Courses of Study

(Detailed Course Contents)

Shri Mata Vaishno Devi University

Kakryal, Katra 182320 Jammu & Kashmir

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VISION

Establishment of a Scientific & Technical University of Excellence to nurture young and talented human resources for the service of Indian Society & world at large and preserving the integrity and sanctity of human values.

MISSION

The mission of the University is the pursuit of Education, Scholarship and Research at the highest International level of excellence.

OBJECTIVES

- Provide education and training of excellent quality, both at undergraduate and postgraduate level.

- Ensure that the University achieves and maintains an international standing in both teaching and research

- Promote study and research in new and emerging areas and encourage academic interaction of the faculty and the students at national and international levels.

- Encourage close collaboration with industry and facilitate the application of research for commercial use and for the benefit of society.

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Details of

Programme of Study

&

Syllabus of Courses

Offered by

School of Computer Science& Engineering

Course Structure of
M. Tech (Computer Science & Engineering) programme
[Entry Batch 2024]

Semester I   **First Year**

S.No	CourseCode	CourseTitle	L	T	S/P	Credit
1	CSL 6025	Advanced Programming	3	0	0	3
2	CSP 6025	Advanced Programming Lab	0	0	2	1
3	CSL 6103	Artificial Intelligence & fuzzy Logic	3	1	0	4
4	CSL 7133	Research Methodology	4	0	0	4
5	CSL 6113	Digital Image Processing	3	0	0	3
6	CSP 6113	Digital Image Processing Lab	0	0	2	1
7	CSL 6106	Advance Computer Networks	3	0	0	3
8	CSP 6106	Advance Computer Networks Lab	0	0	2	1
		TotalCredits	16	1	6	20

Semester II   **First Year**

S. No	CourseCode	CourseTitle	L	T	S/P	Credit
1	CSL 6088	Data Mining and Web Algorithms	3	0	0	3
2	CSL 6034	Soft Computing	3	0	0	3
3	CSP 6034	Soft Computing Lab	0	0	2	1
4	CSL 6109	Internet of Things	3	0	0	3
5	CSP 6109	Internet of Things Lab	0	0	2	1
6	CSL 6152	Cloud Computing	3	0	0	3
7	CSP 6152	Cloud Computing Lab	0	0	2	1
8		Elective-1	3	0	0	3
9	CSC 6171	Colloquium	0	0	2	1
10		Open Elective-1	3	0	0	3
		TotalCredits	**18**	**0**	**8**	**22**

List of Electives

Course Code	Course Title	L-T-P	Credit
	Elective – I		
CSE6125	Cyber Security	3-0-0	3
CSE6102	Advance Algorithms	3-0-0	3
CSL6110	Big Data Science & Analytics	3-0-0	3
CSE6016	E-Commerce & Cyber Law	3-0-0	3
CSE6017	Block Chain Coding	3-0-0	3

Semester III   **Second Year**

S. No	CourseCode	CourseTitle	L	T	S/P	Credit
1	CSD 7006	Project/Internship with Thesis	0	0	36	18
		Total Credits				**18**

Semester IV   **Second Year**

S. No	Course Code	Course Title	L	T	S/P	Credit
1	CSD 7007	Dissertation/Internship with Thesis	0	0	40	20
		Total Credits				20

Total credits in M.Tech (CSE) =80

Minimum Total Credits to be earned in order to become eligible for award of M.Tech. (Two Year Full Time) Degree: 80

Course Code	**: CSL 6025**
Course Title	**: Advanced Programming**
L-T-P/S=Credits	**: 3-0-0 =3**
Course Category	**:**
Pre-requisite Courses (if any)	**:**
Equal Course Code (if any)	**:**
Equivalent Course Code (if any)	**:**

Detailed Syllabus

Contents

UNIT 1 Basic Concepts
OOP concepts, Data types, Operators, Control statements, Input using Scanner/BufferedReader, Output, String manipulations using String class, Big Numbers, Arrays, 2D, 3D arrays, Classes, Encapsulation, Getters and Setters, Comments, Access modifiers, Constructors, Functions, Overloading constructors and functions.

UNIT 2 Inheritances, Generic Classes, Interfaces, Exception Handling, Multithreading: Dynamic binding, Final classes and methods, Abstract classes, Inner classes, Protected access, Object class, Generic classes and methods, Interfaces, Object cloning, Comparing Objects using Comparable, Exception Handling, Checked & Unchecked Exceptions, Multithreading, Threads synchronization, Classical synchronization problems like Producer-Consumer/Dining Philosophers

UNIT3 COLLECTIONS
Collection interface, Set interface, List interface, Queue interface, SortedSet interface, HashSet class, LinkedHashSet class, TreeSet class, ArrayList class, Vector class, LinkedList class, PriorityQueue class, Arrays class, Collections class, map interface, HashTable class, LinkedHashMap class, HashMap class, Sortedmap interface, TreeMap class, Iterator, ListIterator, Stack

UNIT 4 Database Connectivity & GUI Development using AWT/SWING
Accessing Database with JDBC, Understanding the fundamentals of AWT framework and its limitations, creating Frames using Swing, Layout managers, Buttons, Menus. Event Handling, Adapter classes, Introduction to JAVAFX for creating rich GUI applications, Introduction to Networking, Connecting to sever, Sending email, Introduction to EJB, Introduction to Applets

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication/Reprint
Text Books		
1	Core Java-Volume I & II by Cay S.Horstmann, Gary Cornell, Pearson Education · Java-How to Program, Deitel and Deitel: PHI Publication	2012
2	Thinking in JAVA, Bruce Eckel, Pearson	2008
3	Head First Java, Bert Bates & Kathy Sierra, O'Reilly publications	2014
Reference Books		
1	The Complete Reference Java , Herbert Schildt: TMH	2019

Course Outcome

Sr	Course Outcome	CO
1	Understand the syntax, control structures, data structures of java programming language. Ability to demonstrate simple Java programmes	CO1
2	Ability to code any given algorithm, or provide a solution to real-life-problem using JAVA language	CO2
3	Ability to build Desktop Applications with GUI(Graphical User Interface) and Database connectivity to create real-life/business solutions	CO3
4	Inculcating the ability to enjoy coding and build simple games like Tic-Tac-Toe etc	CO4
5	Ability to use Industry standard IDEs (Integrated Development Environments) like NetBeans/Eclipse for coding, debugging etc	CO5
6	Ability to code and manage at least a few thousand lines of code which enforces the use of Industry best practices like documentation etc	CO6

Course Code	: CSP 6025
Course Title	: Advanced Programming Lab
L-T-P/S=Credits	: 0-0-2 =1
Course Category	:
Pre-requisite Courses (if any)	:
Equal Course Code (if any)	:
Equivalent Course Code (if any)	:

List of Experiments

Sr	Contents
1	Program to display Hello world
2	Program to understand command line arguments
3	Program to Input values using Scanner/BufferedReader class, do simple calculations and print values
4	Program to learn about data types & various arithmetic/bitwise/logical/unary operators
5	Program to understand loops and conditions
6	Program to generate patterns and series like Fibonacci/Prime/Even/Odd etc.
7	Program to understand Classes & Objects
8	Program to understand Inheritance and its concepts
9	Program to understand Constructor overloading & calling super class constructor
10	Program to understand method overloading and overriding
11	Program to understand the importance of Getters and Setters
12	Program to understand various access modifiers
13	Program to understand various types of comments in Java
14	Program to understand Interfaces, Abstract class, Inner Class
15	Program to understand Final Classes and Methods
16	Program to learn String, StringBuffer, StringBuilder classes
17	Program to BigInteger and BigDecimal classes
18	Program to understand Arrays & do matrix problems
19	Program to understand raw and generic ArrayList, Auto boxing and Unboxing
20	Program to understand concepts like Array of Objects &ArrayList of Objects
21	Program to sort/sorting algorithms
22	Program to understand methods available in Math class
23	Program to understand the Cosmic superclass ―Object‖
24	Program to understand the concept of Object Cloning
25	Program to compare objects using Comparable
26	Program to understand Collections(HashMap, HashTable, Set, TreeSet etc.) & Iterators
27	Program to understand try-catch-finally block in Exception Handling
28	Program to understand throw and throws keywords, checked and unchecked Exceptions
29	Program to create user defined exceptions
30	Program to understand Multithreading using Thread class and Runnable Interface
31	Program to understand Thread Synchronization
32	Program the classical Problems of Thread Synchronization like Dining Philosophers, Producer Consumer
33	Program to learn about various (byte/character etc.) streams in Java
34	Program to learn about File I/O
35	Program to Create GUI frames using Swing/AWT and Event Handling
36	Program to understand various layout managers,
37	Program to understand the Adapter classes,
38	Program to connect to database and perform operations like Create Table, Update Table, Select query, Insert query
39	Program to strengthen logic building in students using simple/medium level problems from CodeChef etc.
40	Program to learn about basic concepts of JavaFx
41	Program to learn about basic Networking concepts like sockets, Client & Server
42	Program to learn about sending emails
43	Program to learn about basic EJB concepts
44	Program to learn about basic Applet concepts

Course Code : CSL 6103
Course Title : **Artificial Intelligence & fuzzy Logic**
L-T-P/S=Credits : **3-1-0 =4**
Course Category :
Pre-requisite Courses (if any) :
Equal Course Code (if any) :
Equivalent Course Code (if any) :

Detailed Syllabus

Contents
UNIT 1 Introduction
AI History and applications. Overview of AI application areas: game playing, automated reasoning and theorem proving, expert systems, natural language understanding, planning and robotics, machine learning and Alan Turing Test.
UNIT 2The Propositional and Predicate Logic
Symbol and sentences, the semantics of the Propositional Calculus & Predicate Calculus. Inference Rules and Theorem Proving. Axioms, Literals, Horn clause & Clausal forms.
UNIT 3 Reasoning
Inductive, Deductive, Abductive and Default reasoning. More examples on Resolution proof.
UNIT 4 Problem Solving as Search
Structures and strategies for state space search. Algorithms for Heuristic search, Heuristic evaluation functions, Heuristic search and expert systems, using Heuristics in games, Time & Complexity issues etc..
UNIT 5 Knowledge Representation
Knowledge representation Techniques; a survey of network representation; conceptual graphs; structured representations; frames, scripts; issues in knowledge representation: hierarchies, inheritance, exceptions; efficiencies.
UNIT 6 Knowledge Elicitation and Knowledge Acquisition
An overview of the induction methods, types and tools.Stages in Knowledge acquisition with examples. Analyzing, coding, documenting and diagramming.Scope of knowledge.
UNIT 7 Expert Systems
Overview of expert system technology; rule-based expert systems; Construction of ES. Components of an ES. The explanation facility. Rule-based formation and forward and backward chaining techniques for problem solving.
UNIT 8 Reasoning with uncertain and incomplete information
The statistical approach to uncertainty, Bayesian reasoning, the Dempster-Shafer theory of evidence, Certainty Factor, Reasoning with Fuzzy sets.

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication/Reprint
Text Books		
1	Artificial Intelligence: Strategies and techniques for complex problems solving by George Luger, Addison-Wesley	2003
2	Artificial Intelligence - A Modern Approach by Stuart Russell & Peter Norvig, Prentice Hall.	2017
3	Artificial Intelligence - A New Synthesis by Nils J. Nilsson, Morgan Kaufmann Publishers.	2008

Course Outcome

Sr	Course Outcome	CO
1	Familiarize with propositional and predicate logic and their roles in logic programming	CO1
2	Understand logical programming and write programs in declarative programming style	CO2
3	Learn the knowledge representation and reasoning techniques in rule based systems, case-based systems, and model-based systems	CO3

Course Code	: CSL 7133
Course Title	: Research Methodology
L-T-P/S=Credits	: 4-0-0 =4
Course Category	:
Pre-requisite Courses (if any)	:
Equal Course Code (if any)	:
Equivalent Course Code (if any)	:

Detailed Syllabus

UNIT-1.
Research Methodology: An Introduction Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Research Method versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, problem Encountered by Researchers in India. Defining the Research Problem: Definition of Research Problem, Selecting the Problem, Necessity of Defining the Problem Technique Involved in Defining a Problem.

UNIT - 2
Measurement and Scaling Technique: Measurement in Research, Measurement Scales, Sources of Error in Measurement, Tests of Sound Measurement, Technique of Developing Measurement Tools, Scaling, Meaning of Scaling, Scale Classification Bases, Important Scaling Techniques, Scale Construction Techniques. Processing and Analysis of Data: Processing Operations, Some Problems in Processing, Elements /Types of Analysis, Statistics in Research, Measures of Central Tendency, Measures of Dispersion Measures of Asymmetry (Skewness), Measures of Relationship, Partial Correlation, Association in case of Attributes, Other Measures

UNIT - 3
Sampling Fundamentals: Need for Sampling, Some Fundamental Definitions, Central Limit Theorem, Sampling Theorem, Sandler's A-test, Concept of Standard Error, Estimation, Estimating the Population Mean, Estimating the Population Proportion, Sample size and its Determination, Determination of Sample Size through the Approach, Based on Precision Rate and Confidence Level, Determination of Sample Size through the Approach, Based on Bayesian Statistics. Analysis of Variance and Covariance: Analysis of variance(ANOVA), basic principles, technique, setting up analysis of variance table, short cut method for one- way ANOVA, coding method, two-way-ANOVA, ANOVA in Latin Square-Design, Analysis of Co
variance(ANOCOVA), technique, assumption in ANOCOVA

UNIT - 4
Analysis and Report Writing: Graphical plots: Charts, Box plots, histograms, Scatter plots and normal probability plots, Time series methods: Lag plots, Corellograms, Variograms, 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 a Research Report.

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication/Reprint
Text Books		
1	Kothari C.R. (reprint 2011), Research Methodology – Methods and Techniques (New Age International, New Delhi)	2011
2	Montgomery, Douglas C. (2007), Design and Analysis of Experiments. (Willey India) · Montgomery, Douglas C. &Runger, George C. , Applied Stastics& Probability for Engineers (Wiley India)	2007
3	S.P Gupta Statistical Methods S Chand and Co.	2013

Course Outcome

Sr	Course Outcome	CO
1	Develop skills in qualitative and quantitative data analysis and presentation	CO1
2	Identify and interpret the issues and concepts salient to the research process	CO2
3	To identify various sources of information for literature review and data collection.	CO3
4	Analyze the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project.	CO4
5	Evaluate the concepts and procedures of sampling, data collection, analysis and reporting.	CO5

Course Code	: CSL 6113
Course Title	: Digital Image Processing
L-T-P/S=Credits	: 3-0-0 =3
Course Category	:
Pre-requisite Courses (if any)	:
Equal Course Code (if any)	:
Equivalent Course Code (if any)	:

Detailed Syllabus

Unit-1 Introduction and Digital Image Fundamentals
Application of Image Processing, Image Processing definition, steps in image Processing, Image Sensing and Acquisition, Image Sampling and Quantization, Spatial and Intensity resolution-Effect of reducing spatial resolution, DPI, Effect of reducing image gray levels. Basic relationships between pixels and adjacency

Unit-2 Intensity Transformation and Spatial Filtering
Basics of intensity transformation and spatial filtering, intensity transformation functions- image negative, log transformation, power law; Piecewise-linear transformation functions- contrast stretching, intensity level slicing, bit plane slicing; Histogram Processing-histogram stretching, histogram equalization, Spatial Filtering, Spatial Correlation and Convolution, Smoothing Spatial Filters, order statistic filters, Sharpening Spatial Filters- The Laplacian, The Gradient-Robert cross gradient operator, Sobel operators

Unit-3 Image Restoration
Model of the image degradation/restoration process, Noise Models, Periodic Noise, Estimation of noise parameters, Restoration in the presence of noise-spatial filtering- Mean filters, Order-statistics filters, Median filter, Max and Min filters, Mid-point filter, Alpha-trimmed mean filter, adaptive filters.

Unit-4 Color Image Processing
Introduction to the color image processing, color models: RGB, HSI, CMY/ CMYK; Conversion of color models: converting colors from RGB to HSI, HSI to RGB, RGB to CMY and CMY to RGB etc. Pseudo coloring of images.

Unit-5 Image Compression
Introduction to image compression, need of compression, methods of image compression: coding redundancy, spatial and temporal redundancy, irrelevant information, models of image compression, Huffman coding, Arithmetic coding, LZW coding, run-length coding, block transform coding, JPEG compression, predictive coding

Unit-6 Image Segmentation
Fundamental, Point, Line and Edge detection, edge linking and boundary detection, Hough transform, thresholding, region-based segmentation, region splitting and merging

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication/Reprint
Text Books		
1	Rafael C. Gonzalez & Richard E. Woods, —Digital Image Processing‖, 3rd edition, Pearson Education	2008
2	David A. Forsyth, Jean Ponce, —Computer Vision: A Modern Approach‖, Prentice Hall· A.K. Jain, —Fundamental of Digital Image Processing‖, PHI	2013
3	W.K. Pratt, —Digital Image Processing	2005

Course Outcome

Sr	Course Outcome	CO
1	Understand image formation for the acquisition of images.	CO1
2	Get broad exposure of the various applications of image processing in industry, medicine, agriculture etc.	CO2
3	Get knowledge of existing algorithms for the processing of digital images.	CO3
4	Apply knowledge/skills to solve industrial problems based on image processing.	CO4
5	Think independently to evolve new methods and procedures with the analysis of image processing problems and techniques.	CO5

Course Code	**: CSP 6113**
Course Title	**: Digital Image Processing Lab**
L-T-P/S=Credits	**: 0-0-2 =1**
Course Category	**:**
Pre-requisite Courses (if any)	**:**
Equal Course Code (if any)	**:**
Equivalent Course Code (if any)	**:**

List of Experiments

Sr	Contents
1	Input a colored image and convert it into Black & White Image using Matlab Function.
2	Input an image and compare the effects of reduced Quantization levels to produce False Contouring.
3	Input an image and compare the effects of increased Quantization levels to produce Saturation affect.

4	Input an image and down-sample the image to a desired size.
5	Input an image an up-sample it to study the effect on image clarity.
6	Input an image and resize it to a desired size.
7	Write a code in Matlab to display the negative of an image.
8	Write a code in Matlab to improve the contrast of an image and compare the original and enhanced image.
9	Write a code in Matlab to observe thresholding (or extreme mage contrast).
10	Perform Gray level slicing on an image using both with and without background slicing techniques and compare the outputs.
11	Write a code in Matlab to hide a text in an input image and retrieve the same.
12	Write a Matlab code to improve the dynamic range of an input image using Log transformation or power law transformation.
13	Add Gaussian noise to an image and perform low –pass Average filtering on the image to study the effect.
14	Add salt & pepper noise to an image and perform Low-pass median filtering on it to analyse the effect.
15	Write a Matlab code to zoom an image using both replication as well as interpolation and compare the results
16	Input an image and perform histogram stretching on it to see the resulting image.
17	Input an image to perform histogram equalisation on it and plot the resulting image to analyse the effect.
18	Perform masking on an input image using Sobel , Roberts and Prewitts operators.

Course Code   **: CSL 6106**
Course Title   **: Advance Computer Networks**
L-T-P/S=Credits   **: 3-0-0 =3**
Course Category   **:**
Pre-requisite Courses (if any)   **:**
Equal Course Code (if any)   **:**
Equivalent Course Code (if any)   **:**

Detailed Syllabus

UNIT-I:
Review of Physical, Data link layer, TCP/IP: Datalink Protocols; ARP and RARP.

UNIT-II:
Network Layer: Routing algorithms and protocols, Congestion control algorithm, Router Operation, Router configuration, Internetworking, IP Protocol, IPv6 (an overview), Network layer in ATM Network.

UNIT-III:
Transport Layer: Transport Service, Transport Protocol (TCP, UDP, protocol etc.).

UNIT-IV:
Application layer: Security, DNS, SNMP, RMON, Electronic Mail, WWW etc.

UNIT-V:
Network Security: Firewalls (Application and packet filtering), Virtual Public Network

UNIT-VI:
Evolution of Wireless Networks, Infrastructure based wireless networks, Infrastructure less wireless Networks, Personal Area Networks, Body Area Networks, Mobile Ad hoc Networks, Vehicular Ad hoc Networks, WiMAX, Wireless Mesh Networks, Sensor Networks, Underwater Sensor Networks.

UNIT-VII:
Flying Ad hoc Networks, UAVs, Cloud Computing, Social Networks, Optical Networks, Blockchain, Networks for Cyber Physical Systems, Internet of Things,Internet of Nano Things, Nano Communication Networks, Quantum Internet, Various Future Generation Systems and Networks

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication/Reprint
Text Books		
1	Tananbaum A.S., ─Computer Networks ‖ , 3rd Ed, PHI, 1999	1999
2	Laura Chappell (ed), ─Introduction to Cisco Router Configuration ‖ , Techmedia, 1999	1999
3	Subramaniam M., ─Network Management: Principles and Practice‖, Pearson.	2001

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Course Outcome

Sr	Course Outcome	CO
1	Remember & understand the components requirement of networks	CO1
2	Applying Various Protocols in Different Networks	CO2
3	Analyzing various Networks and Protocols	CO3
4	Evaluating Different Networks and Protocols in Various scenarios	CO4
5	Creating various networks & protocols	CO5

Course Code : **CSP 6106**
Course Title : **Advance Computer Networks Lab**
L-T-P/S=Credits : **0-0-2 =1**
Course Category :
Pre-requisite Courses (if any) :
Equal Course Code (if any) :
Equivalent Course Code (if any) :

List of Experiments

Sr	Contents
1	Introduction to NetSim,
2	Understand IP forwarding within a LAN and across a router . Study the working of spanning tree algorithm by varying the priority among the switches
3	Understand the working of ─Connection Establishment‖ in TCP using NetSim.
4	Study the throughputs of Slow start + Congestion avoidance (Old Tahoe) and Fast Retransmit (Tahoe) Congestion Control Algorithms
5	Study how the Data Rate of a Wireless LAN (IEEE 802.11b) network varies as the distance between the Access Point and the wireless nodes is varied
6	Study the working and routing table formation of Interior routing protocols, i.e. Routing Information Protocol (RIP) and Open Shortest Path First (OSPF)
7	Experiment on M/D/1 Queue
8	Plot the characteristic curve throughput versus offered traffic for a Slotted ALOHA system
9	Understand the impact of bit error rate on packet error and investigate the impact of error of a simple hub based CSMA / CD network
10	To determine the optimum persistence of a p-persistent CSMA / CD network for a heavily loaded bus capacity
11	Analyze the performance of a MANET, (running CSMA/CA (802.11b) in MAC) with increasing node density
12	Analyze the performance of a MANET, (running CSMA/CA (802.11b) in MAC) with increasing node mobility
13	Study the working of BGP and formation of BGP Routing table

Course Code : **CSL 6088**
Course Title : **Data Mining and Web Algorithms**
L-T-P/S=Credits : **3-0-0 =3**
Course Category :
Pre-requisite Courses (if any) :
Equal Course Code (if any) :
Equivalent Course Code (if any) :

Detailed Syllabus

Unit-1 Introduction

Motivation of Mining, significance of Data Mining, Data Mining—On What Kind of Data? Data Mining Functionalities—Kinds of Patterns Can Be Mined, Interesting Patterns, Classification of Data Mining Systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or Data Warehouse System, Major Issues in Data Mining.

Unit-2 Data Warehouse

Data Warehouse Concepts: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining.

Data Pre-processing: Data extraction, Data Cleaning, Data Integration and Transformation, Data Reduction, Loading into Staging area, Post Load Processing

Dimensional modeling and OLAP Technology: Defining Dimensional model, Granularity of Facts, Additivity of facts, Helper tables, Implementing Many–to-Many Relationship between fact and dimension tables, Implementing changing dimensions, Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction

Unit-3 Data Mining

Association Algorithms: Usability and Complexity Analysis of Apriori Algorithm, Sampling Algorithm, Partitioning, Using multiple minimum supports , Rough set approach

Classification Algorithms: Issues Regarding Classification and Prediction, Bayesian Classification, Usability and Complexity Analysis of Bayesian algorithm, Nearest Neighbour algorithm, Decision Tree based algorithm , Rule based Algorithm

Clustering Algorithms: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Usability and Complexity Analysis of Agglomerative Hierarchical Algorithm, k-means Partitioning Algorithm

Unit-4 Web Mining

Searching , crawling and indexing Algorithms: Link Based Search Algorithm, Web Crawling, Indexing, Searching, Zone Indexing, Term-Frequency, Link Analysis Algorithm.

Ranking Algorithms: Page rank, Hits ranking algorithms, Web caching Algorithm: LRV, FIFO, LRU, Random, OPT Recommendation Algorithms: Collaborative Filtering, Item-to-Item recommendation, Memory Based Recommendation

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication/Reprint
Text Books		
1	Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining	2008
2	Data Mining: Concepts and Techniques, Pei, Han and Kamber, Elsevier,	2011

Course Outcome

Sr	Course Outcome	CO
1	Understand the importance and construction of data ware house and Prepare the data needed for data mining using pre pre-processing techniques	CO1
2	Perform exploratory analysis of the data to be used for mining and implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on data sets.	CO2
3	Apply web algorithm to solve practical problems: page ranking, recommendation system	CO3

Course Code : CSL 6034
Course Title : Soft Computing
L-T-P/S=Credits : 3-0-0 =3
Course Category :
Pre-requisite Courses (if any) :
Equal Course Code (if any) :
Equivalent Course Code (if any) :

Detailed Syllabus

Unit I: Artificial Neural Network

Introduction – Fundamental concept – Evolution of Neural Networks – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network. Supervised Learning Network: Perceptron Networks – Adaline – Multiple Adaptive Linear Neurons – Back-Propagation Network – Radial Basis Function Network.

Unit II

– Linear Separability – Hebb Network. Supervised Learning Network: Perceptron Networks – Adaline – Multiple Adaptive Linear Neurons – Back-Propagation Network – Radial Basis Function Network.

Unit III: Fuzzy Set Theory Introduction to Classical Sets and Fuzzy sets
 Classical Relations and Fuzzy Relations – Tolerance and Equivalence Relations – Noninteractive Fuzzy sets – Membership Functions: Fuzzification – Methods of Membership Value Assignments – Defuzzification – Lambda-Cuts for Fuzzy sets and Fuzzy Relations – Defuzzification Methods.

Unit IV :Fuzzy Set Theory
 Fuzzy Arithmetic and Fuzzy Measures: Fuzzy Rule Base and Approximate Reasoning: Truth values and Tables in Fuzzy logic – Fuzzy Propositions – Formation of Rules – Decomposition and Aggregation of rules   – Fuzzy Reasoning – Fuzzy Inference Systems (FIS) – Fuzzy Decision Making – Fuzzy Logic Control Systems.

Unit V: (Genetic Algorithm) Introduction – Basic Operators and Terminologies in GAs –
Traditional Algorithm vs. Genetic Algorithm – Simple GA – General Genetic Algorithm – The Scheme Theorem – Classification of Genetic Algorithm – Holland Classifier Systems – Genetic Programming. Applications of Soft Computing: A Fusion Approach of Multispectral Images with SAR Image for Flood Area Analysis – Optimization of Travelling Salesman Problem using Genetic Algorithm Approach – Genetic Algorithm based Internet Search Technique – Soft Computing based Hybrid Fuzzy Controllers – Soft Computing based Rocket Engine – Control.

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication/Reprint
Text Books		
1	S.N. Sivanandan and S.N. Deepa, Principles of Soft Computing, Wiley India	2007
2	S. Rajasekaran and G.A.V.Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI	2003
3	Timothy J.Ross, Fuzzy Logic with Engineering Applications, McGraw-Hill, 1997. 3. J.S.R.Jang, C. T.Sun and E.Mizutani, Neuro-Fuzzy and Soft Computing, PHI	2004

Course Outcome

Sr	Course Outcome	CO
1	To understand the fundamental theory and concepts of neural networks, neuro-modelling, several neural network paradigms and its applications	CO1
2	To understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic control and other machine intelligence applications of fuzzy logic	CO2
3	To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.	CO3

Course Code	: CSP 6034
Course Title	: Soft Computing Lab
L-T-P/S=Credits	: 0-0-2 =1
Course Category	:
Pre-requisite Courses (if any)	:
Equal Course Code (if any)	:
Equivalent Course Code (if any)	:

List of Experiments

Sr	Contents
1	Design and simulate the behaviour of AND Gate using Perceptron Network in C for bipolar inputs and targets.
2	Design and simulate the behaviour of OR Gate using Adaline Network in C for bipolar inputs and targets.
3	Design and simulate the behaviour XOR Gate using Madaline network in C language for bipolar inputs and targets.
4	Design and simulate the behaviour of XOR gate using Back Propagation Network in c for Bipolar inputs and Binary targets.
5	Write a program in C to Implement the various primitive operations of classical sets.
6	Write a program in C to implement and verify various Laws associated with Classical sets.
7	Write a program in C to perform various primitive operations on Fuzzy Sets with Dynamic Components.
8	Write a program in C to verify various Laws associated with Fuzzy Sets.
9	Write a program in C to perform Cartesian product over two given Fuzzy Sets.
10	Write a program in C to perform Max-Min Composition of Two Matrices obtained from Cartesian Product.

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11	Write a program in C to perform Max-Product Composition of Two Matrices obtained from Cartesian Product.
12	Write a program in C to maximize F(X) = X2 using Genetic Algorithm where 0<X<31

Course Code   : CSL 6109
Course Title   :Internet of Things
L-T-P/S=Credits   : 3-0-0 =3
Course Category   :
Pre-requisite Courses (if any)   :
Equal Course Code (if any)   :
Equivalent Course Code (if any)   :

Detailed Syllabus

Unit I: Introduction
What is the Internet of Things? : History of IoT, About IoT, Overview and Motivations, Examples of Applications, Internet of Things Definitions and Frameworks :IoT Definitions, IoT Architecture, General Observations, ITU-T Views, Working Definition, IoT Frameworks, Basic Nodal Capabilities

Unit II: Fundamental IOT Mechanisms and Key Technologies
Identification of IoT Objects and Services, Structural Aspects of the IoT, Environment Characteristics, Traffic Characteristics, Scalability, Interoperability, Security and Privacy, Open Architecture, Key IoT Technologies, Device Intelligence, Communication Capabilities, Mobility Support, Device Power, Sensor Technology, RFID Technology, Satellite Technology

Unit III: Radio Frequency Identification Technology
RFID: Introduction, Principle of RFID, Components of an RFID system, IssuesEPCGlobal Architecture Framework: EPCIS & ONS, Design issues, Technological challenges, Security challenges, IP for IoT, Web of Things.

Wireless Sensor Networks: History and context, WSN Architecture, the node, Connecting nodes, Networking Nodes, Securing Communication

WSN specific IoT applications, challenges: Security, QoS, Configuration, Various integration approaches, Data link layer protocols, routing protocols and infrastructure establishment

IV: Resource Management in The Internet Of Things
Clustering, Software Agents, Clustering Principles in an Internet of ThingsArchitecture, Design Guidelines, and Software Agents for Object Representation, Data Synchronization.

Identity portrayal, Identity management, various identity management models: Local, Network, Federated and global web identity, user-centric identity management, device centric identity management and hybrid-identity management, Identity and trust.

Unit V: Internet of Things Privacy, Security and Governance
Vulnerabilities of IoT, Security requirements, Threat analysis, Use cases and misuse cases, IoT security tomography and layered attacker model, Identity establishment, Access control, Message integrity, Non repudiation and availability, Security model for IoT.

Unit VI: Business Models For The Internet Of Things
Business Models and Business Model Innovation, Value Creation in the Internet of Things, Business Model Scenarios for the Internet of Things.

Unit VII: Internet of Things Application
 Smart Metering Advanced Metering Infrastructure, e-Health Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication/Reprint
Text Books		
1	Daniel Minoli, ―Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications‖, ISBN: 978-1-118-47347-4, Willy Publications	2009
2	Bernd Scholz-Reiter, Florian Michahelles, ―Architecting the Internet of Things‖, ISBN 978-3-642- 19156-5 e-ISBN 978-3-642-19157-2, Springer	

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| 3 | Parikshit N. Mahalle& Poonam N. Railkar, —Identity Management for Internet of Things‖, River Publishers, ISBN: 978-87-93102-90-3 (Hard Copy), 978-87-93102-91-0 (ebook) | 2006 |

Course Outcome

Sr	Course Outcome	CO
1	Understand the vision of IoT from a global context.	CO1
2	Understand and identify the areas for requirements of applications of IoT.	CO2
3	Determine the Market perspective of IoT.	CO3
4	Use of Devices, Gateways and Data Management in IoT.	CO4
5	Develop applications of IoT in Industrial and Commercial and Real World Design Constraints.	CO5

Course Code : CSP 6109
Course Title : Internet of Things Lab
L-T-P/S=Credits : 0-0-2 =1
Course Category :
Pre-requisite Courses (if any) :
Equal Course Code (if any) :
Equivalent Course Code (if any) :

List of Experiments

Sr	Contents
1	Define and Explain Eclipse IoT Project.
2	List and summarize few Eclipse IoT Projects.
3	Sketch the architecture of IoT Toolkit and explain each entity in brief.
4	Demonstrate a smart object API gateway service reference implementation in IoT toolkit.
5	Write and explain working of an HTTP- to-CoAP semantic mapping proxy in IoT toolkit.
6	Describe gateway-as-a-service deployment in IoT toolkit.
7	Explain application framework and embedded software agents for IoT toolkit
8	Explain working of Raspberry Pi.

Course Code : CSL 6152
Course Title : Cloud Computing
L-T-P/S=Credits : 3-0-0 =3
Course Category :
Pre-requisite Courses (if any) :
Equal Course Code (if any) :
Equivalent Course Code (if any) :

Detailed Syllabus

Unit I: Cloud Computing Fundamental: Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications.
Unit II: Cloud Applications: Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages
Unit III: Cloud Services Management: Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics : Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat)

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Unit IV: Application Development: Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App.

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication/Reprint
Text Books		
1	Gautam Shroff, Enterprise Cloud Computing Technology Architecture Applications	2014
2	Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approac	2011
3	Dimitris N. Chorafas, Cloud Computing Strategies	2005

Course Outcome

Sr	Course Outcome	CO
1	Understand the architecture and different types of clouds	CO1
2	Case studies of different cloud servers	CO2
3	Understanding popular cloud platforms and creating virtual machines	CO3

Course Code   : **CSP 6152**
Course Title   : **Cloud Computing Lab**
L-T-P/S=Credits   : **0-0-2 =1**
Course Category   :
Pre-requisite Courses (if any)   :
Equal Course Code (if any)   :
Equivalent Course Code (if any)   :

List of Experiments

Sr	Contents
1	Implementation of Para-Virtualization using VM Ware_s Workstation/ Oracle_s Virtual Box and Guest O.S
2	Creating a Warehouse Application in SalesForce.com.
3	Creating. Application in SalesForce.com using Apex programming an Language
4	Implementation of SOAP Web services in C#/JAVA Applications
5	Installation and Configuration of Hadoop
6	Create an application (Ex: Word Count) using Hadoop Map/Reduce
7	Case Study: PAAS (Facebook, Google App Engine)
8	Case Study: Amazon Web Services

Course Code   : **CSC 6171**
Course Title   : **Colloquium**
L-T-P/S=Credits   : **0-0-2 =1**
Course Category   :
Pre-requisite Courses (if any)   :
Equal Course Code (if any)   :
Equivalent Course Code (if any)   :

Detailed Syllabus

Sr	Contents	Approx. ContactHours
1	The students will deliver talks on their experience during the 50 working days of practical training and topics of current interest in the computer science and engineering field. These would include technology, research as well as standards issues.	

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Course Code	: CSE6125
Course Title	: Cyber Security
L-T-P/S=Credits	: 3-0-0 =3
Course Category	:
Pre-requisite Courses (if any)	:
Equal Course Code (if any)	:
Equivalent Course Code (if any)	:

Detailed Syllabus

UNIT 1
Introduction to Security: Need for security, Security approaches, Principles of security, Types of attacks.

UNIT 2
Digital Privacy, Online Tracking, Privacy Laws, Types of Computer Security risks (Malware, Hacking, Pharming, Phishing, Ransomware, Adware and Spyware, Trojan, Virus, Worms, WIFI Eavesdropping, Scareware, Distributed Denial-Of-Service Attack, Rootkits, Juice Jacking), Antivirus and Other Security solution, Password, Secure online browsing, Email Security, Social Engineering, Secure WIFI settings, Track yourself online, Cloud storage security, IOT security, Physical Security Threads.

UNIT 3
Systems Vulnerability Scanning Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks Vulnerability Scanning - Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap.

UNIT 4
Network Defense tools Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System

UNIT 5
Introduction to Cyber Crime and law Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Computer Language, Network Language, Realms of the Cyber world.

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication/Reprint
Text Books		
1	Cryptography and Network Security: Behrouz A. Forauzan 2/e	2011
2	Cryptography and Network Security: William Stallings 4/e	2007
3	Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication Mc Graw Hill	2009
Reference Books		
1	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and SunitBelpure, Publication Wiley	2016

Course Outcome

Sr	Course Outcome	CO
1	Student should understand cyber-attack, types of cybercrimes, cyber laws and also how to protect them self and ultimately society from such attacks	CO1

Course Code	: CSL 6102
Course Title	: Advance Algorithms
L-T-P/S=Credits	: 3-0-0 =3
Course Category	:
Pre-requisite Courses (if any)	:
Equal Course Code (if any)	:
Equivalent Course Code (if any)	:

Detailed Syllabus

Design Paradigms: Overview:

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Overview of Divide and Conquer, Greedy and Dynamic Programming strategies. Basic search and traversal techniques for graphs, Backtracking, Branch and Bound.

Max Flow Problem String Matching

Introduction to string-matching problem, Naïve algorithm, Rabin Karp, Knuth Morris Pratt, BoyerMoore algorithms and complexity analysis.

Theory of NP- Hard and NP-Complete Problems.

P, NP and NP-Complete complexity classes; A few NP-Completeness proofs; Other complexity classes.

Approximation Algorithms

Introduction, Combinatorial Optimization, approximation factor, Polynomial Time Approximation Schemes (PTAS), FPTAS, Approximation algorithms for vertex cover, set cover, TSP, knapsack, bin packing, subset sum problem etc. Analysis of the expected time complexity of the algorithms.

Parallel Algorithms

Introduction, Models, speedup and efficiency, Some basic techniques, Examples from graph theory, sorting, Parallel sorting networks. Parallel algorithms and their parallel time and processors complexity.

Probabilistic Algorithms & Randomized Algorithms

Numerical probabilistic algorithms, Las Vegas and Monte Carlo algorithms, Game-theoretic techniques, Applications on graph problems

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication/Reprint
Text Books		
1	Introduction to Algorithms : T.H. Cormen, C.E.Leiserson and R.L. Rivest	2008
2	Fundamentals of Algorithmics : G.Brassard and P.Bratley	2006
3	Approximation Algorithms: Vijay V.Vazirani	2003
Reference Books		
1	Randomized Algorithms: R. Motwani and P.Raghavan	2009
2	Algorithmics :The spirit of computing: D.Harel	2005

Course Outcome

Sr	Course Outcome	CO
1	Understand the key techniques and theory behind the type of random variable and distribution	CO1
2	Use effectively the various algorithms for applications involving probability and statistics in computing (data analytics)	CO2
3	Evaluate and Perform hypothesis testing and to conclude	CO3
4	Design and build solutions for a real world problem by applying relevant distributions	C4

Course Code   : CSL6110
Course Title   : **Big Data Science & Analytics**
L-T-P/S=Credits   : **3-0-0 =3**
Course Category   :
Pre-requisite Courses (if any)   :
Equal Course Code (if any)   :
Equivalent Course Code (if any)   :

Detailed Syllabus

Unit I Introduction To Big Data

Introduction to Big Data Platform – Challenges of conventional systems – Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs. reporting – Modern data analytic tools, Statistical concepts: Sampling distributions, resampling, statistical inference, prediction error.

Unit II Data Analysis

Regression modelling, Multivariate analysis, Bayesian modelling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics – Rule induction – Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, stochastic search methods.

Unit III Mining Data Streams

Introduction to Streams Concepts – Stream data model and architecture – Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments -

Counting oneness in a window – Decaying window – Realtime Analytics Platform(RTAP) applications – case studies – real time sentiment analysis, stock market predictions.

Unit IV Frequent ItemsetsAnd Clustering

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Mining Frequent itemsets – Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques - Hierarchical – K- Means – Clustering high dimensional data – CLIQUE and PROCLUS – Frequent pattern based clustering methods – Clustering in non-euclidean space – Clustering for streams and Parallelism.

Unit Iv Frequent Itemsets And Clustering
Mining Frequent itemsets – Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques - Hierarchical – K- Means – Clustering high dimensional data – CLIQUE and PROCLUS – Frequent pattern based clustering methods – Clustering in non-euclidean space – Clustering for streams and Parallelism.

Unit V Frameworks And Visualization
MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – S3 – Hadoop Distributed file systems – Visualizations – Visual data analysis techniques, interaction techniques; Systems and applications.

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication/Reprint
Text Books		
1	Michael Berthold, David J. Hand, ―Intelligent Data Analysis‖, Springer	2007
2	AnandRajaraman and Jeffrey David Ullman, ―Mining of Massive Datasets‖, Cambridge University Press	2012
3	Bill Franks, ―Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics‖, John Wiley & sons	2012
Reference Books		
1	Glenn J. Myatt, ―Making Sense of Data‖, John Wiley & Sons	2007
2	Pete Warden, ―Big Data Glossary‖, O'Reilly	2011

Course Outcome

Sr	Course Outcome	CO
1	Be exposed to big data	CO1
2	Understand the methods of data collections	CO2
3	Learn the different ways of Data Analysis	CO3
4	Be familiar with the visualization of data	CO4

Course Code	: CSE6016
Course Title	: E-Commerce & Cyber Law
L-T-P/S=Credits	: 3-0-0 =3
Course Category	:
Pre-requisite Courses (if any)	:
Equal Course Code (if any)	:
Equivalent Course Code (if any)	:

Detailed Syllabus

Unit-1- Introduction to E-commerce
Define E-commerce, Brief history of E-commerce, Forces fueling E-commerce, Challenges to traditional methods, Types of E-commerce, E-Business, E business trident, E-com Vs E-Business

Unit-2 E-Commerce Challenges and Issues
E-commerce Challenges, E-commerce Issues- Technical issues, Privacy vs Security, Data, Type of data, Protection of data, Security – challenges and requirements, E-commerce players and attacks, Defenses: Firewall, Network security, , Emerging firewall management issues, Types of online transactions, Requirement for online transactions, Securing the Network Transactions – Cryptography - Encryption, Public key encryption vs Private key encryption, Security Protocols for Web Commerce – SSL, SET, SHTTP

Unit-3 Electronic Payment system.
Overview of E- payment system, Pre, Post and Instant payment methods in e-commerce, Digital cash, Properties, Electronic cheques and benefits, online credit card system, types of credit card payments, secure electronic transactions, Debit cards, E-benefit transfer

Unit-4 E business Issues and Internet Marketing
E-Business, Organizational issues, Implementation issues, Marketing issues, Model for E business, Internet Marketing, Different stages of internet marketing, Critical success factor of internet marketing, E commerce strategies for development, E-commerce & sales

Unit -5 Cyber laws
Definition, Need for cyber laws, Jurisprudence of Indian cyber law, Cyber crimes and criminal justice IT   ACT2000 objectives, E-governance, digital signature, Sections related to ,Electronic records, Attribution,   acknowledgement and dispatch of Electronic Records, security of E-records and digital

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signature, Controller functions, Certificates, subscriber duties, Penalties and Adjudications, Cyber regulation Appellate tribunal, Offences, Contracts in the InfoTech world, Power of arrest without warrant a critique, IT Act Modifications. Cyber consumer protection

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication/Reprint
Text Books		
1	E Commerce, Bharat Bhasker TMH	2007
2	E- Commerce, Ravi kalakote, Pearson ed	2015
3	E commerce , Lauden, PHI	2014
Reference Books		
1	Cyber Law Simplified, VivekSood, TMH	2008

Course Outcome

Sr.	Course Outcome	CO
1	Demonstrate an understanding of the foundations, importance, types and the technical infrastructure requirement of E-commerceand E-business	CO1
2	Understand the components of Business model, importance of business models in E-commerce and analyse the impact of E-commerce on business models and strategy	CO2
3	Recognize and discuss the E-commerce issues like data privacy and security and various solutions to achieve the privacy and security in e-commerce.	CO3
4	Understand and assess electronic prepaid and post-paid payment systems for e-commerce	CO4
5	Understand the Indian IT Act 2000 that govern electronic commerce activities, different types of cybercrime and apply critical thinking in analysing judicial decision related to e commerce cybercrimes	CO5

Course Code	: CSE6017
Course Title	: Block Chain Coding
L-T-P/S=Credits	: 3-0-0 =3
Course Category	:
Pre-requisite Courses (if any)	:
Equal Course Code (if any)	:
Equivalent Course Code (if any)	:

Detailed Syllabus

Unit 1
Introduction to Bit coin, Basic concepts about: Transactions, Transaction Blocks, Blockchain, Mining, Bitcoin Addresses, Wallet technology, Transaction inputs and outputs, Transaction Script, Digital Signature, Advanced Concepts in Transactions and scripting.

Unit 2
The Bit coin Network: Peer to Peer Network Architecture, Full Nodes and SPV Nodes, Encryption andauthentication in connections, Transactions Pool, Structure of Block, Block Header, Block Header Hash and Height, Genesis Block, Markle Trees, Linking Blocks in chains.

Unit 3
Mining and Decentralized consensus, Aggregating Transactions in Blocks, Mining the Block, Validating Block, Mining and the Hashing Race, Consensus Attacks, Bit coin Security principles and best practices, Block Chain Applications.

Unit 4
Introduction to Hyper ledger-Fabric/Ethereum for building distributed ledgers (blockchain), Smart contracts, decentralized blockchain applications.

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication/Reprint
Text Books		
1	Mastering Bitcoin – Programming the Open Blockchain, 2nd Edition by Andreas M Antonopoulos, O'Reilly Publications	2011
2	Building Blockchain Projects: Building decentralized Blockchain applications with Ethereum and Solidity, by Narayan Prusty, Packt publications	2014
3	Hands-On Blockchain with Hyperledger: Building decentralized applications with Hyperledger Fabric and Composer, by Nitin Gaur, Packt publications	2016
Reference Books		

1	Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained, 2nd Edition, by Imran Bashir, Packt Publications	2015
2	Blockchain: Blueprint for a New Economy, 1ᵗ Edition, by Melanie Swan, O'Reilly publications· Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits	2002

Course Outcome

Sr	Course Outcome	CO
1	Know the Basic concepts, Design, Architecture, Mining, Network and Security aspects of a Block chain& Crypto currency.	CO1
2	Know the basics of the languages used in building Block chain & Smart Contracts.	CO2
3	Understand the application of Block chain in various other domains like Smart Contracts, IoT, Business Process Management etc	CO3

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