting, Envy-Freenes and Approximate EF, Sperner's Lemma and Applications, Cake Cutting with a Secret Agent, Fairness Notions for Indivisible Goods.

UNIT - IV

Combinatorial Games: Introduction and examples: N and P positions, Zermelo's Theorem, The game of Hex, Nim games, Sprague-Grundy Theorem, The Sylver Coinage Game, **Zero-Sum Games:** Introduction and examples, Saddle Point Equilibria & the Minimax Theorem, Zero, Mixed Strategies, Properties of Saddle Point Equilibria.

UNIT - V

Iterated elimination of strictly dominated strategies, Lemke-Howson Algorithm, , Evolutionary Stable Strategies, Fictitious Play, Brown-Von Neumann-Nash Dynamics, The Nash Bargaining Problem, Transferable Utility Games, The Core, Characterization of Games with non-empty Core, Shapley Value, The Nucleolus.

Text Books:

1. Noam Nisan, Tim Roughgarden, Eva Tardos, Vijay V. Vazirani (eds), "Algorithmic Game Theory", Cambridge University, 2007.
2. Michael Maschler, Eilon Solan, and Shmuel Zamir "Game Theory", Cambridge University Press, 2013.
3. Y. Narahari "Game Theory and Mechanism Design", World Scientific, 2015.
4. Martin Osborne, "An Introduction to Game Theory", Oxford University Press, 2003.

5. T. Ferguson, "Game Theory", Web Notes.
6. Karlin and Peres, "Game Theory", Alive, AMS.
7. DeVos and Kent, "Game Theory: A Playful Introduction", AMS

Suggested Reading:

1. Robert Duncan Luce "Games and Decisions: Introduction and Critical Survey" (Dover Books on Mathematics), Howard Raiffa, 1989.
2. William Spaniel "Game Theory 101: The Complete Textbook", 2011.
3. John von Neumann, Oskar Morgenstern, "Theory of Games and Economic Behavior", Princeton Univ. Press. 2007.

Online Resources:

1. <https://nptel.ac.in/courses/128106007>
2. <https://nptel.ac.in/courses/110101133>
3. <https://arxiv.org/list/cs.GT/1703>
4. <https://dl.acm.org/doi/book/10.1145/3241304#secAuthors>

20CSE13**ADHOC SENSOR NETWORKS
(Professional Elective – III)**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Data Communication and Computer Networks, IoT.

Course Objectives: The objectives of this course are,

1. To understand the design issues in ad hoc and sensor networks.
2. To learn the different types of MAC protocols.
3. To be familiar with different types of adhoc routing protocols.
4. To get exposure to the TCP issues in adhoc networks.
5. To learn the architecture and protocols of wireless sensor networks.

Course Outcomes: On successful of the course student will be able to,

1. Explain the concepts, network architectures and applications of ad hoc and WSN.
2. Identify different issues in wireless adhoc and sensor networks.
3. Analyze the protocol design issues of adhoc and sensor networks
4. Design routing protocols for adhoc and WSN with respect to protocol design issues.
5. Evaluate the QoS related performance measurements of adhoc and sensor networks.

UNIT - I

Introduction: Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel -mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs): concepts and architectures. Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.

UNIT - II

MAC Protocols for AdHoc Wireless Networks: Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols-Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11.

UNIT - III

Routing Protocols and Transport Layer In AdHoc Wireless Networks : Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

UNIT - IV

Wireless Sensor Networks (WSN) and MAC Protocols: Single node architecture: hardware and software components of a sensor node – WSN Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC-IEEE 802.15.4.

UNIT - V

WSN Routing, Localization & QoS: Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation-QOS in WSN-Energy Efficient Design-Synchronization-Transport Layer issues.

Text Books:

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, 2008.

Suggested Reading:

1. Carlos De Moraes Cordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2006.
2. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication, 2002.

3. Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005.
4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley, 2007.
5. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

20CSE14**SOFTWARE QUALITY TESTING
(Professional Elective – III)**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Software engineering.

Course Objectives: The objectives of this course are,

1. To understand the basics of testing, test planning & design and test team organization.
2. To study the various types of tests in the life cycle of the software product.
3. To build design concepts for system testing and execution.
4. To learn the software quality assurance, metrics and defect prevention techniques.

Course Outcomes: On successful completion of the course, students will be able to,

1. Perform white-box and black-box tests in the life cycle of the software product.
2. Understand system testing and significance of software reliability.
3. Identify defect prevention techniques and SQA metrics.
4. Apply various techniques and standards of SQA.
5. Reduce potential risks to an acceptable level before they occur.

UNIT - I**Software Testing - Concepts, Issues, and Techniques**

Quality Revolution, Verification and Validation, Failure, Error, Fault, and Defect, Objectives of Testing, Testing Activities, Test Case Selection White-Box and Black ,test Planning and design, Test Tools and Automation, Power of Test. Test Team Organization and Management-Test Groups, Software Quality Assurance Group, System Test Team Hierarchy, Team Building.

UNIT - II**System Testing**

System Testing - System Integration Techniques-Incremental, Top Down Bottom Up Sandwich and Big Bang, Software and Hardware Integration, Hardware Design Verification Tests, Hardware and Software Compatibility Matrix Test Plan for System Integration. Built- in Testing. Functional testing - Testing a Function in Context. Boundary Value Analysis, Decision Tables. acceptance testing - Selection of Acceptance Criteria, Acceptance Test Plan, Test Execution Test. software reliability - Fault and Failure, Factors Influencing Software, Reliability Models

UNIT - III**System Test Categories**

System test categories Taxonomy of System Tests, Interface Tests Functionality Tests. GUI Tests, Security Tests Feature Tests, Robustness Tests, Boundary Value Tests Power Cycling Tests Interoperability Tests, Scalability Tests, Stress Tests, Load and Stability Tests, Reliability Tests, Regression Tests, Regulatory Tests. Test Generation from FSM models- State-Oriented Model. Finite-State Machine Transition Tour Method, Testing with State Verification. Test Architectures-Local, distributed, Coordinated, Remote. System test design- Test Design Factors Requirement Identification, modeling a Test Design Process Test Design Preparedness, Metrics, Test Case Design Effectiveness. System test execution- Modeling Defects, Metrics for Monitoring Test Execution .Defect Reports, Defect Causal Analysis, Beta testing, measuring Test Effectiveness.

UNIT - IV**Software Quality**

Software quality - People's Quality Expectations, Frameworks and ISO-9126, McCall's Quality Factors and Criteria - Relationship. Quality Metrics. Quality Characteristics ISO 9000:2000 Software Quality Standard. Maturity models- Test Process Improvement, Testing Maturity Model.

UNIT - V**Software Quality Assurance**

Quality Assurance - Root Cause Analysis, modeling, technologies, standards and methodologies for defect prevention. Fault Tolerance and Failure Containment - Safety Assurance and Damage Control, Hazard analysis using fault-trees and event-trees. Comparing Quality Assurance Techniques and Activities. QA Monitoring and Measurement, Risk Identification for Quantifiable Quality Improvement. Case Study: FSM-Based Testing of Web-Based Applications.

Text Books:

1. Kshirasagar Nak Priyadarshi Tripathy, "Software Testing and Quality Assurance-Theory and Practice", John Wiley & Sons Inc, 2008.
2. Jeff Tian, "Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement", John Wiley & Sons, Inc., Hoboken, New Jersey. 2005.

Suggested Reading:

1. Daniel Galin "Software Quality Assurance - From Theory to Implementation", Pearson Education Ltd. UK, 2004.
2. Milind Limaye "Software Quality Assurance", TMH, New Delhi, 2011.



Department of Computer Science and Engineering

MINUTES OF BOS-MEETING

CSE Department BOS (online) meeting was conducted on 19-04-2021 at 10:30 AM

Agenda

1. Introduction of BOS members
2. Confirmation of minutes of meeting (online) held on 25-07-2020 at 2.00 PM.
3. Approval of R20 UG Syllabus for III and IV semester
4. Scheme of R20 for UG V Semester to VIII Semester
5. Approval of R20 PG scheme and Syllabus of I,II,III,IV Semester
6. Any other item

The following members were present:

Sno	Name	Organization	Designation
1	Dr. G. P. S. Varma	Principal, CBIT	
2	Dr. Y Ramadevi	Head, CSE Dept., CBIT	Chairperson
3	Dr. K Shyamala	Head, CSE Dept., OUCE	Nominee from OU
4	Dr. Praveen Tammana	Assistant Professor, Dept. of CSE, IIT Hyderabad	Academic Expert
5	Dr. Nagender Kumar S	Associate Professor, SCIS, University of Hyderabad Central University	Academic Expert
6	Mr. Srikanth Srinivasan	Sr. Director & Head - Membership & Outreach	Member, Corporate
7	Mr. Vinod Kumar	CEO, Kernelsphere Technologies Pvt. Ltd . Konnect Solutions Pvt. Ltd	Member from Industry
8	Mr. Akash Sinha	Head, Learning and Development, L4G, Hyderabad	Member from Industry
9	Mr. M. Nagarjuna Reddy	Team Manager, SAP Labs India Pvt. Ltd. (PG Alumni)	Member from Industry
10	Prof. M Swamy Das	Professor, CSE Dept.	Member
11	Dr. K Sagar	Professor, CSE Dept.	Member
12	Prof. N Ramadevi	Professor, CSE Dept.	Member
13	Dr. R. Ravinder Reddy	Associate Professor, CSE Dept.	Member
14	Dr. E. Padmalatha	Assistant Professor, CSE Dept.	Member
15	Dr. T. Sridevi	Associate Professor, CSE Dept.	Member
16	Dr. Sangeeta Gupta	Associate Professor, CSE Dept.	Member
17	Smt. A. Sangeetha	Assistant Professor, CSE Dept.	Member
18	Smt. T. Suvarna Kumari	Assistant Professor, CSE Dept.	Member
19	Smt. P Vimala Manohara Ruth	Assistant Professor, CSE Dept.	Member
20	Smt. S. Durga Devi	Assistant Professor, CSE Dept.	Invitee

- The Chairperson welcomed the new BoS members and briefed about the Institute Vision, Mission and Department Vision and Mission.
- Department PEOs, PO, PSO were presented

The Committee has resolved for following modifications

1. Introduction of BOS members

Chairperson introduced Members of the BoS and welcomed all for the Meeting.

2. Confirmation of minutes of meeting (online) held on 25-07-2020 at 2.00 PM.

Minutes of BOS meeting held on 25-07-2020 were confirmed.

3. Approval of R20 UG Syllabus for III and IV semester

- Scheme of III and IV Semesters for three UG programs was presented
- Scheme for BE CSE I to VIII Semester was presented
- Panel has suggested to move core courses such as OS, DCCN, etc., to starting semesters.
 - OS has been moved from V Sem to IV Sem
 - DCCN has been moved from VI to V Sem
- Sensors & Instrumentation is advised to be moved to V Semester and update the syllabus (include analog, microprocessor and microcontroller topics)
- Instead of sensors subject, add any new subject and Unit 1 and 2 of Sensors into BEE
- CAMP (L+P) can split it into Computer Organization Theory and the Microprocessors part is moved to V Semester and clubbed with Sensors & Instrumentation (L+P)
- Internet & Web Technologies advised to include the topics – concentrate more on java script, add bootstrap, node JS and json parsing, MVC
After Discussion it was resolved to have 2 hours theory and four hours practicals
- Move IOT and Cloud Computing from Track-2 to Track-5 of Software Systems Engineering
- Statistics text book by Neil Weiss to be included in P&S and also cover topics related to Regression and Time series analysis which will be more inclined to Data Science.
- Advised to include Hadoop GPU, API's in Data Engineering
- Add Data analysis (statistics) and visualization in Data Science Track
- Add Data Engineering in Data Science Track
- The panel suggested to change the subject from Network Security to IOT Security
- Keep Advanced Databases in Data Science Track and include the real time databases, parallel databases.
- In DBMS, latest editions of text books to be included. In DBMS Lab, experiments need to be updated. Advised to concentrate on PL/SQL programs.
- Advised to move searching and sorting topics to Unit-3 in Basics of Data Structures

Suggestions were considered

4. Scheme of R20 for UG V Semester to VIII Semester

Scheme of R20 for UG V Semester to VIII Semester was approved with suggestions to complete all core subjects before VI semester. All professional Electives to be categorized into different Tracks

Include Wireless communication Technology in DCCN or Professional Elective or Mobile Computing

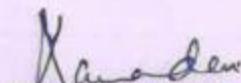
5. Approval of R20 PG scheme and Syllabus of I,II,III,IV Semester

a. In the BOS meeting held on 25-07-2020, R19M.Tech approval was given for the redefined Course objectives and outcomes. The same scheme and syllabus will be with code change to R20 for the academic year 2020-21

b. The evaluation process is changed from 30/ 70 to 40/60 (CIE / SEE) as per the Institute guidelines of R20.

6. Any other item

- Members expressed that Engineering Exploration should be specific to programs. They approved the syllabus of Design thinking, AI tools and Techniques and suggested that it can be implemented for all students admitted from 2021-22 onward.
- Basics of Data Structure (T & L) for non CSE , IT, AI&DS branches was approved
- OOPS using Python(T&L) for BioTechnology was presented and approved
- Additional Minor Engineering and Honors degree courses were to be categorized in tracks and equivalent MOOCs/ courser etc to be identified
- Members from Industry expressed their willingness to extend their cooperation and coordination for providing Internship opportunities, Placements Assistance and Career Guidance for the benefit of the students.
- They expressed to extend their support in organizing Faculty Development Programs, Workshops Conferences on Latest emerging Technologies, to carry out Research Activities and Consultancy.


Chairperson, BOS

20CSE35**AUGMENTED REALITY AND VIRTUAL REALITY
(Professional Elective – VI)**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Programming for problem solving, Internet and web technologies, machine learning, deep learning.

Course Objectives: The objectives of this course are,

1. To explore the history of spatial computing and design interactions.
2. To understand the fundamental principles describing how hardware, computer vision algorithms functions.
3. To learn Virtual reality animation and 3D Art optimization.
4. To demonstrate Virtual reality.
5. To develop visualization tools.

Course Outcomes: On successful completion of the course, students will be able to,

1. Explain how the humans interact with computers.
2. Understand the design and implementation of the technologies for AR and VR systems.
3. Apply technical and creative approaches to make successful applications and experiences.
4. Design audio and video interaction paradigms.
5. Understand AR and VR best practices.
6. Apply VR/MR/AR in various fields in industry.

UNIT - I

How Humans interact with Computers: Introduction, modalities through the ages, types of common HCI modalities, new modalities, the current state of modalities for spatial computing devices, current controllers for immersive computing systems, hand tracking and hand pose recognition.

Designing for Senses: Envisioning a future, sensory technology explained, Sensory design, five sensory principles, Adobe's AR story.

UNIT - II

Virtual Reality for Art: A more natural way of making 3D art, VR for animation.

3D art optimization: Introduction, draw calls, using VR tools for creating 3D art, acquiring 3D models vs making them from scratch.

How augmented reality works: a brief history of AR, how and why to select an AR platform, mapping, platforms, other development considerations, the AR cloud.

UNIT - III

Virtual reality and augmented reality: cross platform theory, the role of game engines, understanding 3D graphics, portability lessons from video game design, simplifying the controller input.

Virtual reality toolkit: open source framework for the community.

UNIT - IV

Virtual Reality and Augmented Reality Development Best Practices: Handling Locomotion in VR and AR, Effective Use of Audio in VR and AR, Common Interactions Paradigms.

Character AI and Behaviors: Introduction, behaviors, current practice: Reactive AI, more intelligence in the system, Deliberative AI, machine learning.

UNIT - V

Use Cases in Embodied Reality

The virtual and augmented reality health technology ecosystem: VR/AR health technology application design, case studies.

Key Principles of AR and VR for Sports

Virtual Reality Enterprise Training Use Cases and Ideal Training Scenarios.

Text Books:

1. Erin Pangilinan, Steve Lukas and Vasanth Mohan, "Creating Augmented & Virtual Realities: Theory and Practice for Next-Generation Spatial Computing", 1st edition, O'REILLY, 2019.
2. Steve Aukstakalnis, "Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR", Pearson Education, 2017.
3. Schmalstieg and Hollerer, "Augmented Reality: Principles & Practice", Pearson Education, 2016.
4. Paul Mealy, "Virtual & Augmented Reality", John Wiley & Sons, 2018.

Suggested Reading:

1. Greengard, Samuel, "Virtual Reality", MIT Press, 2019.
2. Robert Scoble, Shel Israel, "The Fourth Transformation: How Augmented Reality & Artificial Intelligence Will Change Everything", Patrick Brewster Press, 1st Edition, 2016.
3. Tony Parisi, "Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile", O'Reilly Media; 1st Edition, 2015.
4. Tony Parisi, "Programming 3D Applications with HTML5 and WebGL: 3D Animation and Visualization for Web Pages", O'Reilly Media; 1 Edition, 2014.
5. Jos Dirksen, "Learning Three.js: The JavaScript 3D Library for WebGL", 2nd Revised Edition, Packt Publishing, 2015.
6. Jos Dirksen, "Learning Three.js: programming 3D animations and visualizations for the web with HTML5 and WebGL", 3rd Edition, 2018.

20CSE22**BIG DATA ANALYTICS
(Professional Elective – IV)**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Database management systems, Programming for problem solving, OOPs.

Course Objectives: The objectives of this course are,

1. To understand the need of Big Data, challenges and different analytical architectures.
2. To understand Hadoop Architecture and its ecosystems.
3. To understand processing of Big Data with advanced architectures like Spark.

Course Outcomes: On successful completion of the course, students will be able to,

1. Demonstrate knowledge of Big Data, Data Analytics, challenges and their solutions in Big Data.
2. Discuss about Hadoop Framework and eco systems.
3. Understand and work on NoSQL environment and MongoDB.
4. Explain and Analyse the Big Data using Map-reduce programming in Both Hadoop and Spark framework.
5. Demonstrate spark programming with Python/R programming languages.
6. Explain and Analyse the data Analytics algorithms in Spark

UNIT - I

Introduction to big data: Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured - Sources of data. Big Data Evolution -Definition of big data-Characteristics and Need of big data-Challenges of big data.

Big data analytics: Overview of business intelligence, Data science and Analytics– Big Data Analytics - Typical Analytical Architecture – Classification of analytics.

UNIT - II

Big data technologies and Databases: Hadoop – Requirement of Hadoop Framework - Design principle of Hadoop –Comparison with other system (SQL,RDBMS) - Hadoop Components – Architecture -Hadoop 1 vs Hadoop 2 – HDFS.

MapReduce and YARN framework: Introduction to MapReduce , Processing data with Hadoop using MapReduce, Introduction to YARN, Architecture, Managing Resources and Applications with Hadoop YARN.

UNIT – III

Big data technologies and Databases: NoSQL: Introduction to NoSQL - Features and Types- Advantages &Disadvantages -Application of NoSQL. **NewSQL:** Overview of NewSQL - Comparing SQL, NoSQL and NewSQL.

Mongo DB: Introduction – Features – Data types – Mongo DB Query language – CRUD operations – Arrays – Functions: Count – Sort – Limit – Skip – Aggregate – Map Reduce. Cursors – Indexes – Mongo Import – Mongo Export. **Cassandra:** Introduction – Features – Data types – CQLSH – Key spaces – CRUD operations – Collections – Counter – TTL – Alter commands – Import and Export – Querying System tables.

UNIT - IV

(Big Data Frame Works for Analytics)

Hadoop Frame Work: Map Reduce Programming: I/O formats, Map side join-Reduce Side Join-Secondary Sorting-Pipelining MapReduce jobs

Spark Frame Work: Introduction to Apache spark-How spark works, Programming with RDDs: Create RDD-spark Operations-Data Frame.

UNIT - V

(Data Analytics using ML)

Data Analysis with Spark

Data Exploration: Univariate and Multivariate Analysis. **Data Manipulation:** Feature Extraction- Feature Transform-Feature Selection-**Regression:** Linear Regression

Classification: Decision Trees-Naïve Bayes Classification- **Clustering:** K-means

Text Books:

1. Seema Acharya and Subhashini Chellappan, "Big Data and Analytics", Wiley India Pvt. Ltd., 2016.
2. Mike Frampton, "Mastering Apache Spark", Packt Publishing, 2015.

Suggested Reading:

1. TomWhite, "Hadoop: The Definitive Guide", O'Reilly, 4th Edition, 2015.
2. Mohammed Guller, "Big Data Analytics with Spark", Apress, 2015
3. Donald Miner, Adam Shook, "Map Reduce Design Pattern", O'Reilly, 2012

20ADC11

DATA SCIENCE WITH 'R'

Instruction	3 Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce Data Science with R.
2. To impart knowledge on the concepts of Exploring and Cleaning data.
3. To familiarize Supervised and Unsupervised Techniques.
4. To introduce documentation and deployment using R
5. To familiarize text mining with R.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Explore data operations on files and databases using R programming.
2. Understand deployment of models on different datasets.
3. Apply supervised, unsupervised, ensembling and NLP models on different datasets.
4. Perform Sentiment analysis.
6. Build and evaluate the models.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

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

UNIT-I:

Introduction to data science: The Data Science Process: Roles in a data science project, Stages of a data science project, Setting expectations. **Starting with R and data:** Starting with R, working with data from files, Working with relational databases. **Exploring data:** Using Summary Statistics to spot problems, Spotting problems with graphics and visualization.

UNIT-II

Managing data: cleaning data, Data transformations, Sampling for modeling and validation. **Choosing and evaluating models:** Mapping problems to machine learning tasks, evaluating models, Local interpretable model-agnostic explanations (LIME) for explaining model predictions.

UNIT-III

Supervised Learning: Using Linear Regression, Using Logistic Regression. **Unsupervised methods:** Cluster Analysis, Association rules. **Exploring Advanced Methods:** Using bagging and random forest, using generalized additive models, using kernel methods to increase data separation.

UNIT-IV

Documentation and Deployment: Predicting buzz, Using R markdown to produce milestone documentation, Using comments and version control for running documentation, Deploying models. **Text Mining with R: The tidy text format:** Contrasting tidy text with other data structures, the `unnest_tokens` function, tidying the works of Jane Austen, Word Frequencies.

UNIT-V

Sentiment analysis with Tidy data: The sentiments datasets, Comparing the three sentiment dictionaries, Most common positive and negative words, Word clouds, Looking at units beyond just words, **Analyzing word and document frequency:** tf-idf, Term frequency in Jane Austen’s novels, Zipf’s law, The `bind_tf_idf()` function.

Text Books:

1. Zumel, N., Mount, J., & Porzak, J., “Practical data science with R”, 2nd edition. Shelter Island, NY: Manning, 2019.
2. Julia Silge and David Robinson. “Text Mining with R: A Tidy Approach”, 1st. edition. O’Reilly Media, Inc., 2017

Suggested Reading:

1. Garrett Golemund and Hadley Wickham, “R for data science: import, tidy, transform, visualize, and model data” O’Reilly Media, Inc., 2016.
2. Roger D. Peng, “R programming for data science” (pp. 86-181). Lean pub, 2016.

Web Resources:

1. <https://blog.rstudio.com/>
2. <https://r4ds.had.co.nz/index.html>
2. <https://www.dataquest.io/blog/learn-r-for-data-science/>

20CSE15**SOFT COMPUTING LAB
(Professional Elective – II)**

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Linear Algebra & Calculus, Differential Equations and Transform Theory.

Course Objectives: The objectives of this course are,

1. To illustrate the concepts of simple neuron.
2. To learn the fundamentals of Neural Networks & Feed Forward Networks, Associative Memories & Artificial Neural Networks.
3. To understand the concepts of Fuzzy Logic and Fuzzy Systems, Genetic Algorithms and its design.

Course Outcomes: On successful completion of the course, students will be able to,

1. Implement McCulloch-Pitts model for Boolean operations.
2. Apply perceptron learning algorithm for a given problem.
3. Design and analyze various Neural Networks Architectures.
4. Apply concepts of fuzzy sets on real-time applications.
5. Implement Genetic Algorithms with its operators.
6. Apply soft computing strategies for various real time applications.

List of Experiments:

1. Implementation of Simple Neural Network (McCulloch-Pitts model) for realizing AND Operation and OR operation.
2. Implementation of Perceptron network for realizing NAND operation.
3. Implementation of ANDNOT using ADALINE network.
4. Implementation of XOR problem using MADALINE network.
5. Design and Develop the Back Propagation Algorithm.
6. Implementation of Bidirectional Associative Memory (BAM) network.
7. Implementation of Hopfield Network.
8. Implementation of Membership Functions in Fuzzy Sets.
9. Implementation of Kohonen Self-Organizing Feature Maps (KSOFM) network for Clustering.
10. Implement the Genetic Algorithm for the function $f(x) = x^2$.

Textbooks:

1. S.N. Sivanandam & S.N. Deepa, "Principles of soft computing", Wiley publications, 2nd Edition, 2011.

Suggested Reading:

1. D.K Prathikar, "Soft Computing", Narosa Publishing House, New Delhi, 2008.
2. S.N.Sivanandam, S.N.Deepa "Principles of Soft Computing" Second Edition, Wiley Publication 2016.
3. Satish Kumar, "Neural Networks -A classroom approach"; Second Edition, TMH, 2017.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs54/preview

20CSE16**INTERNET OF THINGS LAB
(Professional Elective – II)**

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Computer architecture and microprocessor, Programming for problem solving.

Course Objectives: The objectives of this course are,

1. To understand the basics of IoT and its components.
2. To impart practical knowledge on IoT applications.
3. To develop skills required for building real-time IoT based projects.

Course Outcomes: On successful completion of the course, students will be able to,

1. Use of various hardware and software IoT components.
2. Perform experiments by Interfacing I/O devices, sensors to Raspberry Pi/Arduino.
3. Understand and analyze communication protocols in IoT.
4. Monitor data and controlling of devices.
5. Develop Real time IoT based projects.

List of Experiments:

1. Introduction to IoT equipments and perform necessary software installation.
2. Write a program to interface LED/Buzzer with Arduino and to turn ON LED for 1sec after every 2 seconds.
3. Write a program to interface Digital sensor PIR with Arduino and to turn ON LED when motion detected.
4. Write a program to interface DHT22 sensor with Arduino and display temperature and humidity readings.
5. Write a program to interface motor using relay with Raspberry Pi. Turn ON motor when the temperature is high.
6. Write a program to interface LCD with Raspberry Pi and print temperature and humidity readings on it.
7. Write a program to interface flame/smoke sensor with Arduino /Raspberry Pi and give an alert message when flame/smoke is detected.
8. Implement any case study using Arduino/Raspberry Pi.

Text Books:

1. Arshdeep Bahga and Vijay Madiseti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Suggested Reading:

1. Dr. SRN Reddy, Rachit Tirnkral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs, 2018.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013.
3. Raj Kamal, "Internet of Things:Architecture and Design", McGraw Hill, 2017.
4. Cuno Pfister, "Getting Started with the Internet of Things", O Reilly Media, 2011.
5. O. Vermesan, P. Friess, "Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers, Series in Communications, 2013.

Online Resources / Weblinks / NPTEL Courses:

1. Li Da Xu, Wu He, and Shancang Li, "Internet of Things in Industries: A Survey ", IEEE Transactions on Industrial Informatics, Vol. 10, No. 4, Nov. 2014.
2. T. Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik, JP. Vasseur, R. Alexander, "RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks", IETF, Standards Track, Mar. 2012.
3. Z. Shelby, K. Hartke, C. Bormann, "The Constrained Application Protocol (CoAP)", Internet Engineering Task Force (IETF), Standards Track, 2014.

4. L.Fenzel, "What's The Difference Between IEEE 802.15.4 And ZigBee Wireless?",*Electronic Design (Online)*, Mar. 2013.
5. S. N. Das and S. Misra, "Information theoretic self-management of Wireless Sensor Networks", *Proceedings of NCC 2013*.
6. F. Luo *et al.*, "A Distributed Gateway Selection Algorithm for UAV Networks," in *IEEE Transactions on Emerging Topics in Computing*, vol. 3, no. 1, pp. 22-33, March 2015.

20CSE17**ENTERPRISE APPLICATION DEVELOPMENT LAB
(Professional Elective – II)**

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Internet and web technologies, OOPs, Database management systems.

Course Objectives: The objectives of this course are,

1. To acquire knowledge on MongoDB, ReactJS, Express, Node.js and Angular2 to develop web applications.
2. Ability to develop dynamic web content using web frameworks.
3. To understand the design and development process of a complete web application.

Course Outcomes: On successful completion of the course, students will be able to,

1. Prepare database connections with application servers.
2. Design user interfaces using ReactJS.
3. Construct strong expertise on Express framework to develop responsive web applications.
4. Create server side applications using Node.js
5. Develop SPA using Angular 2.
6. Invent next culture-shifting web applications.

List of Programs:

1. Installation, configuration and connection establishment of MongoDB.
2. CRUD operations on MongoDB.
3. Building and Deploying React App.
4. Demonstration of component intercommunication using ReactJS
5. Create Express application,
6. Demonstration of authentication and authorization using Express.
7. Data access using Node.js
8. Create a form to edit the data using Angular2
9. A case study on a single platform for all financial data for NSE India.

Textbook:

1. Amos Q. Haviv, MEAN Web Development, Second Edition, Packt Publications, November 2016
2. Vasan Subramanian, "Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node", 2nd Edition, APress.

Suggested Reading:

1. Shelly Powers, "Learning Node: Moving to the Server-Side", 2nd Edition, O'REILLY, 2016.
2. Simon D. Holmes and Clive Harber, "Getting MEAN with Mongo, Express, Angular, and Node", Second Edition, Manning Publications, 2019.
3. Brad Dayley, "Node.js, MongoDB and Angular Web Development", 2nd Edition, Addison-Wesley Professional, 2017.

Online Resources:

1. <https://www.mongodbtutorial.org/mongodb-crud/>
2. <https://reactjs.org/tutorial/tutorial.html>
3. <https://www.javatpoint.com/expressjs-tutorial>
4. <https://www.javatpoint.com/nodejs-tutorial>
5. <https://angular-training-guide.rangle.io/>

20CSE18**MACHINE LEARNING LAB
(Professional Elective – II)**

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Artificial Intelligence, Machine learning.

Course Objectives: The main objectives of this course are,

1. To make use of Data sets in implementing the machine learning algorithms.
2. To implement the machine learning concepts and algorithms.
3. To use real world data and implement machine learning models.

Course Outcomes: On Successful completion of this course, student will be able to,

1. Identify the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
2. Identify and utilize modern tools that are useful for data analysis.
3. Recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.
4. Implement and evaluate various Machine Learning approaches on real world problems
5. Apply Keras and Tensorflow to implement ML techniques.

List of Experiments:

1. Identification and Installation of python environment towards the machine learning, installing python modules/Packages Import scikitlearn, keras and tensorflows etc.
2. Build linear regression model using gradient descent, least squares, polynomial, LASSO and RIDGE approaches also compare all the algorithms and draw a table for all the metrics.
3. Demonstration of decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Demonstration of Logistic Regression for a sample training data set stored as a .CSV file. Calculate the accuracy, precision, and recall for your dataset.
5. Demonstration of Naïve Bayesian classifier for a sample training data set stored as a .CSV file. Calculate the accuracy, precision, and recall for your dataset.
6. Build the decision tree classifier compare its performance with ensemble techniques like random forest, bagging, boosting and voting Demonstrate it with different decision trees.
7. Implementation of Gradient Descent Algorithm using Tensorflow.
8. Case study on supervised learning algorithms.
9. Demonstration of clustering algorithms - k-Means, Agglomerative and DBSCAN to classify for the standard datasets.

Text Books:

1. Giuseppe Bonaccorso, "Machine Learning Algorithms", Packt Publishing, 2017.

20CSE19**DEVOPS LAB
(Professional Elective – II)**

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Database management systems, Operating systems, OOPs.

Course Objectives: The objectives of this course are,

1. To explore the fundamental concepts in Project Life Cycle.
2. To develop skills using tools of DevOps.
3. To examine the application development with different automation tools.

Course Outcomes: On successful completion of this course, students will be able to,

1. Understand the phases of the software development life cycle.
2. Examine the different version control systems.
3. Recognize the importance of the build and deployment tools and test the software application.
4. Deployment of application in production environment.
5. Summaries the software configuration management.
6. Synchronize and provisioning using Puppet and Ansible.

List of Experiments:

1. Git installation and create a repository and perform fetch, pull, branching operations.
2. Jenkins Installation and implement continues Integration and Continues deployment, build a job using Jenkins.
3. To install and configure Docker for creating containers of different Operating System (Virtualization Concept)
4. Deployment Tool (Team City /Ansible) Install Docker and execute commands in a Docker and deploy the application in to Docker file
5. Test the Application using selenium tool.
6. Configuring and establish Connection between Agent and Master using Puppet
7. Install code monitoring tools ex: Nagios..Perform operations
8. Install issue tracker and monitor the workflow of any application and track the issues JIRA tool (Agile management tool)

Text Books:

1. Joakim Verona. "Practical Devops", Second Edition. Ingram short title; 2nd edition, 2018.
2. Deepak Gaikwad, Viral Thakkar, "DevOps Tools from Practitioner's Viewpoint". Wiley publications, 2019.

Suggested Reading:

1. Len Bass, Ingo Weber, Liming Zhu, "DevOps: A Software Architect's Perspective". Addison Wesley, 1st Edition, 2015.

Online Resources:

1. <https://www.coursera.org/learn/intro-to-devops>
2. <https://www.tutorialspoint.com/introduction-to-devops/index.asp>

20CSE08**ENTERPRISE APPLICATION DEVELOPMENT
(Professional Elective – II)**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Internet and web technologies, OOPs, Database management systems.

Course Objectives: The objectives of this course are,

1. To provide good understanding of latest web technologies on client side components like ReactJS and Angular2
2. To acquire knowledge on web frameworks, develop server side web applications like Node.js and Express
3. To develop innovative web applications using various technologies.

Course Outcomes: On successful completion of the course, students will be able to,

1. Understand the database connectivity and application servers.
2. Explore the type of forms with validations using ReactJS.
3. Utilize Express framework to develop responsive web applications.
4. Demonstrate the architecture and file system of NodeJs.
5. Identify the significance of component intercommunication with Angular2.
6. Adapt MEAN or MERN stack to implement a real-time web application.

UNIT - I

Introduction to Full stack development and NoSQL

MongoDB: Basics, Configuring Server and Client, MongoDB Compass, Creating Database, MongoDB Commands, MongoDB CRUD Operations.

REST: Introduction to REST and API, REST Constraints, Representations, Resource Identifier, REST Actions, Status Codes.

UNIT - II

NodeJs: Introduction, NodeJS Features and Drawbacks, setup Environment for NodeJs, NodeJS Program architecture, NodeJS Web Server, NodeJS Global Objects, NodeJS OS Objects, NodeJS Error Handling, Node JS Event Loop, NodeJS File System, Async and Sync, Connecting with Database, Handling CRUD Operations.

UNIT - III

Building an Express web application: Introduction to Express, Installation of Express, Create first Express application, the application request and response objects, configuring an Express application, rendering views, Authentication, Authorization.

UNIT - IV

Introduction to ReactJS: React Components, React State and Props

Component intercommunication: Component Composition, pass data from parent to child, pass data from child to parent, Fetching data API using axios, Types of forms, Form Validations, Posting Data, React Router, Building & Deploying React App.

UNIT - V

Introduction to Angular2: Angular2 Architecture (Component-Based Architecture), Consuming API, State Management, Validation, Routing, Passing data from parent to child and Passing data between siblings.

Angular2 Specific: Directives, Modules, Components, Observables, Binding, Pipes, Dependency Injection.

Text Books:

1. Amos Q. Haviv, MEAN Web Development, Second Edition, Packt Publications, November 2016.
2. Vasan Subramanian, "Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node", 2nd Edition, APRESS.
3. Fernando Doglio, "REST API Development with Node.js", 2nd Edition, APRESS.

Suggested Reading:

1. Shelly Powers, "Learning Node: Moving to the Server-Side", 2nd Edition, O'REILLY, 2016.
2. Simon D. Holmes and Clive Harber, "Getting MEAN with Mongo, Express, Angular, and Node", Second Edition, Manning Publications, 2019
3. Brad Dayley, "Node.js, MongoDB and Angular Web Development", 2nd Edition, Addison-Wesley Professional, 2017.

Online Resources:

1. <https://www.mongodbtutorial.org/mongodb-crud/>
2. <https://reactjs.org/tutorial/tutorial.html>
3. <https://www.javatpoint.com/expressjs-tutorial>
4. <https://www.javatpoint.com/nodejs-tutorial>
5. <https://angular-training-guide.rangle.io/>

20CSC08**DATA STRUCTURES**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Basic knowledge of programming language such as C, C++, Java, Python is preferred (but not mandatory) and some mathematical maturity also will be expected.

Course Objectives: The objectives of this course are

1. Basic linear and non-linear data structures.
2. Analyzing the performance of operations on data structures.
3. Different balanced binary trees, which provides efficient implementation for data structures.

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand the basic concepts of data structures and sorting techniques.
2. Analyze the performance of algorithms.
3. Distinguish between linear and non-linear data structures.
4. Apply linear and non-linear data structures.
5. Identify the significance of balanced search trees, graphs and hashing.
6. Establish a suitable data structure for real world applications.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	1	1	1	-	-	-	-	-	-	-	1	2	2	1	1
CO 2	2	3	2	2	-	-	-	-	-	-	-	1	2	2	1	1
CO 3	2	1	2	-	-	-	-	-	-	-	-	-	2	2	1	1
CO 4	1	2	2	2	-	-	-	-	1	-	-	1	2	2	1	1
CO 5	2	2	1	1	-	-	-	-	-	-	-	1	2	2	1	1
CO 6	2	3	3	-	-	-	-	-	1	-	-	1	2	2	1	1

UNIT - I

Introduction: Data Types, Data structures, Types of Data Structures, Operations, ADTs, Algorithms, Comparison of Algorithms, Complexity, Time-space trade off, Asymptotic Notations. **Recursion:** Introduction, format of recursive functions, recursion Vs. Iteration, examples. **Sorting:** Quick sort, Merge Sort, Selection Sort, Radix sort, Comparison of Sorting Algorithms.

UNIT - II

Linked Lists: Introduction, Linked lists, Representation of linked list, operations on linked list, Comparison of Linked Lists with Arrays and Dynamic Arrays, Types of Linked Lists and operations-Circular Single Linked List, Double Linked List, Circular Double Linked List, Skip List-Definition and uses

UNIT- III

Stacks and Queues: Introduction to stacks, applications of stacks, implementation of stack. Introduction to queues, applications of queues and implementations, Double Ended Queues, Priority Queues and applications

UNIT - IV

Trees: Definitions and Concepts, properties of Binary Trees, types of binary trees, Representation of binary tree, Tree Traversal. **Binary Search Trees:** Representation and operations. Tries- Definition and uses

Heap Tree: Definition, Representation, Heap Sort. **Balanced Search Trees:** AVL Trees

UNIT - V

Graphs: Introduction, Applications of graphs, Graph representations, graph traversals,

Hashing: Introduction, Hashing Functions-Modulo, Middle of Square, Folding, Collision Techniques-Linear Probing, Quadratic Probing, Double Hashing, Separate Chaining.

String Algorithms: Introduction, String Matching Algorithm, Brute Force Method, Rabin-Karp String Matching Algorithm

Text Books:

1. Narasimha karumanchi, "Data Structures and Algorithms Made Easy", Career Monk Publications, 2020
2. S. Sahni and Susan Anderson-Freed, "Fundamentals of Data structures in C", E. Horowitz, Universities Press, 2nd Edition.
3. Reema Thareja, "Data Structures using C", Oxford University Press.
4. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structure and Algorithms in Python", Wiley, 2013.

Suggested Reading:

1. D. S. Kushwaha and A K. Misra, "Data structures A Programming Approach with C", PHI.
2. Seymour Lipschutz, "Data Structures with C", Schaums Outlines, Kindle Edition
3. Kenneth A. Lambert, " Fundamentals of Python: Data Structures", Cengage Learning, 2018
4. D. Samantha, "Classic Data Structures", Prentice Hall India, 2nd Edition, 2013

Online Resources:

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. <https://www.edx.org/course/foundations-of-data-structures>
3. <https://sites.google.com/site/merasemester/data-structures/data-structures-#DS>
4. <https://www.cs.usfca.edu/~galles/visualization/Algorithms>
5. <https://www.coursera.org/specializations/data-structures-algorithms>

20CIC02**FUNDAMENTALS OF CYBER SECURITY AND TOOLS LAB**

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	50 Marks
Credits	1

Pre-requisites: Basic Computer Knowledge

Course Objectives: The objectives of this course are

1. To understand the tools used in Cyber Crimes.
2. To understand the phases involved in planning Cyber Crimes.
3. To configure Defense Security System.

Course Outcomes: On Successful completion of this course, student will be able to

1. Use Foot Printing Tools for Information Gathering.
2. Scan and scrutinize the information gathered.
3. Understand the usage of Sniffer Tools.
4. Become familiar with Attack Launching Tools.
5. Configure the proactive defense system.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/ PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	-	2	3	1	-	1	3	3	-	2	3	3	1
CO 2	2	3	1	3	3	1	-	1	2	2	1	2	3	3	1
CO 3	2	2	2	3	3	1	-	1	2	2	1	2	3	3	1
CO 4	2	2	2	3	3	2	-	1	2	2	-	2	3	3	1
CO 5	2	3	3	2	2	2	-	1	1	1	1	2	3	3	1

LIST OF EXPERIMENTS:

1. Explore Information Gathering Tools (Foot Printing – Network Foot Printing, Website Foot Printing, DNS Footprinting, Social Network Footprinting, Email Footprinting).
2. Explore the tools for Scanning and Scrutinizing the gathered information. (IP Scanner, Port Scanner, Vulnerability Scanner, Web Application Scanner).
3. Introduction to Password Hacking Tools.
4. Analysis of Keylogger Software.
5. Introduction to Malware tools. (Virus dissemination tools, Trojans).
6. Introduction to Phishing & Sniffer Tools.
7. Study and Exploration of Different Attack Launching Tools. (DoS Attacks).
8. Study of Ransomware.

Text Books:

1. Sunit Belpre and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Pvt. Ltd, 2011.
2. Zoom, "Cyber Security Professional Lab Manual".
3. Dr. Eric cole, Dr. Ronald Krutz and James W. Conley, "Network Security Bible", Edition 2, Wiley India Pvt. Ltd, 2010.

Online Resources:

1. <https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks>
2. <https://www.coursera.org/specializations/intro-cyber-security>
3. <https://www.coursera.org/learn/foundations-cybersecurity>
4. https://onlinecourses.swayam2.ac.in/ugc19_hs25/preview

20CIC02**FUNDAMENTALS OF CYBER SECURITY AND TOOLS LAB**

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	50 Marks
Credits	1

Pre-requisites: Basic Computer Knowledge

Course Objectives: The objectives of this course are

1. To understand the tools used in Cyber Crimes.
2. To understand the phases involved in planning Cyber Crimes.
3. To configure Defense Security System.

Course Outcomes: On Successful completion of this course, student will be able to

1. Use Foot Printing Tools for Information Gathering.
2. Scan and scrutinize the information gathered.
3. Understand the usage of Sniffer Tools.
4. Become familiar with Attack Launching Tools.
5. Configure the proactive defense system.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/ PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	-	2	3	1	-	1	3	3	-	2	3	3	1
CO 2	2	3	1	3	3	1	-	1	2	2	1	2	3	3	1
CO 3	2	2	2	3	3	1	-	1	2	2	1	2	3	3	1
CO 4	2	2	2	3	3	2	-	1	2	2	-	2	3	3	1
CO 5	2	3	3	2	2	2	-	1	1	1	1	2	3	3	1

LIST OF EXPERIMENTS:

1. Explore Information Gathering Tools (Foot Printing – Network Foot Printing, Website Foot Printing, DNS Footprinting, Social Network Footprinting, Email Footprinting).
2. Explore the tools for Scanning and Scrutinizing the gathered information. (IP Scanner, Port Scanner, Vulnerability Scanner, Web Application Scanner).
3. Introduction to Password Hacking Tools.
4. Analysis of Keylogger Software.
5. Introduction to Malware tools. (Virus dissemination tools, Trojans).
6. Introduction to Phishing & Sniffer Tools.
7. Study and Exploration of Different Attack Launching Tools. (DoS Attacks).
8. Study of Ransomware.

Text Books:

1. Sunit Belpre and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Pvt. Ltd, 2011.
2. Zoom, "Cyber Security Professional Lab Manual".
3. Dr. Eric cole, Dr. Ronald Krutz and James W. Conley, " Network Security Bible", Edition 2, Wiley India Pvt. Ltd, 2010.

Online Resources:

1. <https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks>
2. <https://www.coursera.org/specializations/intro-cyber-security>
3. <https://www.coursera.org/learn/foundations-cybersecurity>
4. https://onlinecourses.swayam2.ac.in/ugc19_hs25/preview

20CAC02**FUNDAMENTALS OF DATA SCIENCE LAB**

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-Requisites: Probability and Statistics

Course Objectives: The objectives of this course are

1. Understand the significance of data science tools.
2. Apply statistical methods to implement various functionalities.
3. Apply exploratory data analytical techniques to deal with single and multiple variables.

Course Outcomes: On successful completion of this course, Student will be able to:

1. Understand the significance of data science tools.
2. Apply statistical methods to implement functionalities in Numpy, Scipy, Pandas packages.
3. Analyze the significance of Inferential Statistics.
4. Apply Exploratory Data Analytical Techniques to visualize Single variable.
5. Apply Exploratory Data Analytical Techniques to visualize Multiple variables.
6. Analyze the significance of Time Series Forecasting.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1	1	1	1	-	-	-	-	-	1	-	1	1	-	1
CO 2	3	2	-	2	-	-	-	-	-	-	-	-	1	1	-	1
CO 3	3	2	-	2	-	-	-	-	-	-	-	-	1	1	-	1
CO 4	3	1	-	2	-	-	-	-	-	-	-	-	1	1	-	-
CO 5	3	1	-	2	-	-	-	-	-	-	-	-	1	1	-	-
CO 6	3	2	-	2	-	-	-	-	-	-	-	-	1	1	-	1

List of Experiments

1. Identification and Installation of required softwares/Technologies (python/modules).
2. Implementation of statistical methods in Numpy.
3. Implementation of statistical methods in Scipy.
4. Implementation of statistical methods in Pandas.
5. Demonstration of Inferential Statistics-sampling.
6. Demonstration of Hypothesis testing-variants of t-test.
7. Demonstration of statistical methods Anova.
8. Time Series Forecasting with ARIMA model.

Text Books:

1. EMC Education Services "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley Publishers, 2012.
2. Cathy O'Neil and Rachel Schutt, "Doing Data Science", O'Reilly, 2015.
3. Jiawei Han, Micheline Kamber and Jian Pei, Data Mining: Concepts and Techniques, 3rd ed.

Suggested Readings:

1. JojoMoolayil, "Smarter Decisions: The Intersection of IoT and Data Science", PACKT, 2016.
2. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013.
3. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics", IGI Global.
4. Hastie, Trevor, et al., "The elements of statistical learning: Data Mining, Inference, and Prediction", Vol. 2. No. 1. New York: Springer, 2009.

Online Resources:

1. <https://www.topcoder.com/role-of-statistics-in-data-science/>
2. <https://www.logianalytics.com/predictive-analytics/what-is-predictive-analytics/>.
3. <https://data-flair.training/blogs/>

4. <https://www.analyticsvidhya.com/blog/2016/02/time-series-forecasting-codes-python/>
5. <https://conjointly.com/kb/descriptive-statistics/>



Department of Computer Science and Engineering

MINUTES OF BOS-MEETING

CSE Department BOS (online) meeting was conducted on 19-04-2021 at 10:30 AM

Agenda

1. Introduction of BOS members
2. Confirmation of minutes of meeting (online) held on 25-07-2020 at 2.00 PM.
3. Approval of R20 UG Syllabus for III and IV semester
4. Scheme of R20 for UG V Semester to VIII Semester
5. Approval of R20 PG scheme and Syllabus of I,II,III,IV Semester
6. Any other item

The following members were present:

Sno	Name	Organization	Designation
1	Dr. G. P. S. Varma	Principal, CBIT	
2	Dr. Y Ramadevi	Head, CSE Dept., CBIT	Chairperson
3	Dr. K Shyamala	Head, CSE Dept., OUCE	Nominee from OU
4	Dr. Praveen Tammana	Assistant Professor, Dept. of CSE, IIT Hyderabad	Academic Expert
5	Dr. Nagender Kumar S	Associate Professor, SCIS, University of Hyderabad Central University	Academic Expert
6	Mr. Srikanth Srinivasan	Sr. Director & Head - Membership & Outreach	Member, Corporate
7	Mr. Vinod Kumar	CEO, Kernelsphere Technologies Pvt. LTd . Konnect Solutions Pvt. Ltd	Member from Industry
8	Mr. Akash Sinha	Head, Learning and Development, L4G, Hyderabad	Member from Industry
9	Mr. M. Nagarjuna Reddy	Team Manager, SAP Labs India Pvt. Ltd. (PG Alumni)	Member from Industry
10	Prof. M Swamy Das	Professor, CSE Dept.	Member
11	Dr. K Sagar	Professor, CSE Dept.	Member
12	Prof. N Ramadevi	Professor, CSE Dept.	Member
13	Dr. R. Ravinder Reddy	Associate Professor, CSE Dept.	Member
14	Dr. E. Padmalatha	Assistant Professor, CSE Dept.	Member
15	Dr. T. Sridevi	Associate Professor, CSE Dept.	Member
16	Dr. Sangeeta Gupta	Associate Professor, CSE Dept.	Member
17	Smt. A. Sangeetha	Assistant Professor, CSE Dept.	Member
18	Smt. T. Suvarna Kumari	Assistant Professor, CSE Dept.	Member
19	Smt. P Vimala Manohara Ruth	Assistant Professor, CSE Dept.	Member
20	Smt. S. Durga Devi	Assistant Professor, CSE Dept.	Invitee

- The Chairperson welcomed the new BoS members and briefed about the Institute Vision, Mission and Department Vision and Mission.
- Department PEOs, PO, PSO were presented

The Committee has resolved for following modifications

1. Introduction of BOS members

Chairperson introduced Members of the BoS and welcomed all for the Meeting.

2. Confirmation of minutes of meeting (online) held on 25-07-2020 at 2.00 PM.

Minutes of BOS meeting held on 25-07-2020 were confirmed.

3. Approval of R20 UG Syllabus for III and IV semester

- Scheme of III and IV Semesters for three UG programs was presented
- Scheme for BE CSE I to VIII Semester was presented
- Panel has suggested to move core courses such as OS, DCCN, etc., to starting semesters.
 - OS has been moved from V Sem to IV Sem
 - DCCN has been moved from VI to V Sem
- Sensors & Instrumentation is advised to be moved to V Semester and update the syllabus (include analog, microprocessor and microcontroller topics)
- Instead of sensors subject, add any new subject and Unit 1 and 2 of Sensors into BEE
- CAMP (L+P) can split it into Computer Organization Theory and the Microprocessors part is moved to V Semester and clubbed with Sensors & Instrumentation (L+P)
- Internet & Web Technologies advised to include the topics – concentrate more on java script, add bootstrap, node JS and json parsing, MVC
After Discussion it was resolved to have 2 hours theory and four hours practicals
- Move IOT and Cloud Computing from Track-2 to Track-5 of Software Systems Engineering
- Statistics text book by Neil Weiss to be included in P&S and also cover topics related to Regression and Time series analysis which will be more inclined to Data Science.
- Advised to include Hadoop GPU, API's in Data Engineering
- Add Data analysis (statistics) and visualization in Data Science Track
- Add Data Engineering in Data Science Track
- The panel suggested to change the subject from Network Security to IOT Security
- Keep Advanced Databases in Data Science Track and include the real time databases, parallel databases.
- In DBMS, latest editions of text books to be included. In DBMS Lab, experiments need to be updated. Advised to concentrate on PL/SQL programs.
- Advised to move searching and sorting topics to Unit-3 in Basics of Data Structures

Suggestions were considered

4. Scheme of R20 for UG V Semester to VIII Semester

Scheme of R20 for UG V Semester to VIII Semester was approved with suggestions to complete all core subjects before VI semester. All professional Electives to be categorized into different Tracks


Include Wireless communication Technology in DCCN or Professional Elective or Mobile Computing

5. Approval of R20 PG scheme and Syllabus of I,II,III,IV Semester

- a. In the BOS meeting held on 25-07-2020, R19M.Tech approval was given for the redefined Course objectives and outcomes. The same scheme and syllabus will be with code change to R20 for the academic year 2020-21
- b. The evaluation process is changed from 30/ 70 to 40/60 (CIE / SEE) as per the Institute guidelines of R20.

6. Any other item

- Members expressed that Engineering Exploration should be specific to programs. They approved the syllabus of Design thinking, AI tools and Techniques and suggested that it can be implemented for all students admitted from 2021-22 onward.
- Basics of Data Structure (T & L) for non CSE , IT, AI&DS branches was approved
- OOPS using Python(T&L) for BioTechnology was presented and approved
- Additional Minor Engineering and Honors degree courses were to be categorized in tracks and equivalent MOOCs/ courser etc to be identified
- Members from Industry expressed their willingness to extend their cooperation and coordination for providing Internship opportunities, Placements Assistance and Career Guidance for the benefit of the students.
- They expressed to extend their support in organizing Faculty Development Programs, Workshops Conferences on Latest emerging Technologies, to carry out Research Activities and Consultancy.


Chairperson, BOS

20CSC15**INTERNET AND WEB TECHNOLOGIES**

Instruction	2Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	2

Pre-requisites: Programming and Problem Solving, Object Oriented Programming concepts.

Course Objectives: The objectives of this course are

1. Acquire knowledge on XHTML, Java Script and XML to develop client side web applications.
2. Acquire knowledge on web frameworks to develop server side web applications
3. Develop dynamic web content using Django.

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand the technologies required for developing web application.
2. Identify and choose XHTML tags, CSS and java scripts to develop well structured and easily maintained web pages.
3. Design and Develop interactive and innovative web pages using various platforms/technologies like XHTML, CSS, XML, JAVASCRIPT.
4. Create and deploy web applications in web server by using server-side programming concepts like Python.
5. Build a data driven web site using different frameworks and Databases.
6. Evaluate different web applications to implement optimal solutions for real time problems.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	
CO1	2	1	1	1	-	-	-	-	1	-	-	-	-	-	-	-	-
CO2	2	1	1	1	-	-	-	-	1	-	-	-	-	-	-	-	-
CO3	2	2	2	2	3	-	-	-	1	-	-	-	-	-	-	2	2
CO4	2	2	2	2	3	-	-	-	1	3	1	3	-	-	-	-	-
CO5	2	2	2	2	3	3	-	-	1	-	1	3	-	-	2	2	2
CO6	2	2	2	2	3	3	-	3	3	3	3	3	-	-	3	3	3

UNIT – I

Web Basics and Overview: Introduction to Internet, World Wide Web, URL, MIME,HTTP Transactions, Enterprise Application Architecture styles, containers, Client-Side Scripting, Server-Side Scripting, Accessing Web Servers, Apache and MySQL, IDE's.

UNIT – II

XHTML: Introduction to basics of XHTML, Cascading Style Sheets.

XML: Introduction to XML, XML document structure, DTD, Namespaces and XML Schemas.

UNIT - III

The Basics of Java script: Primitive operations and Expressions, Arrays, Functions, Pattern Matching Using Regular Expressions, Document Object Model, Element Access in JavaScript, Events and Event Handling, Handling Events from Body, Button, Text Box and Password Elements.

Dynamic Documents with Java Script: Positioning Elements, Moving Elements, Changing Colors and Fonts, Dynamic Content.

UNIT – IV

Django: Introduction, Models, Templates, supported data bases, URL configuration. Templates, Modifying and Improving the Templates , Creating a Form, Connecting Django with databases, enable Django sessions.

UNIT – V

Applications: Introduction to Ajax, Node.js and JSON.

Bootstrap: Introduction to Bootstrap, bootstrap grid, bootstrap components.

Web Application Frameworks: AngularJS, JQuery, Flask, Web2py, FuelPHP.

Text Books

1. Nigel George, "Build a Website with Django 3", GNW Independent Publishing, Hamilton NSW, Australia,2019
2. HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery), Dreamtech,2017.
3. Robert W Sebesta, "Programming the World Wide Web", Pearson Education, 8th Edition-2013
4. Adrian Holovaty and Jacob Kaplan-Moss "The Definitive Guide to Django Web Development Done Right", après- 2009
5. P.J.Deitel – Deitel, H.M.Deitel – Deitel, "Internet & World Wide Web How To Program", 5th Edition, Prentice Hall, 2007.
6. Miguel Grinberg ,"Flask Web Development", First edition-2014

Suggested Reading

1. Web Technologies, Uttam K Roy, Oxford University Press
2. Chris Bates, "Web Programming, building internet applications", 2nd edition, John Wiley & Sons, 2010.
3. JavaScript for Modern Web Development: Building a Web Application Using HTML, CSS, and Java Script, by Alok Ranjan , Abhilasha Sinha , Ranjit Battwad,bpb,2020.

Online Resources

1. <https://www.w3.org/standards/webdesign/>
2. <https://www.w3schools.com/angular/>
3. <https://www.w3schools.com/jquery/default.asp>
4. <https://www.tutorialspoint.com/flask/index.htm>
5. <https://www.tutorialspoint.com/web2py/index.htm>
6. <https://www.tutorialspoint.com/fuelphp/index.htm>

20CSE22**BIG DATA ANALYTICS
(Professional Elective – IV)**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Database management systems, Programming for problem solving, OOPs.

Course Objectives: The objectives of this course are,

1. To understand the need of Big Data, challenges and different analytical architectures.
2. To understand Hadoop Architecture and its ecosystems.
3. To understand processing of Big Data with advanced architectures like Spark.

Course Outcomes: On successful completion of the course, students will be able to,

1. Demonstrate knowledge of Big Data, Data Analytics, challenges and their solutions in Big Data.
2. Discuss about Hadoop Framework and eco systems.
3. Understand and work on NoSQL environment and MongoDB.
4. Explain and Analyse the Big Data using Map-reduce programming in Both Hadoop and Spark framework.
5. Demonstrate spark programming with Python/R programming languages.
6. Explain and Analyse the data Analytics algorithms in Spark

UNIT - I

Introduction to big data: Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured - Sources of data. Big Data Evolution -Definition of big data-Characteristics and Need of big data-Challenges of big data.

Big data analytics: Overview of business intelligence, Data science and Analytics– Big Data Analytics - Typical Analytical Architecture – Classification of analytics.

UNIT - II

Big data technologies and Databases: Hadoop – Requirement of Hadoop Framework - Design principle of Hadoop –Comparison with other system (SQL,RDBMS) - Hadoop Components – Architecture -Hadoop 1 vs Hadoop 2 – HDFS.

MapReduce and YARN framework: Introduction to MapReduce , Processing data with Hadoop using MapReduce, Introduction to YARN, Architecture, Managing Resources and Applications with Hadoop YARN.

UNIT – III

Big data technologies and Databases: NoSQL: Introduction to NoSQL - Features and Types- Advantages &Disadvantages -Application of NoSQL. **NewSQL:** Overview of NewSQL - Comparing SQL, NoSQL and NewSQL.

Mongo DB: Introduction – Features – Data types – Mongo DB Query language – CRUD operations – Arrays – Functions: Count – Sort – Limit – Skip – Aggregate – Map Reduce. Cursors – Indexes – Mongo Import – Mongo Export. **Cassandra:** Introduction – Features – Data types – CQLSH – Key spaces – CRUD operations – Collections – Counter – TTL – Alter commands – Import and Export – Querying System tables.

UNIT - IV

(Big Data Frame Works for Analytics)

Hadoop Frame Work: Map Reduce Programming: I/O formats, Map side join-Reduce Side Join-Secondary Sorting-Pipelining MapReduce jobs

Spark Frame Work: Introduction to Apache spark-How spark works, Programming with RDDs: Create RDD-spark Operations-Data Frame.

UNIT - V

(Data Analytics using ML)

Data Analysis with Spark

Data Exploration: Univariate and Multivariate Analysis. **Data Manipulation:** Feature Extraction- Feature Transform-Feature Selection-**Regression:** Linear Regression

Classification: Decision Trees-Naïve Bayes Classification- **Clustering:** K-means

Text Books:

1. Seema Acharya and Subhashini Chellappan, "Big Data and Analytics", Wiley India Pvt. Ltd., 2016.
2. Mike Frampton, "Mastering Apache Spark", Packt Publishing, 2015.

Suggested Reading:

1. TomWhite, "Hadoop: The Definitive Guide", O'Reilly, 4th Edition, 2015.
2. Mohammed Guller, "Big Data Analytics with Spark", Apress, 2015
3. Donald Miner, Adam Shook, "Map Reduce Design Pattern", O'Reilly, 2012

20CSE36

CYBER SECURITY
(Professional Elective – IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Operating Systems, Data communications and computer networks, Cryptography and network security.

Course Objectives: The objectives of this course are,

1. To identify and understand methods and tools used in cybercrimes.
2. To collect, process, analyze and present Computer Forensics Evidence.
3. To understand the legal perspectives and organizational implications of cyber security.

Course Outcomes: On Successful completion of this course, student will be able to,

1. List the different types of cybercrimes and analyze legal frameworks to handle cybercrimes.
2. Discuss the cyber offence and vulnerabilities in programming languages.
3. Identify the Tools and Methods used in cybercrimes.
4. Analyze and resolve cyber security issues and laws governing Cyberspace.
5. Describe the need of Digital Forensics and the importance of digital evidence in prosecution.
6. Interpret the commercial activities in the event of significant information security incidents in the Organization.

UNIT - I

Introduction to Cyber Crime: Cyber Crime: Definition and Origins of the Word, Cybercrime and Information Security, Classification of Cyber Crimes, Cyber Crime: The Legal Perspective, Cyber Crime: An Indian Perspective.

UNIT - II

Cyber Offenses: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Buffer Overflow, How Browsers Work, Google Dorking, Scanning the Entire Internet: Masscan and Shodan.

Building Secure Software: Memory corruption attack, Vulnerability in programming language, Virtual memory layout of C Program, Buffer overflow attack in C and C++, Pointer attacks, Heap Overflow, Integer Overflow.

UNIT - III

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, Injection Attacks, SQL Injection, Ransomware, Cross-Site Scripting Attacks, ARP Spoofing Attacks, SYN Floods and detecting SYN Scans.

UNIT – IV

Cyber Security: The Legal Perspectives: Cyber Crime and the Legal Landscape around the World, Need of Cyber laws: the Indian Context, The Indian IT Act, Amendments to IT Act, Positive and weak areas of IT Act, Challenges to Indian Law and Cyber Crime Scenario in India, Digital Signatures and the Indian IT Act, Data Protection Act 2019.

UNIT – V

Understanding Cyber Forensics: Introduction, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Challenges in Computer Forensics.

Cyber Security: Organizational Implications: Introduction, Cost of Cybercrimes and IPR issues, Software Piracy, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Text Books:

1. Sunit Belpre and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Pvt. Ltd, 2011.
2. Malcolm McDonald "Web Security for Developers" Starch Press, June 2020.
3. Daniel G. Graham "Ethical Hacking: A Hands-on Introduction to Breaking in" Starch Press, 2021.
4. Kevin Mandia, Chris Prorise, "Incident Response and computer forensics", Tata McGraw Hill, 2006.

Suggested Reading:

1. Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, "Cyber Security and Cyber Laws", Paperback, 2018.
2. Mark F Grady, Fransesco Parisi, "The Law and Economics of Cyber Security", Cambridge university press, 2006.

Online Resources:

1. https://onlinecourses.swayam2.ac.in/nou19_cs08/preview
2. https://onlinecourses.swayam2.ac.in/cec20_cs15/preview

20CAC04

MACHINE LEARNING

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Linear Algebra and Probability theory basics, Artificial Intelligence

Course Objectives: The objectives of this course are to,

1. Understand the need for Machine Learning
2. Study various machine learning techniques and its applications
3. Design solutions for real world problems using machine learning techniques

Course Outcomes: On Successful completion of the course, students will be able to

1. Define the basic concepts related to Machine Learning.
2. Recognize the underlying mathematical relationships across ML algorithms and their paradigms.
3. Determine the various applications of Machine Learning.
4. Model, design and develop solutions to real world problems using Machine Learning Algorithms.
5. Evaluate and interpret the results of the various machine learning tools.

UNIT - I

Introduction to Machine Learning: Introduction, Classic and Adaptive machines, Learning Types-Supervised, Unsupervised, deep learning, bio-inspired adaptive systems, Machine Learning, and big data.

Elements of Machine Learning: Data formats, Learnability, Statistical learning concepts, Class balancing, Elements of Information theory.

UNIT - II

Feature Selection and Feature Engineering: Data sets, Creating training and test sets, managing categorical data, missing features, data scaling and normalization, whitening, Feature selection and filtering, PCA, Visualization of high-dimensional datasets.

Regression Algorithms: Linear models for regression, Regression types

UNIT - III

Classification Algorithms: KNN, Linear classification, logistic regression, grid search, classification metrics, ROC curve.

Naïve Bayes and Discriminant Analysis: Bayes theorem, Naïve Bayes classifiers, Discriminant analysis.

Decision Trees and Ensemble Learning: Binary Decision trees, Introduction, to Ensemble Learning-Random Forests, AdaBoost, Gradient Tree Boosting, Voting classifier.

UNIT – IV

Support Vector Machines: Linear SVM, Kernel based Classification.

Clustering Fundamentals: Basics, K-means, Evaluation methods, DBSCAN, Spectral Clustering, Hierarchical Clustering.

UNIT – V

Machine Learning Architectures: Data collection, Normalization and regularization, Dimensionality reduction, Data augmentation, Modeling / Grid Search / Cross-validation, Visualization, GPU support, introduction to distributed architectures, Scikit-learn tools for ML architectures, pipelines and feature Unions.

Text Books:

1. Giuseppe Bonaccorso, "Machine Learning Algorithms", 2nd Edition, Packt, 2018,
2. Tom Mitchel "Machine Learning", Tata McGraW Hill, 2017

Suggested Reading:

1. Abhishek Vijavargia "Machine Learning using Python", BPB Publications, 1st Edition, 2018
2. ReemaThareja "Python Programming", Oxford Press, 2017
3. Yuxi Liu, "Python Machine Learning by Example", 2nd Edition, PACT, 2017

Online Resources:

1. <https://www.guru99.com/machine-learning-tutorial.htm>
2. https://www.tutorialspoint.com/machine_learning_with_python/index.htm

20CAC06

DEEP LEARNING FOR COMPUTER VISION

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Artificial intelligence, Machine Learning

Course Objectives: The objectives of this course are

1. To learn the fundamentals of deep learning and the challenging issues.
2. To acquire the knowledge in Deep learning methods, models, Optimizations, Regularizations and algorithms.
3. To understand CNN, RNN and GANs and their applications.

Course Outcomes: On Successful completion of the course, students will be able to,

1. Understand various optimization techniques used in deep learning.
2. Analyze various Autoencoders and Regularization Techniques.
3. Design and Develop various Convolution Neural Networks architectures.
4. Design various RNNs and Encoder Decoder Models.
5. Understand the importance of GANs to develop real-time applications.
6. Evaluate the Performance of different models for deep neural network training.

UNIT - I

Introduction: Feedforward Neural Networks, Representation Power of Feedforward Neural Networks, Historical Trends in Deep Learning, Backpropagation.

Optimization: Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam.

UNIT - II

Autoencoders: relation to PCA, Regularization in autoencoders, Denoising autoencoders, Sparse autoencoders, Contractive autoencoders, **Regularization:** Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout, Greedy Layer wise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization

UNIT - III

Convolutional Neural Network: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types.

LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Backpropagation, Deep Dream, Deep Art, Fooling Convolutional Neural Networks

UNIT – IV

Recurrent Neural Networks, Backpropagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs

Encoder Decoder Models, Attention Mechanism, Attention over images

UNIT – V

Transformers: Getting Started with the model architecture of the Transformer, Fine Tuning BERT Models.

Generative Adversarial Networks (GANs): Introduction, Discriminator, Generator, Activation, Common activation functions for GANs, BCE loss, Conditional GANs, Controllable generation, real life GANs

Text Books:

1. Goodfellow. I., Bengio. Y. and Courville. A., “Deep Learning “, MIT Press, 2016.
2. Rothman, Denis, “Transformers for Natural Language Processing: Build innovative deep neural network architectures for NLP with Python, PyTorch, TensorFlow, BERT, RoBERTa, and more”, Packt Publishing Ltd, 2021.
3. Ganguly Kuntal, “Learning generative adversarial networks: next-generation deep learning simplified”, Packt Publishing, 2017.

Suggested Reading:

1. Tom M. Mitchell, "Machine Learning ",MacGraw Hill, 1997.
2. LiMin Fu, "Neural Networks in Computer Intelligence", McGraw-Hill edition, 1994.
3. Umberto Michelucci "Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks" Apress, 2018.
4. Giancarlo Zaccane, Md. RezaulKarim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
5. Hands-On Computer Vision with TensorFlow 2: Leverage deep learning to create powerful image processing apps with TensorFlow by Benjamin Planche, Eliot Andres, Packt Publishers, 2019
6. Tunstall, Lewis, Leandro von Werra, and Thomas Wolf, "Natural Language Processing with Transformers ", O'Reilly Media, Inc., 2022.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_cs41/
2. https://onlinecourses.nptel.ac.in/noc22_cs22/
3. https://onlinecourses.nptel.ac.in/noc19_cs85/

20CSE08**ENTERPRISE APPLICATION DEVELOPMENT
(Professional Elective – II)**

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Internet and web technologies, OOPs, Database management systems.

Course Objectives: The objectives of this course are,

1. To provide good understanding of latest web technologies on client side components like ReactJS and Angular2
2. To acquire knowledge on web frameworks, develop server side web applications like Node.js and Express
3. To develop innovative web applications using various technologies.

Course Outcomes: On successful completion of the course, students will be able to,

1. Understand the database connectivity and application servers.
2. Explore the type of forms with validations using ReactJS.
3. Utilize Express framework to develop responsive web applications.
4. Demonstrate the architecture and file system of NodeJs.
5. Identify the significance of component intercommunication with Angular2.
6. Adapt MEAN or MERN stack to implement a real-time web application.

UNIT - I

Introduction to Full stack development and NoSQL

MongoDB: Basics, Configuring Server and Client, MongoDB Compass, Creating Database, MongoDB Commands, MongoDB CRUD Operations.

REST: Introduction to REST and API, REST Constraints, Representations, Resource Identifier, REST Actions, Status Codes.

UNIT - II

NodeJs: Introduction, NodeJS Features and Drawbacks, setup Environment for NodeJs, NodeJS Program architecture, NodeJS Web Server, NodeJS Global Objects, NodeJS OS Objects, NodeJS Error Handling, Node JS Event Loop, NodeJS File System, Async and Sync, Connecting with Database, Handling CRUD Operations.

UNIT - III

Building an Express web application: Introduction to Express, Installation of Express, Create first Express application, the application request and response objects, configuring an Express application, rendering views, Authentication, Authorization.

UNIT - IV

Introduction to ReactJS: React Components, React State and Props

Component intercommunication: Component Composition, pass data from parent to child, pass data from child to parent, Fetching data API using axios, Types of forms, Form Validations, Posting Data, React Router, Building & Deploying React App.

UNIT - V

Introduction to Angular2: Angular2 Architecture (Component-Based Architecture), Consuming API, State Management, Validation, Routing. Passing data from parent to child and Passing data between siblings.

Angular2 Specific: Directives, Modules, Components, Observables, Binding, Pipes, Dependency Injection.

Text Books:

1. Amos Q. Haviv, MEAN Web Development, Second Edition, Packt Publications, November 2016.
2. Vasan Subramanian, "Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node", 2nd Edition, APRESS.
3. Fernando Doglio, "REST API Development with Node.js", 2nd Edition, APRESS.

Suggested Reading:

1. Shelly Powers, "Learning Node: Moving to the Server-Side", 2nd Edition, O'REILLY, 2016.
2. Simon D. Holmes and Clive Harber, "Getting MEAN with Mongo, Express, Angular, and Node", Second Edition, Manning Publications, 2019
3. Brad Dayley, "Node.js, MongoDB and Angular Web Development", 2nd Edition, Addison-Wesley Professional, 2017.

Online Resources:

1. <https://www.mongodbtutorial.org/mongodb-crud/>
2. <https://reactjs.org/tutorial/tutorial.html>
3. <https://www.javatpoint.com/expressjs-tutorial>
4. <https://www.javatpoint.com/nodejs-tutorial>
5. <https://angular-training-guide.rangle.io/>

20CSE15**SOFT COMPUTING LAB
(Professional Elective – II)**

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Linear Algebra & Calculus, Differential Equations and Transform Theory.

Course Objectives: The objectives of this course are,

1. To illustrate the concepts of simple neuron.
2. To learn the fundamentals of Neural Networks & Feed Forward Networks, Associative Memories & Artificial Neural Networks.
3. To understand the concepts of Fuzzy Logic and Fuzzy Systems, Genetic Algorithms and its design.

Course Outcomes: On successful completion of the course, students will be able to,

1. Implement McCulloch-Pitts model for Boolean operations.
2. Apply perceptron learning algorithm for a given problem.
3. Design and analyze various Neural Networks Architectures.
4. Apply concepts of fuzzy sets on real-time applications.
5. Implement Genetic Algorithms with its operators.
6. Apply soft computing strategies for various real time applications.

List of Experiments:

1. Implementation of Simple Neural Network (McCulloch-Pitts model) for realizing AND Operation and OR operation.
2. Implementation of Perceptron network for realizing NAND operation.
3. Implementation of ANDNOT using ADALINE network.
4. Implementation of XOR problem using MADALINE network.
5. Design and Develop the Back Propagation Algorithm.
6. Implementation of Bidirectional Associative Memory (BAM) network.
7. Implementation of Hopfield Network.
8. Implementation of Membership Functions in Fuzzy Sets.
9. Implementation of Kohonen Self-Organizing Feature Maps (KSOFM) network for Clustering.
10. Implement the Genetic Algorithm for the function $f(x) = x^2$.

Textbooks:

1. S.N. Sivanandam & S.N. Deepa, "Principles of soft computing", Wiley publications, 2nd Edition, 2011.

Suggested Reading:

1. D.K Prathikar, "Soft Computing", Narosa Publishing House, New Delhi, 2008.
2. S.N.Sivanandam, S.N.Deepa "Principles of Soft Computing" Second Edition, Wiley Publication 2016.
3. Satish Kumar, "Neural Networks -A classroom approach"; Second Edition, TMH, 2017.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs54/preview

20CSE16**INTERNET OF THINGS LAB
(Professional Elective – II)**

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Computer architecture and microprocessor, Programming for problem solving.

Course Objectives: The objectives of this course are,

1. To understand the basics of IoT and its components.
2. To impart practical knowledge on IoT applications.
3. To develop skills required for building real-time IoT based projects.

Course Outcomes: On successful completion of the course, students will be able to,

1. Use of various hardware and software IoT components.
2. Perform experiments by Interfacing I/O devices, sensors to Raspberry Pi/Arduino.
3. Understand and analyze communication protocols in IoT.
4. Monitor data and controlling of devices.
5. Develop Real time IoT based projects.

List of Experiments:

1. Introduction to IoT equipments and perform necessary software installation.
2. Write a program to interface LED/Buzzer with Arduino and to turn ON LED for 1sec after every 2 seconds.
3. Write a program to interface Digital sensor PIR with Arduino and to turn ON LED when motion detected.
4. Write a program to interface DHT22 sensor with Arduino and display temperature and humidity readings.
5. Write a program to interface motor using relay with Raspberry Pi. Turn ON motor when the temperature is high.
6. Write a program to interface LCD with Raspberry Pi and print temperature and humidity readings on it.
7. Write a program to interface flame/smoke sensor with Arduino /Raspberry Pi and give an alert message when flame/smoke is detected.
8. Implement any case study using Arduino/Raspberry Pi.

Text Books:

1. Arshdeep Bahga and Vijay Madiseti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Suggested Reading:

1. Dr. SRN Reddy, Rachit Timkral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs, 2018.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013.
3. Raj Kamal, "Internet of Things:Architecture and Design", McGraw Hill, 2017.
4. Cuno Pfister, "Getting Started with the Internet of Things", O Reilly Media, 2011.
5. O. Vermesan, P. Friess, "Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers, Series in Communications, 2013.

Online Resources / Weblinks / NPTEL Courses:

1. Li Da Xu, Wu He, and Shancang Li, "Internet of Things in Industries: A Survey ", IEEE Transactions on Industrial Informatics, Vol. 10, No. 4, Nov. 2014.
2. T. Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik, JP. Vasseur, R. Alexander, "RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks", IETF, Standards Track, Mar. 2012.
3. Z. Shelby, K. Hartke, C. Bormann, "The Constrained Application Protocol (CoAP)", Internet Engineering Task Force (IETF), Standards Track, 2014.

4. L.Fenzel, "What's The Difference Between IEEE 802.15.4 And ZigBee Wireless?",Electronic Design (Online), Mar. 2013.
5. S. N. Das and S. Misra, "Information theoretic self-management of Wireless Sensor Networks", Proceedings of NCC 2013.
6. F. Luo *et al.*, "A Distributed Gateway Selection Algorithm for UAV Networks," in IEEE Transactions on Emerging Topics in Computing, vol. 3, no. 1, pp. 22-33, March 2015.

20CSE17**ENTERPRISE APPLICATION DEVELOPMENT LAB
(Professional Elective – II)**

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Internet and web technologies, OOPs, Database management systems.

Course Objectives: The objectives of this course are,

1. To acquire knowledge on MongoDB, ReactJS, Express, Node.js and Angular2 to develop web applications.
2. Ability to develop dynamic web content using web frameworks.
3. To understand the design and development process of a complete web application.

Course Outcomes: On successful completion of the course, students will be able to,

1. Prepare database connections with application servers.
2. Design user interfaces using ReactJS.
3. Construct strong expertise on Express framework to develop responsive web applications.
4. Create server side applications using Node.js
5. Develop SPA using Angular 2.
6. Invent next culture-shifting web applications.

List of Programs:

1. Installation, configuration and connection establishment of MongoDB.
2. CRUD operations on MongoDB.
3. Building and Deploying React App.
4. Demonstration of component intercommunication using ReactJS
5. Create Express application,
6. Demonstration of authentication and authorization using Express.
7. Data access using Node.js
8. Create a form to edit the data using Angular2
9. A case study on a single platform for all financial data for NSE India.

Textbook:

1. Amos Q. Haviv, MEAN Web Development, Second Edition, Packt Publications, November 2016
2. Vasam Subramanian, "Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node", 2nd Edition, APress.

Suggested Reading:

1. Shelly Powers, "Learning Node: Moving to the Server-Side", 2nd Edition, O'REILLY, 2016.
2. Simon D. Holmes and Clive Harber, "Getting MEAN with Mongo, Express, Angular, and Node", Second Edition, Manning Publications, 2019.
3. Brad Dayley, "Node.js, MongoDB and Angular Web Development", 2nd Edition, Addison-Wesley Professional, 2017.

Online Resources:

1. <https://www.mongodbtutorial.org/mongodb-crud/>
2. <https://reactjs.org/tutorial/tutorial.html>
3. <https://www.javatpoint.com/expressjs-tutorial>
4. <https://www.javatpoint.com/nodejs-tutorial>
5. <https://angular-training-guide.rangle.io/>

20CSE18**MACHINE LEARNING LAB
(Professional Elective – II)**

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Artificial Intelligence, Machine learning.

Course Objectives: The main objectives of this course are,

1. To make use of Data sets in implementing the machine learning algorithms.
2. To implement the machine learning concepts and algorithms.
3. To use real world data and implement machine learning models.

Course Outcomes: On Successful completion of this course, student will be able to,

1. Identify the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
2. Identify and utilize modern tools that are useful for data analysis.
3. Recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.
4. Implement and evaluate various Machine Learning approaches on real world problems
5. Apply Keras and Tensorflow to implement ML techniques.

List of Experiments:

1. Identification and Installation of python environment towards the machine learning, installing python modules/Packages Import scikitlearn, keras and tensorflows etc.
2. Build linear regression model using gradient descent, least squares, polynomial, LASSO and RIDGE approaches also compare all the algorithms and draw a table for all the metrics.
3. Demonstration of decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Demonstration of Logistic Regression for a sample training data set stored as a .CSV file. Calculate the accuracy, precision, and recall for your dataset.
5. Demonstration of Naïve Bayesian classifier for a sample training data set stored as a .CSV file. Calculate the accuracy, precision, and recall for your dataset.
6. Build the decision tree classifier compare its performance with ensemble techniques like random forest, bagging, boosting and voting Demonstrate it with different decision trees.
7. Implementation of Gradient Descent Algorithm using Tensorflow.
8. Case study on supervised learning algorithms.
9. Demonstration of clustering algorithms - k-Means, Agglomerative and DBSCAN to classify for the standard datasets.

Text Books:

1. Giuseppe Bonaccorso, "Machine Learning Algorithms", Packt Publishing, 2017.

20CSE19**DEVOPS LAB**
(Professional Elective – II)

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Database management systems, Operating systems, OOPs.

Course Objectives: The objectives of this course are,

1. To explore the fundamental concepts in Project Life Cycle.
2. To develop skills using tools of DevOps.
3. To examine the application development with different automation tools.

Course Outcomes: On successful completion of this course, students will be able to,

1. Understand the phases of the software development life cycle.
2. Examine the different version control systems.
3. Recognize the importance of the build and deployment tools and test the software application.
4. Deployment of application in production environment.
5. Summaries the software configuration management.
6. Synchronize and provisioning using Puppet and Ansible.

List of Experiments:

1. Git installation and create a repository and perform fetch, pull, branching operations.
2. Jenkins Installation and implement continues Integration and Continues deployment, build a job using Jenkins.
3. To install and configure Docker for creating containers of different Operating System (Virtualization Concept)
4. Deployment Tool (Team City /Ansible) Install Docker and execute commands in a Docker and deploy the application in to Docker file
5. Test the Application using selenium tool.
6. Configuring and establish Connection between Agent and Master using Puppet
7. Install code monitoring tools ex: Nagios..Perform operations
8. Install issue tracker and monitor the workflow of any application and track the issues JIRA tool (Agile management tool)

Text Books:

1. Joakim Verona. "Practical Devops", Second Edition. Ingram short title; 2nd edition, 2018.
2. Deepak Gaikwad, Viral Thakkar, "DevOps Tools from Practitioner's Viewpoint". Wiley publications, 2019.

Suggested Reading:

1. Len Bass, Ingo Weber, Liming Zhu, "DevOps: A Software Architect's Perspective". Addison Wesley, 1st Edition, 2015.

Online Resources:

1. <https://www.coursera.org/learn/intro-to-devops>
2. <https://www.tutorialspoint.com/introduction-to-devops/index.asp>