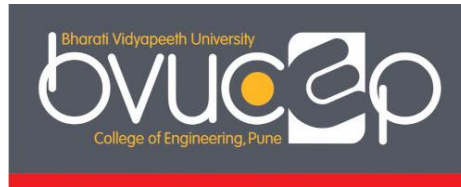




Bharati Vidyapeeth
(Deemed to be University)
Pune, India

College of Engineering, Pune



M. Tech (Information Technology)
(2023 CBCS COURSE)

Program Curriculum

VISION OF THE UNIVERSITY

Social Transformation through Dynamic Education

MISSION OF THE UNIVERSITY

- To make available quality education in different areas of knowledge to the students as per their choice and inclination
- To offer education to the students in a conducive ambience created by enriched infrastructure! and academic facilities in its campuses.
- To bring education within the reach of rural, tribal and girl students by providing them substantive fee concessions and subsidized hostel and mess facilities
- To make available quality education to the students of rural, tribal and other deprived sections of the population

VISION OF THE INSTITUTE

To be World Class Institute for Social Transformation Through Dynamic Education.

MISSION OF THE INSTITUTE

- To provide quality technical education with advanced equipment, qualified faculty members, infrastructure to meet needs of profession and society.
- To provide an environment conducive to innovation, creativity, research and entrepreneurial leadership.
- To practice and promote professional ethics, transparency and accountability for social community, economic and environmental conditions.

VISION OF THE DEPARTMENT

To be a leading Programme, transforming students into skilled IT professionals.

MISSION OF THE DEPARTMENT

- Amplify the student's technical skills by conducting continuing education

programs, organizing and participating in various technical events.

- Provide comprehensive support in synchronization with industry to achieve professional and technological excellence.
- Provide an environment for effective social and ethical skills.

Structure of M. Tech Information Technology (Semester-I) (2023 Course)

Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Credits
	L	P	Theory	Internal Assessment	TW	PR	Oral	Total	
Natural Language Processing	04	--	50	50	-	--	--	100	04
Data Science	04	--	50	50	-	--	--	100	04
Distributed Computing	04	--	50	50	--	--	--	100	04
Open Elective – I	04	--	50	50	--	--	--	100	04
Lab Practice – I	--	04	--	--	25	--	25	50	02
Lab Practice – II	--	04	--	--	25	--	25	50	02
	16	8	200	200	50	--	50	500	20

Open Elective- I

Choice-1 : Research Foundation & IPR

Choice-2: High performance Computing

Structure of M. Tech Information Technology (Semester-II) (2023 Course)

Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Credits
	L	P	Theory	Internal Assessment	TW	PR	Oral	Total	
Information Retrieval	04	--	50	50	--	--	--	100	04
Cyber Security	04	--	50	50	--	--	--	100	04
Block Chain Technologies	04	--	50	50	--	--	--	100	04
Open Elective – II	04	--	50	50	--	--	--	100	04
Lab Practice – I	--	04	--	--	25	--	25	50	02
Lab Practice – II	--	04	--	--	25	--	25	50	02
Total	16	8	200	200	50	--	50	500	20

Open Elective- II

Choice-1: Information Technology Enabled Services

Choice-2: Internet of Things

Structure of M. Tech Information Technology (Semester-III) (2023 Course)

Semester III			Total Duration: 08 hrs/week Total Marks : 250 Total Credits: 20						
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Credits
	L	P	Theory	Internal Assessment	TW	PR	Oral	Total	
Seminar	--	02	--	--	50	--	50	100	05
Dissertation Stage - I	--	06	--	--	100	--	50	150	15
Total	--	08	--	--	150	--	100	250	20

Structure of M. Tech Information Technology (Semester-IV) (2023 Course)

Semester IV			Total Duration: 08 hrs/week Total Marks : 250 Total Credits: 20						
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Credits
	L	P	Theory	Internal Assessment	TW	PR	Oral	Total	
Dissertation Stage - II	--	08	--	--	150	--	100	250	20
Total	--	08	--	--	150	--	100	250	20

M.Tech (IT) Semester – I Subject : Natural Language Processing		
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 Hrs/Week	End Semester Examination : 50 Marks	Theory :04
	Internal Assessment : 50 Marks	
Course Objectives:		
Is to cover linguistic aspects, core algorithms for solving basic tasks, statistical and shallow machine learning models for development of chatbot.		
Course Prerequisites:		
Students should have knowledge of Python programming and Machine learning algorithms		
Course Outcome:		
Students will be able to:		
1) Learn the techniques in natural language processing		
2) Exposed to natural language text preprocessing through open source development platform		
3) learn open source frameworks for chatbot development		
UNIT-I	NLP Text Pre-processing and Libraries:	(08 Hours)
	Language Modeling with N-Grams, Text Pre-processing: Tokenization in NLP, Byte Pair Encoding, Tokenizer, Free Language Modeling with Pixels, Stop word, Removal, Stemming vs Lemmatization Text Mining Spacy ,Gensim	
UNIT-II	Regular Expressions and Text Representation:	(08 Hours)
	String Similarity, Spelling Correction, Topic Modeling: Introduction to Topic Modeling, Latent Dirichlet Allocation (LDA), Implement Topic Modeling , Feature Engineering for Text Data, Text Feature Engineering Techniques, One Hot Encoding, Count Vectorizer and TF-IDF, Text classification using TF-IDF. Word Vectors, Skip Gram and Continous Bag Of Words, Word2Vec Implementation in Gensim, Visualizing Word2Vec, Word Senses	
UNIT-III	Sequence Processing with Recurrent Networks :	(08 Hours)
	Simple Recurrent Neural Networks , Applications of Recurrent Neural Networks , Deep Networks: Stacked and Bidirectional RNNs, Managing Context in RNNs: LSTMs and GRUs, Words, Subwords and Characters.	

UNIT-IV	Building Chatbots using Rasa:	(08 Hours)
	Introduction to Rasa Core, Defining Custom Actions, Rasa Core - The Domain', Defining Stories & Running the Action Server Demo, Rasa Core – Rules, Rasa Core-Dialogue Policies. Rasa Slots.	
UNIT-V	RASA Natural Language Understanding (NLU):	(08 Hours)
	Intents & Entities, Writing Intents & Entities Examples - Training Data – NLU, Rasa NLU Pipeline, Defining NLU Pipeline in Config File	
Assignment List: This list can be used for practical sessions		
1.	Basic Text Processing operation on text document.	
2.	Write a program to extract features from text	
3.	Implement word embedding using Word2Vec/Glove/fastText	
4.	Implement PoS Tagging on text	
5.	Implement text processing with neural network	
6.	Develop any one NLP application Sentiment Analysis • Chatbot <ul style="list-style-type: none"> • Installing RASA and Python • RASA Natural Language Understanding (NLU) - Intents & Entities • Defining NLU Pipeline in Config File 	
Text Books:		
1.	Xiaoquan Kong, Guan Wang, Alan Nichol, “Conversational AI with Rasa”, Packt Publishing, ISBN: 9781801077057,2021	
2.	Christopher D. Manning and Hinrich Schütze, “Foundations of Statistical Natural Language Processing”. MIT Press, 1999.	
3.	Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta, Harshit Surana. “Practical Natural Language Processing”, O'Reilly,2020	
Reference Books:		
1)	Jurafsky, Dan and Martin, James, Speech and Language Processing, Second Edition, Prentice Hall, 2008.	
2)	Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.	
3)	Radford, Andrew et. al., Linguistics, An Introduction, Cambridge University Press, 1999.	

M.Tech (IT) Semester - I		Subject : Data Science	
Teaching Scheme	Examination Scheme	Credit Allotted	
Theory : 04 Hrs/Week	End Semester Examination : 50 Marks	Theory :04	
Practical : 02 Hrs/Week	Internal Assessment : 50 Marks	Practical : 01	
	Total :100 Marks		
	Term Work:25 Marks	Total Credits : 05	
	Prat/Oral : 25 Marks		
Course Objectives:			
1) Design solution to a problem by applying the Data Science			
2) Apply data science techniques for data analysis.			
Course Prerequisites:			
Students should have knowledge of			
Statistical concepts, Artificial Intelligence			
Course Outcome:			
Students will be able to:			
1) Understand the Data Science fundamentals.			
2) Apply the AI and ML concepts.			
3) Analyze the patterns available in the data.			
4) Apply data pre-processing for better learning.			
5) Design a model by applying data science techniques.			
6) Optimize the performance of the model			
...			
UNIT-I	Data Science Essentials	(08 Hours)	
	Introduction to ANN, Perceptron, AutoEncoders, Batch Normalization, Introduction to statistical methods, Introduction to Python, Application of libraries Numpy, pandas for Data Pre-Processing.		
UNIT-II	Convolution Neural Network	(08 Hours)	
	Introduction to CNNs, Convolution, Correlation, Filtering, CNN architectures, Detection and Segmentation, Visualizing and Understanding, and Advanced CNNs for computer vision.		
UNIT-III	Recurrent Neural Networks	(08 Hours)	
	Recurrent Neural networks (RNNs), Hidden Layer, Activation Functions, learning Rate calculations, Time series detection using RNN.		
UNIT-IV	Generative Models	(08 Hours)	
	Advanced RNN: LSTM, GRU, Generative Adversarial Networks (GANs), Advanced GANs.		
UNIT-V	Advancements in Data Science: Case Study	(08 Hours)	
	Proficient understanding of TensorFlow, Keras, Case Study: Google Sparrow, Multimedia Neural Network of OpenAI.		
Text Books:			
1)	Data Science from Scratch 2e: First Principles with Python, Joel Grus, O'Really		

2)	Learning Deep Learning: Theory and Practice of Neural Networks, Computer Vision, Natural Language Processing, and Transformers Using TensorFlow, Mangus Ekman, NVIDIA
3)	Deep Learning with PyTorch: Build, train, and tune neural networks using Python tools, Eli Stevens, MANNING.
Reference Books:	
1)	Deep Learning Using Python, S Lovelyn Rose, WILLEY
2)	Automated Deep Learning Using Neural Network Intelligence: Develop and Design PyTorch and TensorFlow Models Using Python, Ivan Gridin.
3)	Neural Networks and Deep Learning: A Textbook, Charu Agarwal, Springer

M.Tech (IT) Semester - I		Subject : Distributed Computing	
Teaching Scheme	Examination Scheme	Credit Allotted	
Theory : 04 Hrs/Week	End Semester Examination : 50 Marks	Theory :04	
Practical : --	Internal Assessment : 50 Marks	Practical : --	
	Term Work:--	Total Credits : 04	
	Prat/Oral : --		
Course Objectives: To provide an understanding of key concepts underlying the function of distributed computing systems			
Course Prerequisites:			
Students should have knowledge of Fundamentals of Data Structures, Operating Systems, Networking concepts			
Course Outcome:			
Students will be able to:			
1) Infer the distributed computing environment			
2) Interpret the communication and naming fundamentals in distributed computing			
3) Understand the importance of synchronization and fault tolerance in distributed computing			
4) Understand the working of Distributed Coordination-Based Systems			
5) Correlate the concepts of security with distributed computing			
UNIT-I	Fundamentals		(8 Hours)
	Definition and evolution of Distributed Computing System, Models and Types of Distributed Computing Systems, Issues and Goals in designing Distributed System, Distributed Computing Environment, Types of Distributed Systems, Peer to peer systems, Peer to peer middleware, Routing overlays		
UNIT-II	Communication And Naming		(8 Hours)
	Communication: Fundamentals, Remote Procedure Call, Message Oriented Communication, Stream Oriented Communication, Multicast Communication Naming: Names, Identifiers, And Addresses, Flat Naming, Structured Naming, Attribute-Based Naming		

UNIT-III	Synchronization and Fault Tolerance	(8 Hours)
	Clock Synchronization: Drifting, Issues, Algorithms, Event Ordering, Logical Clocks, Mutual Exclusion, Global Positioning Of Nodes, Election Algorithms Introduction To Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, Recovery	
UNIT-IV	Consistency, Replication and Distributed Coordination-Based Systems	(8 Hours)
	Introduction, Data-Centric Consistency Models, Client-Centric Consistency Models, Replica Management, Consistency Protocols Distributed Coordination-Based Systems: architectures, processes, communication, naming, synchronization, consistency and replication, fault tolerance, security	
UNIT-V	Security	(8 Hours)
	Distributed System Security: Goals, Design Principles, Attacks, Cryptography, Secure Channels, Access control, Digital Signatures, Security Management, Cryptographic hash Functions, Distributed hashing.	
Assignment List:		
1)	Case study of any peer to peer system with application	
2)	Case study of any middleware with application	
3)	Detail study of DCE RPC	
4)	Detailed study of CHORD DHT	
5)	Implementation of any election algorithm	
6)	Study of deadlocks and its avoidance	
7)	Comparison of deadlock prevention algorithms	
8)	Analysis of consistency and replication in Peer-to-Peer File Systems	
9)	Replication for Web Hosting Systems and Web Applications	
10)	Case study of NFS wrt architecture, communication, naming, semantics of file sharing, consistency and replication, security	
Text Books:		
1)	George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, “Distributed Systems: Concepts and Design”, Pearson Education India; 5th edition	
2)	Pradeep K. Sinha, “Distributed Operating Systems: Concepts and Design”, Wiley-IEEE Press.	
Reference Books:		
1)	Andrew S. Tanenbaum, Maarten van Steen, “Distributed Systems: Principles and Paradigms”, Prentice Hall India Learning Private Limited, Second edition	
2)	Ajay D. Kshemkalyani, Mukesh Singhal, “Distributed Computing: Principles, Algorithms, and Systems”, Cambridge University Press- South Asian edition	
3)	Abraham Silberschatz, Peter B. Galvin, Greg Gagne , “Operating System Concepts”, Wiley, 8th Edition	

M.Tech (IT) Semester - I		Subject : Research Methodology and IPR (Open Elective-I)	
Teaching Scheme	Examination Scheme		Credit Allotted
Theory : 04 Hrs/Week	End Semester Examination : 50 Marks		Theory :04
	Internal Assessment : 50 Marks		Total Credits : 04
Course Objectives:			
To comprehend research concepts and the procedures that support research scholars in their work.			
Course Prerequisites:			
Students should have knowledge of basics of software development life cycle.			
Course Outcome:			
Students will be able to:			
1) Focus on a research problem using scientific methods			
2) Recognize techniques for creating and designing an experiment set-up			
3) Learn hypothesis testing steps			
4) Use parameter estimates and associated modelling techniques			
5) Create research content			
UNIT-I	Foundation of Research		(8 Hours)
	Research Problem Meaning of research problem, Sources of research problem, Criteria / Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Review of Literature: Importance of literature review in defining a research problem, sources of literature, identifying the gap areas from the literature review		
UNIT-II	Research Design and Methods of Data Collection		(8 Hours)
	Features of a good research design, Exploratory Research Design -concept, types and uses, Descriptive Research Designs- concept, types and uses. Experimental Design: Concept of Independent & Dependent variables Methods of Data Collection: Static and dynamic characteristics of instruments used in experimental set up, calibration of various instruments, sampling methods, various methods of data collection, selection of appropriate method for data collection, data collection using a digital computer system, case studies of data collection.		
UNIT-III	Inferential Statistics and Hypothesis Testing		(8 Hours)
	Data processing, data analysis strategies and tools, Basic concepts concerning testing of hypotheses, procedures of hypothesis testing, generalization and interpretation, Hypothesis testing: Z-test, T-test, Chi Square test, Analysis of variance (ANOVA) etc.		
UNIT-IV	Quantitative Methods and Applied Statistics		(8 Hours)

	Measurement of central tendency and dispersion, Probability distribution, Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, moments and response curve methods, probable errors in research, error analysis, Hidden Markov Model (HMM)	
UNIT-V	Research Writing and IPR	(8 Hours)
	Research Paper, Proposal and Thesis Writing: Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports, use of plagiarism tools and its importance. Intellectual property rights (IPR): intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty	
Text Books:		
1)	Wayne Goddard, Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, 2004	
2)	Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, SAGE publications Ltd., 2011.	
3)	C. R. Kothari, Research Methodology: Methods and Trends, New Age International, 2004	
4)	Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers	
Reference Books:		
1)	Donald Cooper, Pamela Schindler, Business Research Methods, McGraw-Hill publication, 2005.	
2)	T. W. Anderson, An introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt. Ltd. New Delhi.	
3)	Anthony, M., Graziano, A.M. and Raulin, M.L., 2009. Research Methods: A Process of Inquiry, Allyn and Bacon.	

M.Tech (IT) Semester – I Subject : High Performance Computing (Open Elective-I)

Teaching Scheme		Examination Scheme		Credit Allotted	
Theory	: 04 Hrs/Week	End Semester Examination	: 50 Marks	Theory	:04
		Internal Assessment	: 50 Marks		

Course Objectives:

- To Study various computing technology architecture.
- To know Emerging trends in computing technology.
- To highlight the advantage of deploying computing technology.

Course Prerequisites:

Computer Organization and Architecture, Microprocessor Architecture

Course Outcome:

On successful completion of the course,

- 1) The student will be having the basic knowledge of high performance computing technology.
- 2) Student will be able to understand architecture of various advanced computing technologies.
- 3) Student will be able to know cloud computing service models.

UNIT-I	Parallel Computing Concepts	(08 Hours)
	Levels and model of parallelism: instruction, transaction, task, thread, memory, function, data flow models, demand-driven computation; Taxonomy of parallel computing paradigms- Shared memory computers- Shared memory parallel programming using OpenMP, Cache coherence- UMA - ccNUMA- Distributed-memory computers, Distributed memory parallel programming using MPI, Parallel architectures: superscalar architectures, multi-core, multi-threaded, vector architectures, Scalable storage systems: RAID, SSD cache, SAS, SAN	
UNIT-II	Issues in HPC	(08 Hours)
	Fundamental design issues in HPC: Load balancing, scheduling, synchronization and resource management; Operating systems for scalable HPC, Job Allocation, Job Partitioning, Dependency Analysis, Mapping Parallel Algorithms onto Parallel Architectures, Performance Analysis of Parallel Algorithms Fundamental limitations in HPC: bandwidth, latency and latency hiding techniques; Benchmarking HPC	

UNIT-III	Introduction to Grid Computing	(08 Hours)
	Introduction to Grid Computing, Virtual Organizations, Architecture, Applications, Computational, Data, Desktop and Enterprise Grids, Data-intensive Applications, High-Performance Commodity Computing, High-Performance Schedulers, Grid Middleware: Connectivity, Resource and Collective Layer, Globus Toolkit, GSI, GRAM, LDAP, GridFTP, GIIS, Heterogeneous Computing Systems, Mapping Heuristics: Immediate and Batch Mode, Immediate: MCT, MET, Switching Algorithm, KPB and OLB, Batch: Min-Min, Max-Min, Sufferage, Duplex, GA, SA, GSA, Tabu and A*, Expected Time to Compute Matrix, Makespan, Heterogeneity: Consistent, Inconsistent and Partially-Consistent, QoS Guided Min-Min, Selective Algorithm, Grid Computing Security, Introduction to GridSim, Architecture, Grid Resource Broker, Grid Referral Service.	
UNIT-IV	Introduction to Cloud Computing	(08 Hours)
	Defining Clouds, Cloud Providers, Consuming Cloud Services, Cloud Models, IaaS, PaaS, SaaS, Inside the cloud, Administering cloud services Technical interface, Cloud resources, Nature of Cloud: Tradition Data Center, Cost of Cloud Data Center, Scaling computer systems, Cloud work load, Managing data on clouds, Public, private and hybrid clouds Cloud Elements: Infrastructure as a service, Platform as a service, Software as a service	
UNIT-V	Case Studies	(08 Hours)
	Case study on the following: <ol style="list-style-type: none"> 1) Petascale Computing 2) Optics in Parallel Computing 3) Quantum Computers 4) Recent developments in Nanotechnology and its impact on HPC 5) High performance computing architectures: (Examples: IBM CELL BE, Nvidia Tesla GPU, Intel Larrabee Microarchitecture and Intel Nehalem microarchitecture) GPU Architecture, CUDA	
Text Books:		
1.	Georg Hager and Gerhard Wellein. Introduction to High Performance Computing for Scientists and Engineers (1st ed.). CRC Press, Chapman & Hall/CRC Computational Science, India, 2010..	
2.	D. Janakiram, Grid Computing, Tata McGraw-Hill, 2005	
3.	R. Buyya, C. Vecchiola and S. T. Selvi, Mastering Cloud Computing Foundations and Applications Programming, Morgan Kaufmann, Elsevier, 2013.	
4.	Hurwitz, Bllor, Kaufman, Halper, Cloud Computing for Dummies, Wiley India.	

5.	Patrick H. Stakem, "Graphics Processing Units: an overview", Independent Publication.
6.	Introduction to Parallel Computing, Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, 2nd edition, Addison-Welsey, © 2003.
7.	Advanced Computer Architecture: Parallelism, Scalability, Programmability", by Kai Hwang, McGraw Hill
8.	Parallel Computer Architecture: A hardware/Software Approach", by David Culler Jaswinder Pal Singh, Morgan Kaufmann

Reference Books:

1)	B. Sosinsky, Cloud Computing Bible, Wiley, 2011.
2)	Cloud Computing, A Practical Approach, Anthony Velte, Toby Velte, Robert Elsen peter, McGraw Hill.
3)	B. Wilkinson, Grid Computing: Techniques and Applications, CRC Press, 2009.
4)	Cloud Computing, A Practical Approach, Anthony Velte, Toby Velte, Robert Elsenpeter, McGrawHill.

M.Tech (IT) Semester – I Subject : Lab Practice-I

Teaching Scheme	Examination Scheme	Credit Allotted
Practical 04 Hrs/Week	Termwork : 25 Marks Oral : 25 Marks	02

Course Objectives:

Is to cover linguistic aspects, core algorithms for solving basic tasks, statistical and shallow machine learning models for development of chatbot.

Course Prerequisites:

Students should have knowledge of Python programming and Machine learning algorithms

Course Outcome:

Students will be able to:

- 1) Learn the techniques in natural language processing
- 2) Exposed to natural language text preprocessing through open source development platform
- 3) learn open source frameworks for chatbot development

Assignment List: This list can be used for practical sessions

1.	Basic Text Processing operation on text document.
2.	Write a program to extract features from text
3.	Implement word embedding using Word2Vec/Glove/fastText
4.	Implement PoS Tagging on text
5.	Implement text processing with neural network
6.	Develop any one NLP application Sentiment Analysis • Chatbot <ul style="list-style-type: none"> • Installing RASA and Python • RASA Natural Language Understanding (NLU) - Intents & Entities • Defining NLU Pipeline in Config File

M.Tech (IT) Semester - I		Subject : Lab Practices - II	
Teaching Scheme	Examination Scheme	Credit Allotted	
Theory : 04 Hrs/Week	End Semester Examination : 50 Marks	Theory :04	
Practical : 02 Hrs/Week	Internal Assessment : 50 Marks	Practical : 01	
	Total :100 Marks		
	Term Work:25 Marks	Total Credits : 05	
	Prat/Oral : 25 Marks		
Course Objectives:			
1) Design solution to a problem by applying the Data Science			
2) Apply data science techniques for data analysis.			
Course Prerequisites:			
Students should have knowledge of			
Statistical concepts, Artificial Intelligence			
Course Outcome:			
Students will be able to:			
1) Understand the Data Science fundamentals.			
2) Apply the AI and ML concepts.			
3) Analyze the patterns available in the data.			
4) Apply data pre-processing for better learning.			
5) Design a model by applying data science techniques.			
6) Optimize the performance of the model			
Assignment List:			
1)	Apply data pre-processing techniques to clean and normalize the data.		
2)	Apply dataset validation techniques to check.		
3)	Apply the conventional algorithm for data analysis.		
4)	Implement data analysis using Tableau.		
5)	Apply the hybrid approach for training and testing of the data.		
6)	Implement Time series analysis using RNN		
7)	Design a predictive Model.		
8)	Apply the cost minimization functions.		
9)	Use BERT for studying applications of DNN in NLP.		
10)	Apply DS techniques word embedding.		

M.Tech (IT) Semester - II		Subject: Information Retrieval			
Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Lecture	04	University Examination	50	Lecture	04
		Internal Assessment	50		
Practical	--	Term Work	--	Practical	--
		Oral	--		
Total	04	Total	100	Total	04
Course Objective:					
<ul style="list-style-type: none"> • Concepts and algorithms in IR • Data/file structures those are necessary to design, and implement Information retrieval (IR) systems • Cataloguing, Indexing, Automatic Indexing. • Various search algorithms and retrieval techniques. 					
Prerequisite:					
<ul style="list-style-type: none"> • Students must have the minimal concept of Data Base Management Systems • They must also have the concept of different types of algorithms used for searching data • They must also have the minimal knowledge of Natural language such as thesaurus, synonyms etc. to understand the concept of retrieving the textual information because text is the main data type used in Information Retrieval Systems 					
Course Outcomes: On completion of the course, students will have the ability to:					
1. Apply IR principles to locate relevant information large collections of data					
2. Devise different document clustering algorithms					
3. Implement retrieval systems for web search tasks.					
4. Describe models like vector-space, probabilistic and language models to identify the similarity of query and document					
Unit I Introduction to information retrieval systems:					08 Hours
Text analysis, Types of text analysis , Introduction to IR, IR system architecture, Components of an information retrieval system , Retrieval strategies: Probabilistic retrieval strategies: Simple term weights, Non binary independence model, Language models, Ranked Retrieval ,Text Similarity Metrics ,Tokenizing- stemming-Evaluations on benchmark text collections .					
Unit II Text Indexing, Storage and Compression:					
Text processing (Text format, Tokenization, stemming, lemmatization, stop words, phrases, index optimization ,Language modelling),Indexes and query matching, Index compression: lexicon compression and postings lists compression. Gap encoding, gamma codes, Zipf's Law. Index construction. Postings size estimation, dynamic indexing, positional indexes, n-gram indexes					
Unit III Retrieval Models:					08 Hours

Boolean, vector space, TFIDF, Okapi, probabilistic, latent semantic indexing. Vector space scoring. The cosine measure. Efficiency considerations. Document length normalization. Relevance feedback and query expansion. Rocchio	
Unit IV Text Categorization and Filtering:	08 Hours
Introduction to text classification Latent Semantic Indexing, Naive Bayes models. Spam filtering. Vector space classification using hyperplanes; centroids; k Nearest Neighbors. Support vector machine classifiers. Kernel functions. Boosting.	
Unit V Text Clustering	
Clustering versus classification. Partitioning methods, k-means clustering. Mixture of Gaussians model. Hierarchical agglomerative clustering. Clustering terms using documents.	
Textbooks:	
<ol style="list-style-type: none"> 1. Introduction to Information Retrieval. Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schuetze, Cambridge University Press, 2007. 2. Modern Information Retrieval. Baeza-Yates Ricardo and Berthier Ribeiro-Neto. 2nd edition, Addison-Wesley, 2011. 3. Information Retrieval: Implementing and Evaluating Search Engines. Stefan Buttcher, Charlie Clarke, Gordon Cormack, MIT Press, 2010. 	
Reference Books:	
<ol style="list-style-type: none"> 1. Christopher D Manning, Prabhakar Raghavan, Hinrich Schuetze, An Introduction to Information Retrieval By Cambridge University Press, England, 2009. 2. Introduction to Information Retrieval. Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schuetze, Cambridge University Press, 2007. 	
List of Assignments	
<ol style="list-style-type: none"> 1. Implementation of inverted index 2. Implementation of Boolean retrieval model 3. Study of various data structure for fast accessing of the data (Hash table, B-trees, sparse lists) 4. Implementation of cosine similarity using Tf and IDf 5. Study of Zip's law .: Statistical and Mathematical study 6. Implementation of indexing and building the query processing. 7. Study of text clustering algorithms. 8. Evaluating the search engine. 	

M.Tech(IT) Semester-II Subject: Cyber Security		
TeachingScheme	ExaminationScheme	CreditAllotted
Theory :04Hrs/Week	EndSemesterExamination :50Marks	Theory : 04
	InternalAssessment :50Marks	
		Total Credits: 04
CourseObjectives:		
1) Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an Organization.		
2) To develop skills that can help students plan, implement, and monitor cyber security mechanisms to ensure the protection of information technology assets		
CoursePrerequisites:		
Students should have knowledge of		
Basic concepts of cyber security, various attacks		
CourseOutcome:		
Students will be able to:		
1) Learn the foundations of Cyber security and threat landscape..		
2) Understand the investigation of cyber frauds and crimes		
3) Understand the legal and related issues in cyber cases		
4) Learn online privacy techniques in modern day		
5) Understand various cyber security policies		
UNIT-I	OVERVIEW OF CYBER SECURITY	(08 Hours)
	Cyber security increasing threat landscape, Cyber security terminologies- Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker., Non-state actors, Cyber terrorism, Protection of end user machine, Critical IT and National Critical Infrastructure, Cyberwarfare, Case Studies.	
UNIT-II	CYBER CRIMES	(08 Hours)
	Cyber crimes targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach., Online scams and frauds- email scams, Phishing, Vishing, Smishing, Online job fraud, Online sextortion, Debit/ credit card fraud, Online payment fraud, Cyber bullying, website defacement, Cyber squatting, Pharming, Cyber espionage, Cryptojacking, Darknet- illegal trades, drug trafficking, human trafficking., Social Media Scams & Frauds- impersonation, identity theft, job scams, misinformation, fake news cyber crime against persons - cyber grooming, child pornography, cyber stalking., Social Engineering attacks, Cyber Police stations, Crime reporting procedure, Case studies.	

UNIT-III	CYBER LAW	(08 Hours)
	Cyber crime and legal landscape around the world, IT Act,2000 and its amendments. Limitations of IT Act, 2000. Cyber crime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies- AI/ML, IoT, Blockchain, Darknet and Social media, Cyber Laws of other countries, Case Studies.	
UNIT-IV	DATA PRIVACY AND DATA SECURITY	(08 Hours)
	Defining data, meta-data, big data, nonpersonal data. Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles, Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations(GDPR),2016 Personal Information Protection and Electronic Documents Act (PIPEDA)., Social media- data privacy and security issues	
UNIT-V	CYBER SECURITY MANAGEMENT , COMPLIANCE AND GOVERNANCE	(08 Hours)
	Cyber security Plan- cyber security policy, cyber crises management plan, Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy.	
AssignmentList:		
1)	Configure and launch scans to find vulnerabilities	
2)	Explain the steps required to conduct a penetration test.	
3)	Identify security threats applicable to important organizational assets	
4)	Setting privacy settings on social media platforms	
5)	Do's and Don'ts for posting content on Social media platforms	
6)	Registering complaints on a Social media platform.	
7)	Log into computer system as an administrator and check the security policies in the system.	
8)	Platforms for reporting cyber crimes.	
9)	Explain the role Governance, Risk, and Compliance professionals have in ensuring audits achieve expected goals	
10)	Explain how organizations measure cybersecurity risk	
TextBooks:		
1)	Data privacy principles and practice - NatarajVenkataramanan, Ashwin Shriram	
ReferenceBooks:		
1)	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd.	
2)	Information Warfare and Security by Dorothy F. Denning, Addison Wesley.	
3)	Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform.	
4)	Data Privacy Principles and Practice by Natraj Venkataramanan and Ashwin Shriram, CRC Press.	
5)	Information Security Governance, Guidance for Information Security Managers by W. KragBrothy, 1st Edition, Wiley Publication	

6)	Auditing IT Infrastructures for Compliance By Martin Weiss, Michael G. Solomon, 2nd Edition, Jones Bartlett Learning
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M.Tech (IT) Semester - II		Subject : Block Chain Technologies	
Teaching Scheme	Examination Scheme	Credit Allotted	
Theory : 04 Hrs/Week	End Semester Examination : 50 Marks	Theory :04	
Practical : 02 Hrs/Week	Internal Assessment : 50 Marks	Practical : 01	
	Total :100 Marks		
	Term Work:25 Marks	Total Credits : 05	
	Prat/Oral : 25 Marks		
Course Objectives:			
1) Understand the functioning of the Blockchain technology			
2) Use blockchain environment for deploying the applications.			
Course Prerequisites:			
Students should have knowledge of			
Distributed System, Network Security			
Course Outcome:			
Students will be able to:			
1) Understand the Blockchain fundamentals.			
2) Understand the application of security of algorithm.			
3) Use Web3j for the deployment			
4) Understand the basic structure of Ethereum.			
5) Design an environment with Swarm.			
6) Design an Environment with IPFS			
...			
UNIT-I	Block Chain Essentials		(08 Hours)
	Introduction to Block chain – History, Definition, Distributed Ledger, Blockchain Categories – Public, Private, Consortium, Blockchain Network and Nodes, Peer-to-Peer Network, Mining Mechanism, Generic elements of Blockchain, Features of Blockchain, and Types of Blockchain.		
UNIT-II	Architecture of the Blockchain		(08 Hours)
	Operation of Bitcoin Blockchain, Blockchain Architecture – Block, Hash, Distributer P2P, Structure of Blockchain- Consensus mechanism: Proof of Work (PoW), Proof of Stake (PoS), Byzantine Fault Tolerance (BFT), Proof of Authority (PoA) and Proof of Elapsed Time (PoET)		

UNIT-III	Initial Coin Offerring	(08 Hours)
	Public versus private and permissioned versus permission less blockchains- Privacy and anonymity in Ethereum- Why are privacy and anonymity important? - The Ethereum Enterprise Alliance- Blockchain as-a-Service- Initial Coin Offering (ICO): Project setup for ICO implementation- Token contracts- Token sale contracts- Contract security and testing the code.	
UNIT-IV	Environment Setup for Block Chain	(08 Hours)
	Project presentation- Futures smart contract: Blockchain oracles- Web3j: Setting up the Web3J- Installing web3j- Wallet creation, Java client: The wrapper generator- Initializing web3j- Setting up Ethereum accounts- Deploying the contract	
UNIT-V	Distribution storage with IPFS	(08 Hours)
	Ethereum Virtual Machine- Swarm and IPFS: Installing IPFS, Hosting our frontend: Serving your frontend using IFPS, Serving your frontend using Swarm, IPFS file uploader project: Project setup the web page	
Assignment List:		
1)	Prepare your build system and Building Bitcoin Core.	
2)	Write Hello World smart contract in a higher programming language (Solidity).	
3)	Implement Solidity example using arrays and functions	
4)	Create a Maven project using Web3j.	
5)	Deploy the contract on Web3j	
6)	Implement an ICO on Ethereum.	
7)	Install IPFS locally on our machine	
8)	Configure the contract with IPFS	
9)	Install swarm locally on our machine	
10)	Configure the contract with Swarm.	
Text Books:		
1)	Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, decentralization, and smart contracts explained", 2nd Edition, Packt Publishing Ltd, March 2018.	
2)	Bellaj Badr, Richard Horrocks, Xun (Brian) Wu, "Blockchain By Example: A developer's guide to creating decentralized applications using Bitcoin, Ethereum, and Hyperledger", Packt Publishing Limited, 2018.	
Reference Books:		
1)	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press, 2016.	
2)	Andreas M. Antonopoulos , "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly Media Inc, 2015	

M.Tech (IT) Semester - II		Subject: IoT (Open Elective-I)			
Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Lecture	04	University Examination	50	Lecture	04
		Internal Assessment	50		
Practical	--	Term Work	--	Practical	--
		Oral	--		
Total	04	Total	100	Total	04
Course Objective:					
The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experience-					
<ol style="list-style-type: none"> 1. To Provide a strong foundation of fundamentals of Internet of Things and need of IoT Security. 2. To provide detailed understanding of present scope of Internet of Things with case studies. 					
Prerequisite:					
Digital Electronics, Computer Networks, Computer Architecture					
Course Outcomes: On completion of the course, students will have the ability:					
<ol style="list-style-type: none"> 1. To understand the fundamentals about IoT. 2. To understand the fundamentals of Embedded System 3. To understand the fundamentals IoT Protocols in different layers. 4. To understand the fundamentals of IoT Security. 					
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Unit-1: Introduction to embedded systems					08 Hours
Application Areas, Categories of embedded systems, Overview of embedded system architecture, Specialties of embedded systems, recent trends in embedded systems, Architecture of embedded systems, Hardware architecture, Software architecture, Application Software, Communication Software.					
Unit-2: Introduction to IoT					08 Hours
Review of computer communication concepts (OSI layers, components, packet communication, Networks, TCP-IP, subnetting, IPV4 addressing and challenges). IPV6 addressing. IoT architecture reference layer. Edge computer, cloud and peripheral cloud, Examples of IoT infrastructure, Industrial IoT, Consumer IoT, Commercial IoT, Infrastructure IoT, Military IoT					
Unit-3: IoT Protocols and PTP Communication					
IoT protocols and softwares: IoT Datalink, Network, Session, Service and Transport later protocols: MQTT, UDP, MQTT brokers, publish subscribe					

<p>modes, HTTP, COAP, XMPP and gateway protocols, IoT point to point communication technologies: IoT Communication Pattern, IoT protocol Architecture, Selection of Wireless technologies (6LoWPAN, Zigbee, WIFI, BT, BLE, SIG, NFC, LORA, Lifi, Widi</p>	
Unit-4: IoT Security	08 Hours
<p>Need for encryption, standard encryption protocol, light weight cryptography, Quadruple Trust Model for IoT-A – Threat Analysis and model for IoT-A, Cloud security, IoT and cyber-physical systems, IoT security (vulnerabilities, attacks, and countermeasures), security engineering for IoT development, IoT security lifecycle.</p>	
Unit-5: Case Studies	08 Hours
<p>Case study on the following:</p> <ol style="list-style-type: none"> 1) Wearable Computing 2) Augmented Reality 3) Mobile and Wearable AR 	
Textbooks	
<p>1) Arshdeep Bahga, Vijay Madiseti, “Internet of Things – A hands-on approach”, Universities Press, ISBN: 0: 0996025510, 13: 978-0996025515.</p>	
<p>2) Raj Kamal, Internet of Things: Architecture and Design Principle” , ISBN-13: 978-93-5260-522-4, McGraw Hill Education (India) 2017.</p>	
<p>3) Lyla B. Das, “Embedded Systems: An Integrated Approach” Pearson , ISBN: 9332511675, 9789332511675</p>	
<p>4) Orchestrating and Automating Security for the Internet of Things: Delivering Advanced Security Capabilities from Edge to Cloud for IoT, by Anthony Sabella, Rik IronsMclean, Marcelo Yannuzzi, Publisher: Cisco Press, Release Date: June 2018, ISBN: 9780134756936</p>	
<p>5) Securing the Internet of Things, Shancang Li Li Da Xu, Syngress, 2017, Elsevier, ISBN: 978-0-12-804458-2</p>	
<p>6) IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017.</p>	
Reference Books	
<p>1. Internet of Things: A Hands-on Approach, By Arshdeep Bahga and Vijay Madiseti Lee, Heather Schneider, Robbie Schell, Mobile Applications: Architecture, Design, and Development, Prentice Hall, April 2004, ISBN-13: 978-0131172630</p>	
<p>2. Lyla B. Das, “Embedded Systems: An Integrated Approach” Pearson , ISBN: 9332511675, 9789332511675</p>	
<p>3. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill HigherEducation.</p>	
<p>4. Fei Hu, “Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations “, ISBN: 9781498723183, CRC Press, 2016. 6.</p>	

5. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012.
6. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012, ISBN:978-1-119-99435-0.
7. David Hanes, IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, Cisco Press, ISBN-13: 978-1-58714-456-1, ISBN-10: 1-58714-456-5, 2017.

M.Tech (IT) Semester - II Subject: Open Elective II: Information Technology Enabled Services					
Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Lecture	04	University Examination	50	Lecture	04
		Internal Assessment	50		
Practical	--	Term Work	--	Practical	--
		Oral	--		
Total	04	Total	100	Total	04
Course Objective:					
<ul style="list-style-type: none"> • To understand importance of IT enabled services. • To encourage the use of Information Technology so as to enable students to improve their skills, knowledge and job prospects and enable them to obtain employment in sunrise industries • To develop the ability to integrate various resources for optimization in the industry as well as for strategic utilization of IT enabled services and functions. 					
Prerequisite:					
<ul style="list-style-type: none"> • Information Technology and Project Management, Web Engineering and Technology. 					
Course Outcomes: On completion of the course, students will have the ability to:					
1. Understand the process of IT Industry					
2. Understand Indian laws of IT industry					
3. Study current trends and services in IT industry					
4. Understand programming concept of IT Web services.					
Unit I Introduction:					08 Hours
What is ITES?, Objectives of ITES, ITES Services and applications, Medical Transcription, Document Processing, Data Entry and Processing, Datawarehousing, IT Help Desk Services, Application Development, Enterprise Resource Planning, Telecommunication Services, Financial & Accounting Services, Insurance Services, Taxation, Legal Services, Health Care Services, Document Management Services					
Unit II Business Strategy: Challenges and opportunities for IT					08 Hours
Business Strategy: Challenges and Opportunities in the Globalized, Interconnected, Convergent World, IT Strategy, Stages of IT Strategy Development and Implementation Application Strategy, Technology Strategy for IT, Developing IT Strategy for Competitive Advantage, , Challenges of IT and Business Strategy Alignment, Inhibitors of Business and IT Strategy Alignment, Three-D Framework for Business and IT Strategy Alignment					
Unit III Strategic Planning					08 Hours

Business Implications for IT Strategic and Planning, Strategic IT Planning Motivations, SITP Process: Prevalent Planning Approaches, Difficulties in Developing and Executing SITP, Best Practices for Achieving Good SITP,	
Unit IV Enterprise IT Architecture	
Defining EITA, Contents of a Typical Enterprise IT Architecture, Standard for Enterprise IT Architecture, Technology Management strategy Framework, Prevalent Technology Reference Architectures Framework and Standards, Program Management, Benefits of PMO, Desired Qualities of a Program Office Manager, Maturity of PMO, Implementation of PMO Strategy, Measuring PMO Performance, Success Factors for PMO, Project Scope Management, PMO Dashboard and Reporting	
Unit V IT Service Management Strategy	08 Hours
Information Technology Infrastructure Library (ITIL), ITIL Overview, ITIL Service Support Processes, Incident Management, Problem Management, Service Delivery, Service Level Management, Financial Management, Capacity Management, IT Service Continuity Management (ITSCM), Availability Management, Imperatives for Outsourcing, IT Management Layers, Variants of Outsourcing, Business Process Outsourcing, In sourcing	
Textbooks:	
1. Sanjiva Shankar Dubey, “IT strategy and Management”, PHI. 2. K.Venkatesh, “Marketing of Information Technology”, TMH. 3. Steve Suehring, Timconverse, Joyoe Park, “PHP 6 and MySQL Bible”, Willey.	
Reference Books:	
1. Nikhil Treebhoothu, “Promoting IT Enabled Services”, Addison-Wesley, 2013 2. Shiro Uesugi, “IT Enabled Services”, Springer; 2013 edition, 2013. 3. Sanjiva Shankar Dubey, “IT Services Business Management: Concepts, Processes and Practices”, PHI, 2012.	
List of Assignments	
1. Create a Dynamic Calendar using PHP functions which allows the user to move the calendar forward or backward by a month at a time using simple XHTML form submit button. 2. Write a program to implement error handling in PHP 3. Write a program to implement file handling in PHP including different file functions such as fwrite(), fgetss(), fpassthru(), file() etc. 4. Write a program to implement WSDL in PHP using request and response operations and its types 5. Write a program to implement a SOAP web service in PHP using request and response operations. 6.. Write a program in Object Oriented PHP such that it will create the number of pages for a web site that will look and behave in same way and those pages should be able to modify to suit the different parts of the site. 7. Study assignment on Information Technology Infrastructure Library (ITIL).	

8. Study a case study of Internet Banking web site or Indian Call Center for understanding the Architecture, Strategic IT Planning, Business Strategies – Challenges and Opportunities.

M.Tech(IT) Semester-II Subject: Lab Practice-I		
TeachingScheme	ExaminationScheme	Credits Allotted
	End Semester Examination(Oral) :	
Practical: 04 Hrs/Week	Internal Assessment(TW) :	Oral : 02
	Term Work:25 Marks	Total Credits: 02
	Pract/Oral : 25 Marks	
Course Objectives:		
1) Study Concepts and algorithms in IR		
2) Study of Cataloguing, Indexing, Automatic Indexing.		
3) Study of various search algorithms and retrieval techniques		
Course Outcome:		
Students will be able to:		
1) Apply IR principles to locate relevant information large collections of data..		
2) Devise different document clustering algorithms		
3) Implement retrieval systems for web search tasks		

Assignment List	
1)	Implementation of inverted index
2)	Implementation of Boolean retrieval model
3)	Study of various data structure for fast accessing of the data(Hash table,B-trees,sparse lists)
4)	Implementation of cosine similarity using Tf and IDf
5)	Study of Zip's law .: Statistical and Mathematical study
6)	Implementation of indexing and building the query processing
7)	Study of text clustering algorithms.
8)	Evaluating the search engine.

M.Tech(IT) Semester-II Subject: Lab Practice-II		
TeachingScheme	ExaminationScheme	CreditAllotted
	End Semester Examination(Oral) :	
Practical: 04 Hrs/Week	Internal Assessment(TW) :	Oral : 02
	Term Work:25 Marks	Total Credits: 02
	Pract/Oral : 25 Marks	
CourseObjectives:		
1) Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an Organization.		
2) To develop skills that can help students plan, implement, and monitor cyber security mechanisms to ensure the protection of information technology assets		
CoursePrerequisites:		
Students should have knowledge of		
Basic concepts of cyber security, various attacks		
CourseOutcome:		
Students will be able to:		
1) Learn the foundations of Cyber security and threat landscape..		
2) Understand the investigation of cyber frauds and crimes		
3) Understand the legal and related issues in cyber cases		
4) Learn online privacy techniques in modern day		
5) Understand various cyber security policies		

Practical List:	
1)	Password cracking using open-source tools.
2)	Analyse the security vulnerabilities of E-Commerce service
3)	Explore the NetCat tool.
4)	Study of different types of vulnerabilities for hacking a websites / Web Applications.
5)	Checklist for reporting cyber crimes online.
6)	List out security controls for computer and implement technical security controls in the personal computer.
7)	List out security controls for mobile phone and implement technical security controls in the personal mobile phone.
8)	Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures
9)	Evaluate network defense tools for following (i) IP spoofing (ii) DOS attack
10)	Consider a case study of cyber crime, where the attacker has performed on line credit card fraud. Prepare a report and also list the laws that will be implemented on attacker..

