SHRI SHANKARACHARYA TECHNICAL CAMUS
BHILAI (C.G.)
(An Autonomous Institution)

SCHEME OF TEACHING AND EXAMINATION
B.Tech. (Bigdata Analytics) (Fifth Semester) Computer Science & Engineering

Sl. No.	Board of Studies (BOS)	Courses	Course Code	Period per Week			Scheme of Examination			Total Marks	Credit
				L	T	P	Theory/Lab				
							ESE	CT	TA		
1	Computer Science & Engineering	Theory of Computation	CS111501	2	1	-	100	20	30	150	3
2	Computer Science & Engineering	Computer Network	CS111502	2	1	-	100	20	30	150	3
3	Computer Science & Engineering	Data Science & Modeling	CS111503	2	1	-	100	20	30	150	3
4	Computer Science & Engineering	Artificial Intelligence Machine Learning	CS111504	2	1	-	100	20	30	150	3
5	Computer Science & Engineering	Professional Elective-I		2	1	-	100	20	30	150	3
6	Computer Science & Engineering	Computer Network Lab	CS111591		-	2	25	-	25	50	1
7	Computer Science & Engineering	Data Science & Modeling Lab	CS111592		-	2	25	-	25	50	1
8	Computer Science & Engineering	Artificial Intelligence Lab	CS111593		-	2	25	-	25	50	1
9	Computer Science & Engineering	Minor Project-I	CS111594		-	2	25	-	25	50	1
10	Computer Science & Engineering	Practical Training/Internship (Reports and Seminar)	CS111595		-	2	-	-	25	25	1
11	Computer Science & Engineering	Constitution of India	CS111596		-	-	-	-	25	25	-
Total				**13**	**2**	**10**	**600**	**100**	**300**	**1000**	**20**

L-Lecture T- Tutorial P-Practical
CT- Class Test TA- Teachers Assessment ESE- End Semester Exam

		July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of Release	Version	

SHRI SHANKARACHARYA TECHNICAL CAMUS
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SCHEME OF TEACHING AND EXAMINATION
B.Tech. (Bigdata Analytics) (Fifth Semester) Computer Science & Engineering

Table-I (Professional Elective-I)

Sl. No.	Board of Studies (BOS)	Courses (Subject)	Course Code	Credit
1	Computer Science & Engineering	Big data Analytics Essential	CS111521	3
2	Computer Science & Engineering	Image Processing	CS111522	3
3	Computer Science & Engineering	Advanced Computer Network	CS111523	3
4	Computer Science & Engineering	System and Network Security	CS111524	3
5	Computer Science & Engineering	Text Mining	CS111525	3

L-Lecture T- Tutorial P-Practical
CT- Class Test TA- Teachers Assessment ESE- End Semester Exam

Subject Code CS111501	Theory Of Computation	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
Formal languages and automata theory deals with the concepts of automata, formal languages, Grammar, computability and decidability. The reasons to study Formal Languages and Automata Theory are Automata Theory provides a simple, elegant view of the complex machine that we call a computer .More precisely, the objectives are: • To give an overview of the theoretical foundations of computer science from the perspective of formal languages. • To illustrate finite state machines to solve problems in computing. • To explain the hierarchy of problems arising in the computer sciences. • To familiarize Regular grammars, context frees grammar. • To solve various problems of applying normal form techniques, push down automata and Turing Machines	On successful completion of the course, the student will be able to: **CO1**.Design finite automata to accept a set of strings of a language. **CO2**.Determine whether the given language is regular or not. . **CO3**.Design context free grammars to generate strings of context free language. **CO4**.Design push down automata and the equivalent context free grammars and Design Turing machine. **CO5**.Distinguish between computability and non-computability, Decidability and un-decidability.

UNIT – I:The Theory Of Automata **CO1**

Introduction to automata theory, Examples of automata machine, Finite automata as a language acceptor and translator, Deterministic finite automata. Non-deterministic finite automata, finite automata with output (Mealy Machine. Moore machine), Finite automata with Epsilon moves, Minimizing number of states of a DFA, My hill Nerode theorem, Properties and limitation of FSM, Application of finite automata. **[8Hrs.]**

UNIT – II: Regular Expressions **CO2**

Alphabet, String and Languages, Regular expression, Properties of RegularExpression, Finite automata and Regular expressions, Arden's Theorem, Regular Expression to DFA conversion &vice versa. Pumping lemma for regular sets, Application of pumping lemma, Regular sets and Regular grammar, Closure properties of regular sets. Decision algorithm for regular sets and regular grammar.

[7Hrs.]

UNIT – III: Grammars **CO3**

Definition and types of grammar, Chomsky hierarchy of grammar, Relation between types of grammars, Context free grammar, Left most & right most derivation trees, Ambiguity in grammar, Simplification of context free grammar, Chomsky Normal From, Greibach Normal From, properties of context free language, Pumping lemma for context free language, Decision algorithm for context tree language.

[7Hrs.]

UNIT – IV: Push Down Automata And Turing Machine **CO4**

Basic definitions, Deterministic push down automata and non-deterministic push down automata, Acceptance of push down automata, Push down automata and context free language, Turing machine model, Representation of Turing Machine, Construction of Turing Machine for simple problem's, Universal Turing machine and other modifications .Church's Hypothesis, , Halting problem of Turing Machine. **[7Hrs.]**

UNIT – V: Computability **CO5**

Introduction and Basic concepts, Recursive function, Partial recursive function, Initial functions, Composition of functions, Ackerman's function, Recursively Enumerable and Recursive languages,

Decidable and decidable problem, Post correspondence problem, Space and time complexity**. [7Hrs.]**

Text Books:

S.No.	Title	Author(s)	Publisher
1	Theory of Computer Science (Automata Language & Computation)	K.L.P. Mishra and N. Chandrasekran	PHI
2	Introduction to Automata theory. Language and Computation	John E. Hopcropt & Jeffery D. Ullman	Narosa, Publishing House

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Introduction to Languages and the Theory of Computation	John Martin,	Tata McGraw Hill.
2	Introduction to Formal Languages Automata Theory and Computation	Kamala Krithivasan, Rama R	2nd Edition, Pearson Education.

Subject Code CS111502	Computer Network	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
To Provide students with 0an enhanced knowledge in Computer Networking. • Understanding concept of local area networks, their topologies, protocols and applications. • Understanding the different protocols, and network architectures. • To make students understand the basic model of data communication and various concepts of networking.	On completion of this course the student will be able to: **CO1:**Describe the basis and structure of an abstract layered Network protocol model. **CO2:** understand the working of network protocols. **CO3:** Students will have deep understanding of various protocols used at Data Link Layer and will be able to analyze the advantages and disadvantages of various available protocols for flow and error control. **CO4:**Students will be able to analyze various Ethernet standards and will be able to choose an appropriate standard according to requirement of LAN. **CO5:** Students will be able to use various network based applications.

UNIT – I : Introduction : **CO1**

History of Computer Network, Examples of Networks: Novell Networks, Arpanet, Internet, Network Topologies WAN, LAN, MAN, PAN,. Applications, networks architecture requirements, ISO-OSI, TCP/IP, XNS, IPX/SPX. **Physical Layer :** Transmission media, switching and encoding, asynchronous communications; Narrow band, broad band ISDN and ATM. Bandwidth calculation. **[8Hrs]**

UNIT – II : Data link layer : **CO2**

Design issues, framing, error detection and correction techniques with numerical, CRC, Elementary Protocol : stop and wait, Sliding Window, Slip, Data link layer in HDLC, ATM. Multiple Access Protocols, Link Layer Addressing, ARP, DHCP, Ethernet devices – Hubs, Bridges, and Switches. **Medium Access sub layer :** ALOHA, MAC addresses, CSMA, CSMA/CD. IEEE 802.XStandardEthernet,wireless LAN. **[8Hrs]**

UNIT – III : Network Layer : **CO3**

Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks, Router, Routing Table, Internet Protocol (IP) – IPv4 and IPv6 , ICMP, Link State Routing , Distance Vector Routing, Hierarchical Routing , RIP, OSPF, BGP, Broadcast and Multicast Routing , MPLS, Mobile IP, IP sec. IPv4 : Classes, Classless, Subneting, Super netting and its numerical. **[8Hrs]**

UNIT – IV : Transport Layer : **CO4**

Transport Layer Services – Multiplexing and Demultiplexing, UDP –Go Back-N and Selective Repeat**. Connection-Oriented Transport**: TCP, Segment Structure, RTT estimation, Flow Control, Connection Management, Congestion Control, TCP Delay Modeling, SSL and TLS. QoS architecture models: IntServvsDiffServ. **[8Hrs]**

UNIT – V : Presentation Layer protocols : **CO5**

AFP, ICA, LPP, NCP, NDR, Telnet. **Session Layer protocols**: PAP, PPTP, RPC, SCP. **Application Layer**: Principles of Network Applications , The Web and HTTP, HTTPS, FTP, Electronic Mail, SMTP, IRC, Video Conferencing, MIME, DNS, Socket Programming with TCP and UDP. **Network Security:** Principles of Cryptography, Firewalls, Application Gateway, Attacks and Countermeasures. **[8Hrs]**

Text Books:

S.No.	Title	Author(s)	Publisher
1	Data Communications and Networking	Behrouz A. Forouzan	Third Edition TMH
2	Computer Networking: A Top-Down Approach Featuring the Internet	James F. Kurose and Keith W. Ross	Pearson Education, Third edition, 2006

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Computer Networks	Andrew S Tanenbaum	4th Edition. Pearson Education/PHI
2	An Engineering Approach to Computer Networks	S.Keshav	2nd Edition, Pearson Education

Subject Code CS111503	Data Science And Modeling	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
The objective of this course is to impart necessary knowledge of the mathematical foundations needed for data science and develop programming skills required to build data science applications.	On successful completion of the course, the student will be able to: **CO1** Basic Concepts of Data Science **CO2**: Code using the python libraries needed for data science. **CO3** Demonstrate understanding of the mathematical foundations needed for data science. **CO4:** Collect, explores, clean, munge and manipulates data. **CO5** Implement models such as k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees, neural networks and clustering. And Build data science applications using Python based toolkits.

UNIT I **CO1**

Introduction to data science: Why Data Science, Benefits and uses of data science; Facets of data, The data science process: Setting up goal, retrieving data, data preparation, data exploration, data modeling, Presentation and automation. **[8 Hrs.]**

UNIT II **CO2**

Introduction to Programming: Sequence data: string, list, dictionary, array and tuple. Tools for Data Science, Toolkits using Python: Matplotlib, NumPy, Pandas, Scikit-learn, NLTK 2.2 3. Control structures if-then-else and loops, functions in python. Objects in python

Reading data and handling missing values: Pandas for data manipulation Working with data: Reading Files, (xlsx, csv, txt), creating copy, attribute of data, Indexing and selecting data , data types, summary of data, extracting unique element, Categorical and object data type, Converting data type, finding null values, Detecting missing values, approaches to fill missing values Data,, Rescaling, Dimensionality Reduction **[7 Hrs.]**

UNIT III **CO3**

Exploratory Data Analysis and Data Visualization: Introduction to statistics used in data science, level of data : Nominal, ordinal, interval scale and ratio. Central tendencies (mean, median and mode), skewed data, data dispersion: range, interquartile range, variance, standard deviation, coefficient of variation.

Data visualization tools : matplotlib : scatter, histogram , bar. Seaborn library: box and whiskers plot, pairwise plot.. **[7 Hrs.]**

UNIT IV **CO4**

Feature Engineering Data wrangling and tools for Data wrangling, Data transformation: converting categorical data into one hot encoding. Feature Selection, Feature Transformation, Dimensionality Reduction **[7 Hrs.]**

UNIT V **CO5**

Machine learning algorithm for building a model:Linear Regression- model assumptions, Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors: Confusion matrix recall precision and f-measure. Linear regression evaluation matric: mean square error with respect to case study **[7 Hrs.]**

Text Books:

S.No.	Title	Author(s)	Publisher
1	Data Science from Scratch: First Principles with Python	Joel Grus	O'Reilly Media
2	Doing Data Science, Straight Talk From The Frontline	Cathy O' Neil and Rachel Schutt	O'Reilly
3	Mining of Massive Datasets	Jure Leskovek, Anand Rajaraman and Jeffrey Ullman	Cambridge University Press

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Machine Learning	Jeeva Jose	Khanna Publishers
2	Data Sciences	Jain V.K	Khanna Publishers
3	Big Data and Hadoop	Jain V.K	Khanna Publishers
4	Machine Learning	Chopra Rajiv	Khanna Publishers
5	Practical Statistics for Data Scientists	Peter Bruce, Andrew Bruce, Peter Gedeck	O'Reilly

Subject Code CS111504	Artificial Intelligence Machine Learning	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
The objective of this course is to familiarize the prospective engineers with different kinds of Learning techniques and get acquainted with the basics of machine learning methods and model validation methods and ways to measure their accuracy.	On successful completion of the course, the student will be able to: **CO1** : Get deep insight of AI and its problem Solving techniques. **CO2**: Represent information or knowledge through various representation techniques. **CO3** : Understand various classification and Regression techniques **CO4** : Understand various clustering methodologies and its evaluation process **CO5** : Validate, understand and analyze the different Machine learning curves and performance evaluation methods

Unit I : Introduction to Artificial Intelligence **[CO1]**

Introduction: Defining Artificial Intelligence and its applications

Problem Solving techniques: Blind Search: Depth First and Breadth Search**,** heuristic search: Best first search, A* search, AO* Search, Constraint satisfaction problem, Min-Max Search, Alpha-Beta Pruning **[7 Hrs]**

Unit II : Knowledge Representations **[CO2]**

Logic: Predicate Logic, Resolution in predicate logic, Other ways of knowledge representation: Brief Introduction of semantic nets, frame, conceptual dependency, Scripts

Planning: Goal Stack and Partial Order Planning **[7 Hrs]**

Unit III: Machine Learning and Supervised Learning **[CO3]**

Machine Learning Introduction: What Is Machine Learning?, How Do We Define Learning?, Applications of ML, Aspects of developing a Learning system: training data, Concept representation, function approximation, Machine Learning Techniques: Supervised Learning, Unsupervised Learning and Reinforcement Learning

Supervised Learning : Source of uncertainty, Entropy and Information Gain, K Nearest Neighbor- Challenges in KNN, Application of KNN, Decision trees – ID3, Classification and Regression Trees, Translating Decision tress into rules, Rule Based Classification, Over fitting, noisy data and pruning, Linear Regression, Logistic Regression, Support Vector Machine (SVM) **[8 Hrs]**

Unit IV : Unsupervised Learning **[CO4]**

Partition Based Clustering, K – Means, K- Medoids, Hierarchical Clustering, Agglomerative, Divisive, Distance Measure, DBSCAN, Density Based Clustering, Evaluation of Clustering methods. **[7 Hrs]**

Unit V: Validations **[CO5]**

Validation Techniques, Need for Cross Validation, K-fold validation, Validation and Test Dataset, Evaluation Measures: SSE, MME, R2, Confusion Matrix – Recall, Precision, Accuracy, F-Measure, Learning Curves : ROC and AUC curve. **[7 Hrs]**

Text Books:

S. No.	Title	Author(s)	Publisher
1	Artificial Intelligence	Elaine Rich and Kevin Knight	Tata McGraw Hill
2	Introduction to Machine Learning with Python	Aurelien Geron	Oreilly
3	Machine Learning for Absolute Beginners: A Plain English Introduction	Oliver Theobald	Scatterplot Press
4	Machine Learning Simplified: A gentle introduction to Supervised Learning	Andrew Wolf	Leanpub

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Introduction to Artificial Intelligence and Expert Systems	Dan W.Patterson	Prentice Hall of India.
2	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems (First Edition)	Aurelien Geron	O'Reilly Media
3	Dive into Deep Learning	Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola	E-Books
4	Machine Learning for Humans	Vishal Maini ,Samer Sabri	E-Books

Subject Code CS111591	Computer Network Lab	L =0	T = 0	P = 2	Credits = 1
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	3 Hours

Course Objectives	Course Outcomes
To Provide students the basic knowledge of Computer Networking, tools used, their purpose and their connectivity based on requirements.	On completion of this course the student will be able to setup and configure various networking hardware and software. They will also be able to identify the basic faults and can resolve.

List of experiments

1. Introduction to cables, connectors and topologies.
2. Demonstration of Switch, Hub, Router and their uses and types.
3. Installation of UTP, Co-axial cable, Cross cable, parallel cable.
4. Case Study of Ethernet (10base5,10base2,10 base T)
5. Case Study of various Wireless technologies available.
6. Basic network command and Network configuration commands like ping, netstat, hostname, nslookup, route, arp, tracert, ipconfig, ARP etc.
7. To enable secured / unsecured file sharing, device sharing over network.
8. Installation and working of Remote Desktop and other third party related software's.
9. To setup IP and other values avoiding DHCP.
10. Use of Subnet mask to create two or more different logical network in same lab.
11. Installation and working with IIS Server.
12. Basic Configuration of Home Router/Modem
13. Introduction to Server administration.
14. Basic Chat Program in Java using TCP.
15. Basic Chat Program in Java using UDP.

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Networking Bible	Barrie Sosinsky		Wiley
2	Network Programmability and Automation	Jason Edelman		O'Reilly
3	Subnetting for Beginners: How to Easily Master Ip	Adam Vardy		Amazon
4	Networking Made Easy: Get Yourself Connected	James Berstein		

Subject Code CS111592	Data Science And Modeling Lab	L = 0	T = 0	P = 2	Credits =1
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	3 hours

Course Objectives	Course Outcomes
The objective of this course is to impart necessary knowledge of the mathematical foundations needed for data science and develop programming skills required to build data science applications.	On successful completion of the course, the student will be able to: **CO1** Basic Concepts of Data Science **CO2** Demonstrate understanding of the mathematical foundations needed for data science. **CO3** Collect, explore, clean, manage and manipulate data. **CO4** Implement models such as k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees, neural networks and clustering. **CO5** Build data science applications using Python based toolkits.

List of Experiments

1. Write programs to understand the use of Matplotlib for Simple Interactive Chart, Set the Properties of the Plot, matplotlib and NumPy.
2. Write programs to understand the use of Numpy's Structured Arrays, Reading and Writing Array Data on Files.
3. Write programs to understand the use of Matplotlib for Working with Multiple Figures and Axes, Adding Text, Adding a Grid, Adding a Legend, Saving the Charts.
4. Write programs to understand the use of Matplotlib for Working with Line Chart, Histogram, Bar Chart, Pie Charts
5. Write programs to understand the use of Numpy's Shape Manipulation, Array Manipulation, vectorization.
6. Write a program in Python to predict the class of the flower based on available attributes.
7. Write a program in Python to predict if a loan will get approved or not.
8. Write a program in Python to predict the traffic on a new mode of transport.
9. Write a program in Python to predict the class of user.
10. Write a program in Python to indentify the tweets which are hate tweets and which are not.
11. Write a program in Python to predict the age of the actors.
12. Mini project to predict the time taken to solve a problem given the current status of the user

Text Books:

S.No.	Title	Author(s)	Publisher
1	Python Crash Course: A Hands-On, Project-Based Introduction to Programming	Eric Matthes	William Pollock
2	Data Science from Scratch: First Principles with Python	Joel Grus	O'Reilly Media

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Machine Learning	Jeeva Jose	Khanna Publishers
2	Data Sciences	Jain V.K	Khanna Publishers
3	Fluent Python	Luciano Ramalho	O'Reilly Media
4	Machine Learning	Chopra Rajiv	Khanna Publishers

Subject Code CS111593	Artificial Intelligence and Machine Learning Lab	L = 0	T = 0	P = 2	Credits =1
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	3 hours

Course Objectives	Course Outcomes
Implementing the various AI searching algorithms. Make use of Data sets in implementing the machine learning algorithms. Implement the machine learning concepts and algorithms in any suitable language of choice.	On successful completion of the course, the student will be able to: **CO1** Understand the implementation procedures for the machine learning algorithms. **CO2** Design python programs for various learning algorithms. **CO3** Apply appropriate data sets to the Machine Learning algorithms. **CO4** Identify and apply machine Learning algorithms to solve real world problems.

List of Experiments

1. Implement A* Search algorithm.
2. Implement AO* Search algorithm.
3. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
4. Write a program to demonstrate the working of the decision tree-based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
5. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
6. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
7. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using the k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
8. Write a program to implement the k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
9. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select the appropriate data set for your experiment and draw graphs.

Text Books:

S. No.	Title	Author(s)	Publisher
1	Python for Data Analysis	WesMc Kinney	O'Reilly

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Python Data Analytics	Fabio Nelli	Apress

Subject Code CS111594	Minor Project-I	L = 0	T = 0	P =2	Credits = 1
Evaluation Scheme	ESE	CT	TA	-	ESE Duration
	25	-	25	-	3 Hours

Course Objective	Course Outcomes
The objectives of this lab are: The objective of this course is to improve student 's ability to analyze, design and solve complex engineering problems through pedagogies **(Project Based Learning)** that support them in developing these skills. The goal here is not to passively absorb and reiterate information; but rather to actively engage with the content, work through itwith others, relate to it through an analysis, use modern tools and effectively solve problems with the corresponding knowledge gained.	**On successful completion of the course, the student will be able to:** **CO1:** Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach. **CO2:** Reproduce, improve and refine technical aspects of engineering projects applying appropriate techniques, resources, and modern engineering and IT tools. **CO3:** Work as an individual and as a member or leaderin teams in development of technical projects. **CO4:** Follow management principle and value health, safety and ethical practices during project. **CO5:** Communicate and report effectively project related activities and findings.

The Process Followed to Maintain the Quality of Student Projects are: [12 Hrs.]

(a) Allotment of Projects:

(i) Students form their team (max four students) and submit their areas in which they would liketo pursue their projects.

(ii) Through meeting and deliberations students are allotted guide depending on their preferenceand maximum number of groups under a faculty is limited to three.

(b) Identification of projects:

Students are asked to formulate problem statement and state objectives of their project inconsultation with the project guide

c) Continuous Monitoring

(i) Progress is continuously monitored by guide and instructions are given how to proceedfurther during their project periods as per time table.

(ii) Students submit weekly progress report to the project in-charge after consultation with theirproject guide.

(d) Evaluation

(i) In order to evaluate projects two project seminars (assessment) are taken in which student 'steam present their project through presentations and demonstrate their work.

(ii) Students are assessed on the basis of their technical skill implementation, use of modern tools, communication skill, team work, health, safety and ethical practices and relevance of theproject.
(iii) At the end of the semesters a report is submitted by the students and student ‘s projects arefinally evaluated by external examiner in end semester practical examination based

Reference Books:

S. No.	Title	Authors	Publisher
1	Basics Of Project Management	IES Master Team	IES Master Publication (1 January 2021)
2	Modern Systems Analysis and Design	Jeffrey A. Hoffer, Joey F. George, Joseph S. Valakati	Pearson Education; Third Edition; 2002.

Professional Elective-I

Subject Code CS111521	Bigdata Analytics Essentials	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
Student will get answers of questions like What is Big Data? How do we tackle Big Data? Why are we interested in it? How does Big Data add value to businesses? Etc. Students will also understand how to process big data on platforms that can handle the volume, velocity, variety and veracity of Big Data. Student will get to know why Hadoop is a great Big Data solution and why it's not the only Big Data solution. Student will also find out the truth about what Data Science is and various tools available for Data Science.	After completion of this course, student will be able to 1. Understand fundamentals of Big Data. 2. Understand Architecture and working of platforms like Hadoop and Spark. 3. Apply Data Science methodologies in learning Data Science tools. 4. Understand how data analytics and data science rules current IT industries

UNIT – I : Basics of Big Data **CO1**

What is Big Data?, Characteristics of Big Data, What are the V's of Big Data?, The Impact of Big Data, Big Data Examples, Sources of Big Data, Big Data Adoption, The Big Data Platform, Big Data and Data Science, Skills for Data Scientists, the Data Science Process, Eco systems of Big Data. **[8 Hrs.]**

UNIT – II: Hadoop Introduction **CO2**

What is Hadoop, how Big Data solutions can work on the Cloud, other open source software related to Hadoop, Hadoop components, how HDFS works, data access patterns for which HDFS is designed, how data is stored in an HDFS cluster, Add and remove nodes from a cluster, Verify the health of a cluste rStart and stop a clusters components, Modify Hadoop configuration parameters, Setup a rack topology, Describe the Map Reduce philosophy, Explain how Pig and Hive can be used in a Hadoop environment, Describe how Flume and Sqoop can be used to move data into Hadoop, Describe how Oozie is used to schedule and control Hadoop job execution. **[7Hrs.]**

UNIT – III: Spark Fundamentals **CO3**

What is Spark and what is its purpose?, Components of the Spark unified stack, Resilient Distributed Dataset (RDD), Downloading and installing Spark standalone, Scala and Python overview, Launching and using Spark's Scala and Python shell, Resilient Distributed Dataset and Data Frames, Spark application programming, Spark libraries, Spark configuration, monitoring and tuning. **[7Hrs.]**

UNIT – IV: Data Science Introduction **CO4**

Defining Data Science, Role of Data Science people, Data Science in Business, Use Cases for Data Science.

Data Science Tools : Introducing Skills Network Labs, Introducing Jupyter Notebooks, Introducing Zeppelin

Notebooks, Introducing RStudio IDE. **[7Hrs.]**

UNIT – V Data Science Methodology **CO5**

From Problem to Approach, From Requirements to Collection, From Understanding to Preparation, From Modeling to Evaluation, From Deployment to Feedback. **[7Hrs.]**

Text Books:

S.No.	Title	Author(s)	Publisher
1	Big Data Analytics	Seema Acharya, Subhasini Chellappan	Wiley
2	BIG Data and Analytics	Subhashini Chhellappan	Willey
3	BIG Data and Analytics	Venkat Ankam	PACKT
4	BIG Data and Analytics	Raj Kamal, Preeti Saxena	Mc Graw Hill Education

Reference Books:

S. No.	Title	Author(s)	Publisher
1	HADOOP : The definitive Guide	Tom White	OReilly
2	Learning Spark: Lightning-Fast Big Data Analysis	Holden Karau , Andy Konwinski, Patrick Wendell Matei Zaharia	OReilly

Subject Code CS111522	Image Processing	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
To study fundamental concepts of digital image processing. To understand and learn image processing operations and algorithms. To expose students to current trends in field of digital image processing.	After completion of this course, students will be able to 1. To Review the formation of digital image and its various formats. [Understand] 2. Compare various filtering techniques in spatial domain and frequency domain. [Analyze] 3. Implement various algorithms on core image processing on MATLAB software [Apply] 4. Correlate color domain image processing technique with gray level. [Analyze] 5. Create Matlab program to apply morphological operators and Image Segmentation. [Create]

UNIT – I : Introduction To Digital Image Processing: **CO1**

Fundamentals Of Elements Of Digital Image, Image As Data, Pixels, Components Of Digital Image, Types Of Image Representation, Measures Of Image, Application Of Digital Image Processing. **Matlab Basics:** Data Types, Operators, Matrices, File, I/O, Image Processing Toolbox. **[8 Hrs.]**

UNIT – II: Image Enhancement: **CO2**

Spatial Domain & Frequency Domain. **Image Filtering Techniques:** Low Pass Filters–Smoothing, High Pass Filters – Edge Detection, Sharpening. **[7Hrs.]**

UNIT – III: Image Degradation/Restoration: **CO3**

Noise Models, Model Of Image Degradation/Restoration Process, Noise Reduction, Inverse Filtering, M Minimum Mean Square Error (Weiner) Filtering. **[7Hrs.]**

UNIT – IV: Color Image Fundamentals : **CO4**

Color Models, Representation of Color in Images, Color Image Processing, Basics Of Color Image Processing Smoothing And Sharpening. **Image Morphology:** Different Morphological Algorithm, Morphological Measures. **[7Hrs.]**

UNIT – V Image Segmentation : **CO5**

Thresholding, Histogram Based Segmentation, Clustering, Region Growing Method, Point, Line and Edge Detection. **[7Hrs.]**

Text Books:

S.No.	Title	Author(s)	Publisher
1	Digital Image Processing	Rafel C. Gonzalez and Richard E. Woods	Pearson Education
2	Fundamentals of Digital Image Processing	Anil K Jain	PHI
3	Fundamentals of Digital Image Processing	ANNADURAI	PEARSON

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Digital Image Processing and Analysis	B.Chanda & D.Dutta Majumder	Prentice Hall of India
2	Fundamentals of Digital Image Processing	Dr. Snjay Sharma	KATSON
3	Digital Image Processing	Bhabatosh Chanda and Dwijesh Majumder	

Subject Code CS111523	Advanced Computer Network	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
Introduction of primary networking concepts and technologies is prime objective of this course. This course specifically make student able to develop the skills required to plan and implement small networks across a variety of networking applications.	After completion of this course, students will be able to 1. Describe concepts of scaling networks and wireless LAN (Analyze) 2. Implement OSPF operations, configuration and troubleshoot (Apply) 3. Implement EIGRP operations, configuration and troubleshoot(Apply) 4. Implement PPP operations, configuration and troubleshoot(Apply) 5. Design ACL for IPv4 and IPv6 with advance configuration (Create)

UNIT – I : Introduction to Scaling Networks : **CO1**

Introduction to Scaling Networks, Implementing a network design, selecting network devices, LAN redundancy, spanning tree concepts, variety of spanning tree protocols, spanning tree configuration, first hop redundancy protocol(FHRP), Link aggregation concepts and configuration. **[8 Hrs]**

UNIT – II: Wireless LAN : **CO2**

Wireless concepts, Wireless LAN operations, Wireless LAN security, Wireless LAN configurations. **OSPF:** Advanced Single – Area OSPF concepts and configuration, Advanced Single – Area OSPF implementation and troubleshooting, Multi area OSPF operations, Multi area OSPF configuration. **[7Hrs.]**

UNIT – III: EIGRP : **CO3**

Characteristics of EIGRP, EIGRP configuration for IPv4, EIGRP operations, EIGRP configuration for IPv6, Advanced EIGRP configurations, EIGRP troubleshooting. **Connecting Networks :** WAN concepts, Overview and selection of WAN technologies, Concepts of point-to-point connections, Serial Point-to-Point Overview, PPP Operation and Implementation, PPP troubleshooting. **[7Hrs.]**

UNIT – IV: Branch Connections : **CO4**

Remote Access Connections, PPPoE, VPNs, GRE, eBGP. **ACL :** Standard ACL Operation and Configuration, Extended IPv4 ACLs, IPv6 ACLs, Troubleshoot ACLs. **[7Hrs.]**

UNIT – V Network Security and Monitoring : **CO5**

LAN Security, SNMP, Switch Port Analyzer (SPAN), QoS Overview, QoS Mechanisms. **NetworkEvolution :** Internet of Things, Cloud and Virtualization, Network Programming. **[7Hrs.]**

Text Books:

S.No.	Title	Author(s)	Publisher
1	Computer Network	andrew s. tanenbaum	PEARSON
2	Advance Computer Networking	Prof. Satish Jain	BPB Publication
3	Computer Networks and Internets	Comer, Douglas E.	Prentice Hall
4	Advance Computer Network	B. M. Harwani And D T Editorial Services	DreamTech New Delhi

Reference Books:

S. No.	Title	Author(s)	Publisher
1	TCP/IP Protocol Suite	Behrouz A. Forouzan	McGraw Hill
2	Data and Computer Communications	William Stallings	Prentice Hall

Subject Code CS111524	System and Network Security	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
The purpose of this course is to provide understanding of the main issues related to security in modern networked computer systems. This covers underlying concepts and foundations of computer security, basic knowledge about security- relevant decisions in designing IT infrastructures, techniques to secure complex systems and practical skills in managing a range of systems, from personal laptop to large-scale infrastructures.	After completion of this course, students will be able to 1. Understanding of the concepts and foundations of computer security, and identify vulnerabilities of IT systems.(Understanding) 2. The students can use basic security tools to enhance system security and develop basic security enhancements in stand-alone applications.(Apply) 3. Students will be able to apply access control in network.(Apply) 4. Analyses Protection and Security Mechanism in Operating System.(Analyses) 5. Analyses system logs and assess system security(Analyze)

UNIT – I : Computer Security Concepts : **CO1**

Introduction to Information Security, Introduction to Data and Network Security, Integrity, and Availability, NIST FIPS199 Standard, Assets and Threat Models, Security Trends, OSI Security Architecture, Security attacks, Security Services and Security Mechanism, Defense in Depth. **[8 Hrs]**

UNIT – II: Cryptography : **CO2**

Cryptographic Techniques, Cryptographic Algorithms- Substitution Cipher- Caesar Cipher, Playfair Cipher, Vernam Cipher, One Time Pad, Transposition Cipher. Computer-based Symmetric and Asymmetric Key, DES, Triple DES, AES,RSA, Diffie Hillman Key exchange Public Key Infrastructure (PKI), Internet Security Protocols. **[7Hrs.]**

UNIT – III: Network Security : **CO3**

Network Attacks, Firewall, Types of Firewall, Firewall Configurations DMZ, Access Control Intrusion Detection System, Intrusion Prevention System. **Web Security :** Web Security Requirements, Secure Socket Layer (SSL), Transport Layer Security (TLS) Electronic Mail Security : Threats to E-Mail, Requirements and Solutions, Encryption for Secure E-Mail, PGP. **[7Hrs.]**

UNIT – IV Application Security : **CO4**

Web Application Security - SQL injection, Cross-site request forgery, Cross-site scripting, Attacks and Defenses, Generating and storing session tokens Wireless Security- Evil Twin Attack, Bluetooth Based Attack, Countermeasures. **[7Hrs.]**

UNIT – V Security Risk Management : **CO5**

Risk, Risk Analysis, SLE, ALE Security information and event management (SIEM) **[7Hrs.]**

Text Books:

S.No.	Title	Author(s)	Publisher
1	Network Security Essentials: Applications and Standards	William Stallings	Prentice Hall
2	Introduction to Computer Security	Michael T. Goodrich and Roberto Tamassia	Addison Wesley

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Handbook of Applied Cryptography	Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone	CRC Press

Subject Code CS111525	Text Mining	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
we will introduce a variety of basic principles, techniques and modern advances in text mining. The extraction of relevant information from a mass of raw, unstructured text can provide a cornucopia of useful insights, which can then be used to drive business decisions in a variety of contexts.	This course introduces students to the tools, techniques, and opportunities for performing text analytics in a variety of contexts. We examine tools such as NLTK, spaCy, and the WordNet dictionary along with fully featured applications such as IBM's Watson Explorer analytics platform.

UNIT – I: Introduction and NLP **CO1**

Introduction and NLP: highlight the basic organization and major topics of this course, and go over some logistic issues and course requirements. Basic techniques in natural language processing, including tokenization, part-of-speech tagging, chunking, syntax parsing and named entity recognition. Public NLP toolkits will be introduced for you to understand and practice with those techniques. **[8Hrs.]**

UNIT – II: Document representation and Text categorization: **CO2**

We will discuss how to represent the unstructured text documents with appropriate format and structure to support later automated text mining algorithms. It refers to the task of assigning a text document to one or more classes or categories. We will discuss several basic supervised text categorization algorithms, including Naive Bayes, k Nearest Neighbor (kNN) and Logistic Regression. (If time allows, we will also cover Support Vector Machines and Decision Trees. **[10Hrs.]**

UNIT – III: Text clustering: **CO3**

It refers to the task of identifying the clustering structure of a corpus of text documents and assigning documents to the identified cluster(s). We will discuss two typical types of clustering algorithms, i.e., connectivity-based clustering (a.k.a., hierarchical clustering) and centroid-based clustering (e.g., k-means clustering).Document summarization: It refers to the process of reducing a text document to a summary that retains the most important points of the original document. Extractionbased summarization methods will be covered. **[7Hrs.]**

UNIT – IV: Topic modelling: **CO4**

Topic models are a suite of algorithms that uncover the hidden thematic structure in document collections. We will introduce the general idea of topic modeling, two basic topic models, i.e., Probabilistic Latent Semantic Indexing (pLSI) and Latent Dirichlet Allocation (LDA), and their variants for different application scenarios, including classification, imagine annotation, collaborative filtering, and hierarchical topical structure modeling. **[7Hrs.]**

UNIT – V: Social media and network analysis: **CO5**

We will discuss the unique characteristic of social network: inter-connectivity, and introduce Google's winning algorithm Page Rank. Based on this, we will discuss social influence analysis and social media analysis. Sentiment analysis: It refers to the task of extracting subjective information in source materials. We will discuss several interesting problems in sentiment analysis, including sentiment polarity prediction, review mining, and aspect identification, Text visualization: It refers to the study of (interactive) visual representations of abstract data to reinforce human cognition. We will introduce some mathematical and programming tools to help you visualize a large collection of text documents. **[7Hrs.]**

Text Books:

S.No.	Title	Author(s)	Publisher
1	Mining Text Data	Charu C. Aggarwal and ChengXiangZhai	Springer
2	Speech & Language Processing	Dan Jurafsky and James H Martin	Pearson Education India

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Introduction to Information Retrieval	Christopher D. Manning, PrabhakarRaghavan, and HinrichSchuetze	Cambridge University Press
2	Machine learning	Mitchell, T.	McGraw-Hill