ACE
Engineering College
An Autonomous Institution

(NBA ACCREDITED B.TECH COURSES: EEE, ECE, MECH, CIVIL & CSE, ACCORDED NAAC 'A'GRADE)

Ghatkesar, Hyderabad- 501 301

B.TECH. FOUR YEAR DEGREE COURSE
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
COURSE STRUCTURE

IV Year							**I Semester**
S.No.	**Course Type**	**Course Code**	**Course Title**	**Periods Per Week**			**Credits**
				L	**T**	**P**	
1	PCC	CS701PC	Cryptography & Network Security	3	0	0	3
2	PCC	CS702PC	Data Mining	2	0	0	2
			Professional Elective – IV				
3	PEC	CS711PE	Graph Theory	3	0	0	3
		CS712PE	Introduction to Embedded Systems				
		CS713PE	**Natural Language Processing**				
		CS714PE	Cloud Computing				
		CS715PE	Ad-hoc & Sensor Networks				
			Professional Elective – V				
4	PEC	CS721PE	Advanced Algorithms	3	0	0	3
		CS722PE	Real Time Systems				
		CS723PE	Soft Computing				
		CS724PE	Internet of Things				
		CS725PE	Software Process & Project Management				
5	OEC		Open Elective – II	3	0	0	3
6	PCC	CS703PC	Cryptography & Network Security Lab	0	0	2	1
7	PROJ	CS704PC	Industrial Oriented Mini Project/ Summer Internship	0	0	0	2
8	SI	CS705PC	Seminar	0	0	2	1
9	PROJ	CS706PC	Project Stage - I	0	0	6	3
Total				**14**	**0**	**10**	**21**

Note: *MC = Satisfactory/Unsatisfactory

NOTE: Industrial Oriented Mini Project/ Summer Internship is to be carried out during the summer vacation between 6th and 7th semesters. Students should submit report of Industrial Oriented Mini Project/ Summer Internship for evaluation.

***Open Elective** – Students should take Open Electives from List of Open Electives Offered by Other Departments/Branches Only. These are the list of open electives offered by our branch to other branches.

Course Code	**Open Elective – II**
CS700OE	Data Structures

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CS701OE	Artificial Intelligence
CS702OE	Python Programming
CS703OE	Java Programming

IV Year							**II Semester**
S.No.	**Course Type**	**Course Code**	**Course Title**	**Periods Per Week**			**Credits**
				L	**T**	**P**	
1	HSMC	SM801MS	Organizational Behaviour	3	0	0	3
			Professional Elective – VI				
2	PEC	CS811PE	Computational Complexity	3	0	0	3
		CS812PE	Distributed Systems				
		CS813PE	Neural Networks & Deep Learning				
		CS814PE	Human Computer Interaction				
		CS815PE	Cyber Forensics				
3	OEC		Open Elective – III	3	0	0	3
4	PROJ	CS801PC	Project Stage - II	0	0	14	7
Total				**9**	**0**	**14**	**16**

***Open Elective** – Students should take Open Electives from List of Open Electives Offered by Other Departments/Branches Only. These are the list of open electives offered by our branch to other branches.

Course Code	**Open Elective – III**
CS800OE	Machine Learning
CS801OE	Mobile Application Development
CS802OE	Scripting Languages
CS803OE	Database Management Systems

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Syllabus

IV Year							I Semester
S.No.	**Course Type**	**Course Code**	**Course Title**	**Periods Per Week**			**Credits**
				L	**T**	**P**	
1	PCC	CS701PC	Cryptography & Network Security	3	0	0	3
2	PCC	CS702PC	Data Mining	2	0	0	2
			Professional Elective – IV				
3	PEC	CS711PE	Graph Theory	3	0	0	3
		CS712PE	Introduction to Embedded Systems				
		CS713PE	**Natural Language Processing**				
		CS714PE	Cloud Computing				
		CS715PE	Ad-hoc & Sensor Networks				
			Professional Elective – V				
4	PEC	CS721PE	Advanced Algorithms	3	0	0	3
		CS722PE	Real Time Systems				
		CS723PE	Soft Computing				
		CS724PE	Internet of Things				
		CS725PE	Software Process & Project Management				
5	OEC		Open Elective – II	3	0	0	3
6	PCC	CS703PC	Cryptography & Network Security Lab	0	0	2	1
7	PROJ	CS704PC	Industrial Oriented Mini Project/ Summer Internship	0	0	0	2
8	SI	CS705PC	Seminar	0	0	2	1
9	PROJ	CS706PC	Project Stage - I	0	0	6	3
Total				**14**	**0**	**10**	**21**

Note: *MC = Satisfactory/Unsatisfactory

NOTE: Industrial Oriented Mini Project/ Summer Internship is to be carried out during the summer vacation between 6th and 7th semesters. Students should submit report of Industrial Oriented Mini Project/ Summer Internship for evaluation.

***Open Elective** – Students should take Open Electives from List of Open Electives Offered by Other Departments/Branches Only. These are the list of open electives offered by our branch to other branches.

Course Code	Open Elective – II
CS700OE	Data Structures
CS701OE	Artificial Intelligence
CS702OE	Python Programming
CS703OE	Java Programming

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CS701PC: CRYPTOGRAPHY AND NETWORK SECURITY (PC)

B.Tech. IV Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS701PC	PCC	3	0	0	3	30	70	100
Contact Classes:50	Tutorial Classes:	Practical Classes: Nil				Total Classes:50		

Prerequisite:

Course Objectives:

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection
- Discuss the fundamental ideas of public-key cryptography.
- Generate and distribute a PGP key pair and use the PGP package to send an encrypted email message.
- Discuss Web security and Firewalls

Course Outcomes:

- Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues.
- Ability to identify information system requirements for both of them such as client and server.
- Ability to understand the current legal issues towards information security.

Unit - 1	Security Concepts	No. of Classes: 09

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security

Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

Unit - 2	Symmetric key Ciphers	No. of Classes: 09

Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

Unit - 3	Cryptographic Hash Functions	No. of Classes: 10

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC,

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CMAC, Digital signatures, Elgamal Digital Signature Scheme.

Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

Unit - 4	**Transport-level Security**	No. of Classes: 10

Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)

Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

Unit - 5	**E-Mail Security**	No. of Classes: 12

E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange

Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

Text Books:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

Reference Books:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

Web References:

https://nptel.ac.in/courses/106/105/106105162/

https://nptel.ac.in/courses/106/105/106105031/

E-Text Books:

http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/

http://uru.ac.in/uruonlinelibrary/Cyber_Security/Cryptography_and_Network_Security.pdf

https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxha2hsYWdoZWF8Z3g6MTRmYTdkZDQ4Y2Q2MmFhMQ

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CS702PC: DATA MINING (PC)

B.Tech. IV Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS702PC	PCC	2	0	0	2	30	70	100
Contact Classes:50	Tutorial Classes:	Practical Classes: Nil				Total Classes:50		

Prerequisite:

- A course on "Database Management Systems"
- Knowledge of probability and statistics

Course Objectives:

- It presents methods for mining frequent patterns, associations, and correlations.
- It then describes methods for data classification and prediction, and data–clustering approaches.
- It covers mining various types of data stores such as spatial, textual, multimedia, streams.

Course Outcomes:

- Ability to understand the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
- Apply preprocessing methods for any given raw data.
- Extract interesting patterns from large amounts of data.
- Discover the role played by data mining in various fields.
- Choose and employ suitable data mining algorithms to build analytical applications
- Evaluate the accuracy of supervised and unsupervised models and algorithms.

Unit - 1	Data Mining	No. of Classes: 09

Data Mining: Data–Types of Data–, Data Mining Functionalities– Interestingness Patterns– Classification of Data Mining systems– Data mining Task primitives – Integration of Data mining system with a Data warehouse–Major issues in Data Mining–Data Preprocessing

Unit - 2	Association Rule Mining	No. of Classes: 09

Association Rule Mining: Mining Frequent Patterns–Associations and correlations – Mining Methods– Mining Various kinds of Association Rules– Correlation Analysis– Constraint based Association mining. Graph Pattern Mining, SPM.

Unit - 3	Classification	No. of Classes: 10

Classification: Classification and Prediction – Basic concepts–Decision tree induction–Bayesian classification, Rule–based classification, Lazy learner.

Unit - 4	Clustering and Applications	No. of Classes: 10

Clustering and Applications: Cluster analysis–Types of Data in Cluster Analysis–Categorization of Major Clustering Methods– Partitioning Methods, Hierarchical Methods– Density–Based Methods, Grid–Based Methods, Outlier Analysis

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Unit - 5	Advanced Concepts	No. of Classes: 12

Advanced Concepts: Basic concepts in Mining data streams–Mining Time–series data—Mining sequence patterns in Transactional databases– Mining Object–Spatial– Multimedia–Text and Web data – Spatial Data mining– Multimedia Data mining–Text Mining– Mining the World Wide Web.

Text Books:

1. Data Mining – Concepts and Techniques – Jiawei Han & Micheline Kamber, 3rd Edition Elsevier.
2. Data Mining Introductory and Advanced topics – Margaret H Dunham, PEA.

Reference Books:

1. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques (Second Edition), Morgan Kaufmann, 2005.

Web References:

https://nptel.ac.in/courses/106/105/106105174/

E-Text Books:

http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/

http://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/The-Morgan-Kaufmann-Series-in-Data-Management-Systems-Jiawei-Han-Micheline-Kamber-Jian-Pei-Data-Mining.-Concepts-and-Techniques-3rd-Edition-Morgan-Kaufmann-2011.pdf

https://doc.lagout.org/Others/Data%20Mining/Data%20Mining_%20The%20Textbook%20%5BAggarwal%202015-04-14%5D.pdf

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CS711PE: GRAPH THEORY (Professional Elective - IV)

B.Tech. IV Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS711PE	PCC	3	0	0	3	30	70	100
Contact Classes:50	Tutorial Classes:	Practical Classes: Nil				Total Classes:50		

Prerequisite:

- An understanding of Mathematics in general is sufficient.

Course Objectives:

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Course Outcomes:

- Know some important classes of graph theoretic problems;
- Be able to formulate and prove central theorems about trees, matching, connectivity, colouring and planar graphs;
- Be able to describe and apply some basic algorithms for graphs;
- Be able to use graph theory as a modelling tool.

Unit - 1	Introduction	No. of Classes: 09

Introduction-Discovery of graphs, Definitions, Subgraphs, Isomorphic graphs, Matrix representations of graphs, Degree of a vertex, Directed walks, paths and cycles, Connectivity in digraphs, Eulerian and Hamilton digraphs, Eulerian digraphs, Hamilton digraphs, Special graphs, Complements, Larger graphs from smaller graphs, Union, Sum, Cartesian Product, Composition, Graphic sequences, Graph theoretic model of the LAN problem, Havel-Hakimi criterion, Realization of a graphic sequence.

Unit - 2	Connected graphs and shortest paths	No. of Classes: 09

Connected graphs and shortest paths - Walks, trails, paths, cycles, Connected graphs, Distance, Cut-vertices and cut-edges, Blocks, Connectivity, Weighted graphs and shortest paths, Weighted graphs, Dijkstra‟s shortest path algorithm, Floyd-Warshall shortest path algorithm.

Unit - 3	Trees	No. of Classes: 10

Trees- Definitions and characterizations, Number of trees, Cayley‟s formula, Kirchoↄ-matrix-tree theorem, Minimum spanning trees, Kruskal‟s algorithm, Prim‟s algorithm, Special classes of graphs, Bipartite Graphs, Line Graphs, Chordal Graphs, Eulerian Graphs, Fleury‟s algorithm, Chinese Postman problem, Hamilton Graphs, Introduction, Necessary conditions and sufficient conditions.

Unit - 4	Independent sets coverings and matchings	No. of Classes: 10

Independent sets coverings and matchings– Introduction, Independent sets and coverings: basic equations, Matchings in bipartite graphs, Hall‟s Theorem, K¨onig‟s Theorem, Perfect matchings in graphs, Greedy and approximation algorithms.

Unit - 5	Vertex Colorings	No. of Classes: 12

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Vertex Colorings- Basic definitions, Cliques and chromatic number, Mycielski"s theorem, Greedy coloring algorithm, Coloring of chordal graphs, Brooks theorem, Edge Colorings, Introduction and Basics, Gupta-Vizing theorem, Class-1 and Class-2 graphs, Edge-coloring of bipartite graphs, Class-2 graphs, Hajos union and Class-2 graphs, A scheduling problem and equitable edge-coloring.

Text Books:

1. J. A. Bondy and U. S. R. Murty. Graph Theory, volume 244 of Graduate Texts in Mathematics. Springer, 1st edition, 2008.
2. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications.

Reference Books:

1. Lecture Videos: http://nptel.ac.in/courses/111106050/13
2. Introduction to Graph Theory, Douglas B. West, Pearson.
3. Schaum's Outlines Graph Theory, Balakrishnan, TMH
4. Introduction to Graph Theory, Wilson Robin j, PHI
5. Graph Theory with Applications to Engineering And Computer Science, Narsing Deo, PHI
6. Graphs - An Introductory Approach, Wilson and Watkins

Web References:

https://nptel.ac.in/courses/106/108/106108054/

E-Text Books:

http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/

http://meskc.ac.in/wp-content/uploads/2018/12/A-Textbook-of-Graph-Theory-R.-Balakrishnan-K.-Ranganathan.pdf

https://www.zib.de/groetschel/teaching/WS1314/BondyMurtyGTWA.pdf

https://www.maths.ed.ac.uk/~v1ranick/papers/wilsongraph.pdf

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CS712PE: INTRODUCTION TO EMBEDDED SYSTEMS (Professional Elective - IV)

B.Tech. IV Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS712PE	PEC	3	0	0	3	30	70	100
Contact Classes:50	Tutorial Classes:	Practical Classes: Nil				Total Classes:50		

Prerequisite:

- A course on "Digital Logic Design and Microprocessors"
- A course on "Computer Organization and Architecture"

Course Objectives:

- To provide an overview of principles of Embedded System
- To provide a clear understanding of role of firmware, operating systems in correlation with hardware systems.

Course Outcomes:

- Expected to understand the selection procedure of processors in the embedded domain.
- Design procedure of embedded firm ware.
- Expected to visualize the role of realtime operating systems in embedded systems.
- Expected to evaluate the correlation between task synchronization and latency issues

Unit - 1	Introduction to Embedded Systems	No. of Classes: 09

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification of Embedded Systems, Major application areas, Purpose of E bedded Systems, Characteristics and Quality attributes of Embedded Systems.

Unit - 2	The Typical Embedded System	No. of Classes: 09

The Typical Embedded System: Core of the Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware, Other System components.

Unit - 3	Embedded Firmware Design and Development	No. of Classes: 10

Embedded Firmware Design and Development: Embedded Firmware Design, Embedded Firmware Development Languages, Programming in Embedded C.

Unit - 4	RTOS Based Embedded System Design	No. of Classes: 10

RTOS Based Embedded System Design: Operating System basics, Types of Operating Systems, Tasks, Process, Threads, Multiprocessing and Multi-tasking, Task Scheduling, Threads-ProcessesScheduling putting them together, Task Communication, Task Synchronization, Device Drivers, How to choose an RTOS.

Unit - 5	Integration and Testing of Embedded Hardware and Firmware	No. of Classes: 12

Integration and Testing of Embedded Hardware and Firmware: Integration of Hardware and Firmware, Boards Bring up The Embedded System Development Environment: The Integrated Development Environment (IDE), Types of files

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generated on Cross-Compilation, Disassembler/Decompiler, Simulators, Emulators and Debugging, Target Hardware Debugging, Boundary Scan.

Text Books:

1. Shibu K V, "Introduction to Embedded Systems", Second Edition, Mc Graw Hill

Reference Books:

1. Frank Vahid and Tony Givargis, "Embedded Systems Design" - A Unified Hardware/Software Introduction, John Wiley
2. Lyla, "Embedded Systems" –Pearson
3. David E. Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.

Web References:

https://nptel.ac.in/courses/108/102/108102169/

https://nptel.ac.in/courses/106/105/106105193/

E-Text Books:

http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/

https://ptolemy.berkeley.edu/books/leeseshia/releases/LeeSeshia_DigitalV2_2.pdf

https://www.iitg.ac.in/pbhaduri/cs522-13/Introduction%20to%20Embedded%20Systems%20(ver%200.5,%20Aug%202010).pdf

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CS713PE: NATURAL LANGUAGE PROCESSING (Professional Elective - IV)

B.Tech. IV Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS713PE	PEC	3	0	0	3	30	70	100
Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 50		

Prerequisite:

Data structures, finite automata and probability theory

Course Objectives: The course should enable the students to:

- Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Course Outcomes: At the end of the course student will be

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms
- Able to design different language modeling Techniques.

Unit -1	Finding the Structure of Words	No. of Classes: 12

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models
Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

Unit - 2	Syntax Analysis	No. of Classes: 12

Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues.

Unit - 3	Semantic Parsing	No. of Classes: 8

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

Unit - 4	Predicate-Argument Structure	No. of Classes: 7

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Predicate-Argument Structure, Meaning Representation Systems, Software.

Unit - 5	Discourse Processing	No. of Classes: 11

Discourse Processing: Cohension, Reference Resolution, Discourse Cohension and Structure

Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Crosslingual Language Modeling

Text Books:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

Reference Books:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications

Web References:

https://nptel.ac.in/courses/106/105/106105158/

E-Text Books:

http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/
https://www.tutorialspoint.com/natural_language_processing/natural_language_processing_tutorial.pdf
http://www.datascienceassn.org/sites/default/files/Natural%20Language%20Processing%20with%20Python.pdf

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CS714PE: CLOUD COMPUTING (Professional Elective - IV)

B.Tech. IV Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS714PE	PCC	3	0	0	3	30	70	100
Contact Classes:50	Tutorial Classes:	Practical Classes: Nil				Total Classes:50		

Prerequisite:

- A course on "Computer Networks"
- A course on "Operating Systems"
- A course on "Distributed Systems"

Course Objectives:

- This course provides an insight into cloud computing
- Topics covered include- distributed system models, different cloud service models, serviceoriented architectures, cloud programming and software environments, resource management.

Course Outcomes:

- Ability to understand various service delivery models of a cloud computing architecture.
- Ability to understand the ways in which the cloud can be programmed and deployed.
- Understanding cloud service providers

Unit - 1	Computing Paradigms	No. of Classes: 09

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing

Unit - 2	Cloud Computing Fundamentals	No. of Classes: 09

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models.

Unit - 3	Cloud Computing Architecture and Management	No. of Classes: 10

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

Unit - 4	Cloud Service Models	No. of Classes: 10

Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS,

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Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

Unit - 5	**Cloud Service Providers**	No. of Classes: 12

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform.

Text Books:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

Reference Books:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

Web References:

https://nptel.ac.in/courses/106/105/106105167/
https://onlinecourses.nptel.ac.in/noc21_cs14/preview

E-Text Books:

http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/

https://studytm.files.wordpress.com/2014/03/hand-book-of-cloud-computing.pdf

https://arpitapatel.files.wordpress.com/2014/10/cloud-computing-bible1.pdf

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CS715PE: AD-HOC & SENSOR NETWORKS (Professional Elective - IV)

B.Tech. IV Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS715PE	PCC	3	0	0	3	30	70	100
Contact Classes:50	Tutorial Classes:	Practical Classes: Nil				Total Classes:50		

Prerequisite:

- A course on "Computer Networks"
- A course on "Mobile Computing"

Course Objectives:

- To understand the concepts of sensor networks
- To understand the MAC and transport protocols for ad hoc networks
- To understand the security of sensor networks
- To understand the applications of adhoc and sensor networks

Course Outcomes:

- Ability to understand the state-of-the-art research in the emerging subject of Ad Hoc and Wireless Sensor Networks
- Ability to solve the issues in real-time application development based on ASN.
- Ability to conduct further research in the domain of ASN

Unit - 1	Introduction to Ad Hoc Networks	No. of Classes: 09

Introduction to Ad Hoc Networks - Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topologybased routing algorithms-**Proactive**: DSDV; **Reactive:** DSR, AODV; Hybrid: ZRP; Position-based routing algorithms-**Location Services**-DREAM, Quorum-based; **Forwarding Strategies**: Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

Unit - 2	Data Transmission	No. of Classes: 09

Data Transmission - Broadcast Storm Problem, **Rebroadcasting Schemes**-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP. **Multicasting:** Tree-based: AMRIS, MAODV; **Mesh-based:** ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.

Unit - 3	Geocasting	No. of Classes: 10

Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR. TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc.

Unit - 4	Basics of Wireless, Sensors and Lower Layer Issues	No. of Classes: 10

Basics of Wireless, Sensors and Lower Layer Issues: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

Unit - 5	Upper Layer Issues of WSN	No. of Classes: 12

Upper Layer Issues of WSN: Transport layer, High-level application layer support,

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Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.

Text Books:

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN – 981–256–681–3.

2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman).

Reference Books:

Web References:

https://nptel.ac.in/courses/106/105/106105160/
https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs09/

E-Text Books:

http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/

http://www.tfb.edu.mk/amarkoski/WSN/Kniga-w03.pdf

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CS721PE: ADVANCED ALGORITHMS (Professional Elective - V)

B.Tech. IV Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS715PE	PCC	3	0	0	3	30	70	100
Contact Classes:50	Tutorial Classes:	Practical Classes: Nil				Total Classes:50		

Prerequisite:

- A course on "Computer Programming & Data Structures"
- A course on "Advanced Data Structures & Algorithms"

Course Objectives:

- Introduces the recurrence relations for analyzing the algorithms
- Introduces the graphs and their traversals.
- Describes major algorithmic techniques (divide-and-conquer, greedy, dynamic programming, Brute Force, Transform and Conquer approaches) and mention problems for which each technique is appropriate;
- Describes how to evaluate and compare different algorithms using worst-case, average-case and best-case analysis.
- Introduces string matching algorithms
- Introduces linear programming.

Course Outcomes:

- Ability to analyze the performance of algorithms
- Ability to choose appropriate data structures and algorithm design methods for a specified application
- Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs

Unit - 1	Introduction	No. of Classes: 09

Introduction: Role of Algorithms in computing, Order Notation, Recurrences, Probabilistic Analysis and Randomized Algorithms.

Sorting and Order Statistics: Heap sort, Quick sort and Sorting in Linear Time. Advanced Design and Analysis Techniques: Dynamic Programming- Matrix chain Multiplication, Longest common Subsequence and optimal binary Search trees.

Unit - 2	Greedy Algorithms	No. of Classes: 09

Greedy Algorithms - Huffman Codes, Activity Selection Problem. Amortized Analysis.

Graph Algorithms: Topological Sorting, Minimum Spanning trees, Single Source Shortest Paths, Maximum Flow algorithms.

Unit - 3	Sorting Networks	No. of Classes: 10

Sorting Networks: Comparison Networks, Zero-one principle, bitonic Sorting Networks, Merging Network, Sorting Network.

Matrix Operations- Strassen's Matrix Multiplication, Inverting matrices, Solving system of linear Equations.

Unit - 4	String Matching	No. of Classes: 10

String Matching: Naive String Matching, Rabin-Karp algorithm, matching with finite Automata, Knuth- Morris - Pratt algorithm.

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Unit - 5	NP-Completeness and Approximation Algorithms	No. of Classes: 12

NP-Completeness and Approximation Algorithms: Polynomial time, polynomial time verification, NP-Completeness and reducibility, NP-Complete problems. Approximation Algorithms- Vertex cover Problem, Travelling Sales person problem.

Text Books:

1. Introduction to Algorithms," T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, Third Edition, PHI.

Reference Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Galgotia publications pvt. Ltd.
2. Design and Analysis Algorithms - Parag Himanshu Dave, Himanshu Bhalchandra Dave Publisher: Pearson
3. Algorithm Design: Foundations, Analysis and Internet examples, M.T. Goodrich and R. Tomassia, John Wiley and sons.
4. Data structures and Algorithm Analysis in C++, Allen Weiss, Second edition, Pearson education

Web References:

https://nptel.ac.in/courses/106/104/106104019/
https://freevideolectures.com/course/3747/advanced-algorithms-cs224

E-Text Books:

http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/

https://dl.acm.org/doi/pdf/10.5555/889553

https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-854j-advanced-algorithms-fall-2008/lecture-notes/

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CS722PE: REAL TIME SYSTEMS (Professional Elective - V)

B.Tech. IV Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS722PE	PCC	3	0	0	3	30	70	100
Contact Classes:50	Tutorial Classes:	Practical Classes: Nil				Total Classes:50		

Prerequisite:

- Computer Organization and Operating System

Course Objectives:

- To provide broad understanding of the requirements of Real Time Operating Systems.
- To make the student understand, applications of these Real Time features using case studies.

Course Outcomes:

- Be able to explain real-time concepts such as preemptive multitasking, task priorities, priority inversions, mutual exclusion, context switching, and synchronization, interrupt latency and response time, and semaphores.
- Able describe how a real-time operating system kernel is implemented.
- Able explain how tasks are managed.
- Explain how the real-time operating system implements time management.
- Discuss how tasks can communicate using semaphores, mailboxes, and queues.
- Be able to implement a real-time system on an embedded processor.
- Be able to work with real time operating systems like RT Linux, Vx Works, MicroC /OSII, Tiny Os

Unit - 1	Introduction	No. of Classes: 09

Introduction: Introduction to UNIX/LINUX, Overview of Commands, File I/O,(open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec).

Unit - 2	Real Time Operating Systems	No. of Classes: 09

Real Time Operating Systems: Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use

Unit - 3	Sorting Networks	No. of Classes: 10

Objects, Services and I/O: Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem.

Unit - 4	Exceptions, Interrupts and Timers	No. of Classes: 10

Exceptions, Interrupts and Timers: Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

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Unit - 5	Case Studies of RTOS	No. of Classes: 12

Case Studies of RTOS: RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, and Tiny OS.

Text Books:

1. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011.

Reference Books:

1. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007, TMH.
2. Advanced UNIX Programming, Richard Stevens
3. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh

Web References:

https://nptel.ac.in/courses/106/105/106105036/

https://onlinecourses.nptel.ac.in/noc21_cs98/preview

E-Text Books:

http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/

https://course.ece.cmu.edu/~ece749/docs/RTSHandbook.pdf

https://ece.uwaterloo.ca/~dwharder/icsrts/Lecture_materials/A_practical_introduction_to_real-time_systems_for_undergraduate_engineering.pdf

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CS723PE: SOFT COMPUTING (Professional Elective - V)

B.Tech. IV Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS723PE	PCC	3	0	0	3	30	70	100
Contact Classes:50	Tutorial Classes:	Practical Classes: Nil				Total Classes:50		

Prerequisite:

-

Course Objectives:

- Familiarize with soft computing concepts
- Introduce and use the idea of fuzzy logic and use of heuristics based on human experience
- Familiarize the Neuro-Fuzzy modeling using Classification and Clustering techniques
- Learn the concepts of Genetic algorithm and its applications
- Acquire the knowledge of Rough Sets.

Course Outcomes:

- Identify the difference between Conventional Artificial Intelligence to Computational Intelligence.
- Understand fuzzy logic and reasoning to handle and solve engineering problems
- Apply the Classification and clustering techniques on various applications.
- Understand the advanced neural networks and its applications
- Perform various operations of genetic algorithms, Rough Sets.
- Comprehend various techniques to build model for various applications

Unit - 1	Introduction to Soft Computing	No. of Classes: 09

Introduction to Soft Computing: Evolutionary Computing, "Soft" computing versus "Hard" computing, Soft Computing Methods, Recent Trends in Soft Computing, Characteristics of Soft computing, Applications of Soft Computing Techniques.

Unit - 2	Fuzzy Systems	No. of Classes: 09

Fuzzy Systems: Fuzzy Sets, Fuzzy Relations, Fuzzy Logic, Fuzzy Rule-Based Systems

Unit - 3	Fuzzy Decision Making	No. of Classes: 10

Fuzzy Decision Making, Particle Swarm Optimization.

Unit - 4	Genetic Algorithms	No. of Classes: 10

Genetic Algorithms: Basic Concepts, Basic Operators for Genetic Algorithms, Crossover and Mutation Properties, Genetic Algorithm Cycle, Fitness Function, Applications of Genetic Algorithm.

Unit - 5	Rough Sets	No. of Classes: 12

Rough Sets, Rough Sets, Rule Induction, and Discernibility Matrix, Integration of Soft Computing Techniques.

Text Books:

1. Soft Computing – Advances and Applications - Jan 2015 by B.K. Tripathy

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and J. Anuradha – Cengage Learning.

Reference Books:

1. S. N. Sivanandam & S. N. Deepa, "Principles of Soft Computing", 2nd edition, Wiley India, 2008.
2. David E. Goldberg, "Genetic Algorithms-In Search, optimization and Machine learning", Pearson Education.
3. J. S. R. Jang, C.T. Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", Pearson Education, 2004.
4. G.J. Klir & B. Yuan, "Fuzzy Sets & Fuzzy Logic", PHI, 1995.
5. Melanie Mitchell, "An Introduction to Genetic Algorithm", PHI, 1998.
6. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw- Hill International editions, 1995

Web References:

https://nptel.ac.in/courses/106/105/106105173/

E-Text Books:

http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/

https://www.cet.edu.in/noticefiles/274_soft%20computing%20LECTURE%20NOTES.pdf

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CS724PE: INTERNET OF THINGS (Professional Elective - V)

B.Tech. IV Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS724PE	PCC	3	0	0	3	30	70	100
Contact Classes:50	Tutorial Classes:	Practical Classes: Nil				Total Classes:50		

Prerequisite:

-

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web based services on IoT devices

Course Outcomes:

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Elaborate the need for Data Analytics and Security in IoT.
- Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

Unit - 1	Introduction to Internet of Things	No. of Classes: 09

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs IoT enabaled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

Unit - 2	IoT and M2M	No. of Classes: 09

IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

Unit - 3	Introduction to Python	No. of Classes: 10

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib.

Unit - 4	IoT Physical Devices and Endpoints	No. of Classes: 10

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IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.		
Unit - 5	**IoT Physical Servers and Cloud Offerings**	No. of Classes: 12
IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API.		
Text Books: 1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547 2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.		
Reference Books:		
Web References: https://nptel.ac.in/courses/106/105/106105166/ https://onlinecourses.nptel.ac.in/noc21_cs17/preview		
E-Text Books: http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/ https://www.tutorialspoint.com/internet_of_things/internet_of_things_tutorial.pdf		

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CS725PE: SOFTWARE PROCESS & PROJECT MANAGEMENT (Professional Elective - V)

B.Tech. IV Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS725PE	PCC	3	0	0	3	30	70	100
Contact Classes:50	Tutorial Classes:	Practical Classes: Nil				Total Classes:50		

Prerequisite:

-

Course Objectives:

- To acquire knowledge on software process management
- To acquire managerial skills for software project development
- To understand software economics

Course Outcomes:

- Gain knowledge of software economics, phases in the life cycle of software development, project organization, project control and process instrumentation
- Analyze the major and minor milestones, artifacts and metrics from management and technical perspective
- Design and develop software product using conventional and modern principles of software project management

Unit - 1	Software Process Maturity	No. of Classes: 09

Software Process Maturity

Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process.

Process Reference Models

Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP).

Unit - 2	Software Project Management Renaissance	No. of Classes: 09

Software Project Management Renaissance

Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way.

Life-Cycle Phases and Process artifacts

Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model-based software architectures.

Unit - 3	Workflows and Checkpoints of process	No. of Classes: 10

Workflows and Checkpoints of process

Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic status assessments.

Process Planning

Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

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Unit - 4	Project Organizations	No. of Classes: 10

Project Organizations

Line-of- business organizations, project organizations, evolution of organizations, process automation. Project Control and process instrumentation

The seven-core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, metrics automation.

Unit - 5	CCPDS-R Case Study	No. of Classes: 12

CCPDS-R Case Study and Future Software Project Management Practices Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

Text Books:

1. Managing the Software Process, Watts S. Humphrey, Pearson Education
2. Software Project Management, Walker Royce, Pearson Education

Reference Books:

1. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000
2. Process Improvement essentials, James R. Persse, O'Reilly, 2006
3. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, TMH, 2006
4. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.
5. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly, 2007
6. Software Engineering Project Management, Richard H. Thayer & Edward Yourdon, 2nd edition, Wiley India, 2004.
7. Agile Project Management, Jim Highsmith, Pearson education, 2004

Web References:

https://nptel.ac.in/courses/106/105/106105218/

https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-cs70/

E-Text Books:

http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/

https://london.ac.uk/sites/default/files/study-guides/software-engineering-project-management.pdf

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CS703PC: CRYPTOGRAPHY AND NETWORK SECURITY LAB (PC)

B.Tech. IV Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS703PC	PCC	0	0	2	1	30	70	100
Contact Classes: 0	Tutorial Classes: 0	Practical Classes: 45				Total Classes: 45		

Prerequisite: Nil

Course Objectives:

List of Experiments:

1.Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and displays the result.

2. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.

3. Write a Java program to perform encryption and decryption using the following algorithms a. Ceaser cipher b. Substitution cipher c. Hill Cipher

4. Write a C/JAVA program to implement the DES algorithm logic.

5. Write a C/JAVA program to implement the Blowfish algorithm logic.

6. Write a C/JAVA program to implement the Rijndael algorithm logic.

7. Write the RC4 logic in Java Using Java cryptography; encrypt the text "Hello world" using Blowfish. Create your own key using Java key tool.

8. Write a Java program to implement RSA algorithm.

9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.

10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.

11. Calculate the message digest of a text using the MD5 algorithm in JAVA.

List of Equipment/Software (with Specifications or Range) Required:
C/Java, HTML

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Syllabus

IV Year							II Semester
S.No.	**Course Type**	**Course Code**	**Course Title**	**Periods Per Week**			**Credits**
				L	**T**	**P**	
1	HSMC	SM801MS	Organizational Behaviour	3	0	0	3
			Professional Elective – VI				
2	PEC	CS811PE	Computational Complexity	3	0	0	3
		CS812PE	Distributed Systems				
		CS813PE	Neural Networks & Deep Learning				
		CS814PE	Human Computer Interaction				
		CS815PE	Cyber Forensics				
3	OEC		Open Elective – III	3	0	0	3
4	PROJ	CS801PC	Project Stage - II	0	0	14	7
Total				**9**	**0**	**14**	**16**

***Open Elective** – Students should take Open Electives from List of Open Electives Offered by Other Departments/Branches Only. These are the list of open electives offered by our branch to other branches.

Course Code	**Open Elective – III**
CS800OE	Machine Learning
CS801OE	Mobile Application Development
CS802OE	Scripting Languages
CS803OE	Database Management Systems

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SM801MS: ORGANIZATIONAL BEHAVIOUR (PC)

B.Tech. IV Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
SM801MS	HSMC	3	0	0	3	30	70	100
Contact Classes:50	Tutorial Classes:	Practical Classes: Nil				Total Classes:50		

Prerequisite:

-

Course Objectives:

- The objective of the course is to provide the students with the conceptual framework and the theories underlying Organizational Behaviour.

Course Outcomes:

Unit - 1	Introduction to OB	No. of Classes: 09

Introduction to OB - Definition, Nature and Scope – Environmental and organizational context – Impact of IT, globalization, Diversity, Ethics, culture, reward systems and organizational design on Organizational Behaviour. Cognitive Processes-I: Perception and Attribution: Nature and importance of Perception – Perceptual selectivity and organization – Social perception – Attribution Theories – Locus of control –Attribution Errors –Impression Management.

Unit - 2	Cognitive Processes-II	No. of Classes: 09

Cognitive Processes-II: Personality and Attitudes – Personality as a continuum – Meaning of personality - Johari Window and Transactional Analysis - Nature and Dimension of Attitudes – Job satisfaction and organizational commitment-Motivational needs and processes- Work-Motivation Approaches Theories of Motivation- Motivation across cultures - Positive organizational behaviour: Optimism – Emotional intelligence – Self-Efficacy.

Unit - 3	Dynamics of OB-I	No. of Classes: 10

Dynamics of OB-I: Communication – types – interactive communication in organizations – barriers to communication and strategies to improve the follow of communication - Decision Making: Participative decision-making techniques – creativity and group decision making. Dynamics of OB –II Stress and Conflict: Meaning and types of stress –Meaning and types of conflict - Effect of stress and intraindividual conflict - strategies to cope with stress and conflict.

Unit - 4	Dynamics of OB –III Power and Politics	No. of Classes: 10

Dynamics of OB –III Power and Politics: Meaning and types of power – empowerment - Groups Vs. Teams – Nature of groups – dynamics of informal groups – dysfunctions of groups and teams – teams in modern work place.

Unit - 5	Leading High performance	No. of Classes: 12

Leading High performance: Job design and Goal setting for High performance- Quality of Work Life- Socio technical Design and High-performance work practices -

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Behavioural performance management: reinforcement and punishment as principles of Learning –Process of Behavioural modification - Leadership theories - Styles, Activities and skills of Great leaders.

Text Books:

Reference Books:

1. Luthans, Fred: Organizational Behaviour 10/e, McGraw-Hill, 2009
2. McShane: Organizational Behaviour, 3e, TMH, 2008
3. Nelson: Organizational Behaviour, 3/e, Thomson, 2008.
4. Newstrom W. John & Davis Keith, Organisational Behaviour-- Human Behaviour at Work, 12/e, TMH, New Delhi, 2009.
5. Pierce and Gardner: Management and Organisational Behaviour: An Integrated perspective, Thomson, 2009.
6. Robbins, P. Stephen, Timothy A. Judge: Organisational Behaviour, 12/e, PHI/Pearson, New Delhi, 2009.
7. Pareek Udai: Behavioural Process at Work: Oxford & IBH, New Delhi, 2009.
8. Schermerhorn: Organizational Behaviour 9/e, Wiley, 2008.
9. Hitt: Organizational Behaviour, Wiley, 2008
10. Aswathappa: Organisational Behaviour, 7/e, Himalaya, 2009
11. Mullins: Management and Organisational Behaviour, Pearson, 2008.
12. McShane, Glinow: Organisational Behaviour--Essentials, TMH, 2009.
13. Ivancevich: Organisational Behaviour and Management, 7/e, TMH, 2008.

Web References:

https://nptel.ac.in/courses/110/106/110106145/

https://onlinecourses.nptel.ac.in/noc20_mg51/preview

E-Text Books:

http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/

http://www.tmv.edu.in/pdf/Distance_education/BCA%20Books/BCA%20VI%20SEM/BCA-629%20OB.pdf

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CS811PE: COMPUTATIONAL COMPLEXITY (Professional Elective - VI)

B.Tech. IV Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS811PE	PCC	3	0	0	3	30	70	100
Contact Classes:50	Tutorial Classes:	Practical Classes: Nil				Total Classes:50		

Prerequisite:

- A course on "Computer Programming and Data Structures"
- A course on "Discrete Structures and Graph Theory"

Course Objectives:

- Introduces to theory of computational complexity classes
- Discuss about algorithmic techniques and application of these techniques to problems.
- Introduce to randomized algorithms and discuss how effective they are in reducing time and space complexity.
- Discuss about Graph based algorithms and approximation algorithms
- Discuss about search trees

Course Outcomes:

- Ability to classify decision problems into appropriate complexity classes
- Ability to specify what it means to reduce one problem to another, and construct reductions for simple examples.
- Ability to classify optimization problems into appropriate approximation complexity classes
- Ability to choose appropriate data structure for the given problem
- Ability to choose and apply appropriate design method for the given problem

Unit - 1	Computational Complexity	No. of Classes: 09

Computational Complexity: Polynomial time and its justification, Nontrivial examples of polynomial-time algorithms, the concept of reduction (reducibility), Class P Class NP and NP- Completeness, The P versus NP problem and why it's hard.

Unit - 2	Algorithmic paradigms	No. of Classes: 09

Algorithmic paradigms: Dynamic Programming – Longest common subsequence, matrix chain multiplication, knapsack problem, Greedy – 0-1 knapsack, fractional knapsack, scheduling problem, Huffman coding, MST, Branch-and-bound – travelling sales person problem, 0/1 knapsack problem, Divide and Conquer – Merge sort, binary search, quick sort.

Unit - 3	Randomized Algorithms	No. of Classes: 10

Randomized Algorithms: Finger Printing, Pattern Matching, Graph Problems, Algebraic Methods, Probabilistic Primality Testing, De-Randomization Advanced Algorithms.

Unit - 4	Graph Algorithms	No. of Classes: 10

Graph Algorithms: Shortest paths, Flow networks, Spanning Trees;

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Approximation algorithms, Randomized algorithms. Approximation algorithms: Polynomial Time Approximation Schemes.

Unit - 5	Advanced Data Structures and applications	No. of Classes: 12

Advanced Data Structures and applications: Decision Trees and Circuits, B-Trees, AVL Trees, Red and Black trees, Dictionaries and tries, Maps, Binomial Heaps, Fibonacci Heaps, Disjoint sets, Union by Rank and Path Compression.

Text Books:

1. T. Cormen, C. Leiserson, R. Rivest and C. Stein, Introduction to Algorithms, Third Edition, McGraw-Hill, 2009.
2. R. Motwani and P. Raghavan, Randomized Algorithms, Cambridge University Press, 1995.
3. J. J. McConnell, Analysis of Algorithms: An Active Learning Approach, Jones & Bartlett Publishers, 2001.
4. D. E. Knuth, Art of Computer Programming, Volume 3, Sorting and Searching, Second Edition, Addison-Wesley Professional, 1998.
5. S. Dasgupta, C. H. Papadimitriou and U. V. Vazirani, Algorithms, McGraw-Hill, 2008.

Reference Books:

Web References:

https://nptel.ac.in/courses/106/106/106106229/

https://nptel.ac.in/noc/courses/noc21/SEM2/noc21-cs90/

E-Text Books:

http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/

https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.297.6224&rep=rep1&type=pdf

https://users.cs.duke.edu/~reif/courses/complectures/books/AB/ABbook.pdf

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CS812PE: DISTRIBUTED SYSTEMS (Professional Elective - VI)

B.Tech. IV Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS812PE	PCC	3	0	0	3	30	70	100
Contact Classes:50	Tutorial Classes:	Practical Classes: Nil				Total Classes:50		

Prerequisite:

- A course on "Operating Systems"
- A course on "Computer Organization & Architecture"

Course Objectives:

- This course provides an insight into Distributed systems.
- Topics include- Peer to Peer Systems, Transactions and Concurrency control, Security and Distributed shared memory

Course Outcomes:

- Ability to understand Transactions and Concurrency control.
- Ability to understand Security issues.
- Understanding Distributed shared memory.
  Ability to design distributed systems for basic level applications

Unit - 1	Characterization of Distributed Systems	No. of Classes: 09

Characterization of Distributed Systems-Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models -Introduction, Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication, Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

Unit - 2	Operating System Support	No. of Classes: 09

Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Service architecture.

Unit - 3	Peer to Peer Systems	No. of Classes: 10

Peer to Peer Systems–Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, OceanStore.

Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.

Coordination and Agreement-Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

Unit - 4	Transactions and Concurrency Control	No. of Classes: 10

Transactions and Concurrency Control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering. Distributed Transactions-Introduction, Flat and Nested Distributed

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Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

Unit - 5	**Replication**	No. of Classes: 12

Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data. Distributed shared memory, Design and Implementation issues, Consistency models.

Text Books:

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.

2. Distributed Systems, S.Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.

Reference Books:

1. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.

2. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani and Mukesh Singhal, Cambridge, rp 2010.

Web References:

https://onlinecourses.nptel.ac.in/noc21_cs87/preview

https://nptel.ac.in/courses/106/106/106106107/

E-Text Books:

http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/

https://vowi.fsinf.at/images/b/bc/TU_Wien-Verteilte_Systeme_VO_%28G%C3%B6schka%29_-_Tannenbaum-distributed_systems_principles_and_paradigms_2nd_edition.pdf

https://cse.iitkgp.ac.in/~pallab/Distributed_Systems_2016_17/ds_spr16.html

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CS813PE: NEURAL NETWORKS & DEEP LEARNING (Professional Elective - VI)

B.Tech. IV Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS813PE	PCC	3	0	0	3	30	70	100
Contact Classes:50	Tutorial Classes:	Practical Classes: Nil				Total Classes:50		

Prerequisite:

Course Objectives:

- To introduce the foundations of Artificial Neural Networks
- To acquire the knowledge on Deep Learning Concepts
- To learn various types of Artificial Neural Networks
- To gain knowledge to apply optimization strategies

Course Outcomes:

- Ability to understand the concepts of Neural Networks
- Ability to select the Learning Networks in modeling real world systems
- Ability to use an efficient algorithm for Deep Models
- Ability to apply optimization strategies for large scale applications

Unit - 1	Artificial Neural Networks	No. of Classes: 09

Artificial Neural Networks Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

Unit - 2	Unsupervised Learning Network	No. of Classes: 09

Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

Unit - 3	Introduction to Deep Learning	No. of Classes: 10

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.

Unit - 4	Regularization for Deep Learning	No. of Classes: 10

Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier.

Unit - 5	Optimization for Train Deep Models	No. of Classes: 12

Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive

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Learning Rates, Approximate SecondOrder Methods, Optimization Strategies and Meta-Algorithms Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing.
Text Books: 1. Deep Learning: An MIT Press Book By Ian Goodfellow and Yoshua Bengio and Aaron Courville 2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.
Reference Books:
Web References: https://nptel.ac.in/courses/106/106/106106184/ https://onlinecourses.nptel.ac.in/noc20_cs62/preview
E-Text Books: http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/ http://www.iitp.ac.in/~shad.pcs15/data/NN-DL.pdf https://www.cse.iitk.ac.in/users/sigml/lec/DeepLearningLib.pdf

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CS814PE: HUMAN COMPUTER INTERACTION (Professional Elective - VI)

B.Tech. IV Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS814PE	PCC	3	0	0	3	30	70	100
Contact Classes:50	Tutorial Classes:	Practical Classes: Nil				Total Classes:50		

Prerequisite:

Course Objectives:

To gain an overview of Human-Computer Interaction (HCI), with an understanding of user interface design in general, and alternatives to traditional "keyboard and mouse" computing; become familiar with the vocabulary associated with sensory and cognitive systems as relevant to task performance by humans; be able to apply models from cognitive psychology to predicting user performance in various human-computer interaction tasks and recognize the limits of human performance as they apply to computer operation; appreciate the importance of a design and evaluation methodology that begins with and maintains a focus on the user; be familiar with a variety of both conventional and non-traditional user interface paradigms, the latter including virtual and augmented reality, mobile and wearable computing, and ubiquitous computing; and understand the social implications of technology and their ethical responsibilities as engineers in the design of technological systems. Finally, working in small groups on a product design from start to finish will provide you with invaluable team-work experience

Course Outcomes:

1. Ability to apply HCI and principles to interaction design.
2. Ability to design certain tools for blind or PH people.

Unit - 1	Introduction	No. of Classes: 09

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design.

The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

Unit - 2	Design process	No. of Classes: 09

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions. Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

Unit - 3	Windows	No. of Classes: 10

Windows – New and Navigation schemes selection of window, selection of devices based and screenbased controls. Components – text and messages, Icons and

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increases – Multimedia, colors, uses problems, choosing colors.		
Unit - 4	**HCI in the software process**	No. of Classes: 10
HCI in the software process, The software life cycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction.		
Unit - 5	**Cognitive models Goal and task hierarchies Design Focus**	No. of Classes: 12
Cognitive models Goal and task hierarchies Design Focus: GOMS saves money Linguistic models The challenge of display-based systems Physical and device models Cognitive architectures Ubiquitous computing and augmented realities Ubiquitous computing applications research Design Focus: Ambient. **Wood** – augmenting the physical Virtual and augmented reality Design Focus: Shared experience Design Focus: Applications of augmented reality Information and data visualization Design Focus: Getting the size right.		

Text Books:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley Dream Tech. Units 1, 2, 3
2. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education Units 4,5

Reference Books:

1. Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia.
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech.
3. User Interface Design, Soren Lauesen , Pearson Education.
4. Human –Computer Interaction, D. R. Olsen, Cengage Learning.
5. Human –Computer Interaction, Smith - Atakan, Cengage Learning.

Web References:

https://nptel.ac.in/courses/106/103/106103115/

https://nptel.ac.in/courses/106/106/106106177/

E-Text Books:

http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/

http://www.ittoday.info/Excerpts/HCI.pdf

https://paragnachaliya.in/wp-content/uploads/2017/08/HCI_Alan_Dix.pdf

https://cse.iitkgp.ac.in/~dsamanta/courses/archive/hci/LectureSlides/01_HCIcourseOverview.pdf

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CS815PE: CYBER FORENSICS (Professional Elective - VI)

B.Tech. IV Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS815PE	PCC	3	0	0	3	30	70	100
Contact Classes:50	Tutorial Classes:	Practical Classes: Nil				Total Classes:50		

Prerequisite:

- Network Security

Course Objectives:

- A brief explanation of the objective is to provide digital evidences which are obtained from digital media.
- In order to understand the objectives of computer forensics, first of all, people have to recognize the different roles computer plays in a certain crime.
- According to a snippet from the United States Security Service, the functions computer has in different kinds of crimes.

Course Outcomes:

1. Students will understand the usage of computers in forensic, and how to use various forensic tools for a wide variety of investigations.
2. It gives an opportunity to students to continue their zeal in research in computer forensics

Unit - 1	Introduction of Cybercrime	No. of Classes: 09

Introduction of Cybercrime: Types, The Internet spawns crime, Worms versus viruses, Computers' roles in crimes, Introduction to digital forensics, Introduction to Incident - Incident Response Methodology –
Steps - Activities in Initial Response, Phase after detection of an incident.

Unit - 2	Initial Response and forensic duplication	No. of Classes: 09

Initial Response and forensic duplication, Initial Response & Volatile Data Collection from Windows system -Initial Response & Volatile Data Collection from Unix system – Forensic Duplication: Forensic duplication: Forensic Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements, Creating a Forensic. Duplicate/Qualified Forensic Duplicate of a Hard Drive.

Unit - 3	Forensics analysis and validation	No. of Classes: 10

Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project.

Unit - 4	Current Forensic tools	No. of Classes: 10

Current Forensic tools: evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating

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e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools.
Cell phone and mobile device forensics: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

Unit - 5	Working with Windows and DOS Systems	No. of Classes: 12

Working with Windows and DOS Systems: understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

Text Books:

1. Kevin Mandia, Chris Prosise, "Incident Response and computer forensics", Tata McGraw Hill, 2006
2. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
3. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning

Reference Books:

1. Real Digital Forensics by Keith J. Jones, Richard Bejtiich, Curtis W. Rose, Addison-Wesley Pearson Education
2. Forensic Compiling, A Tractitioneris Guide by Tony Sammes and Brian Jenkinson, Springer International edition.

Web References:

https://onlinecourses.swayam2.ac.in/cec21_ge10/preview

http://www.cyberforensics.in/?AspxAutoDetectCookieSupport=1

E-Text Books:

http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/

https://us-cert.cisa.gov/sites/default/files/publications/forensics.pdf

http://index-of.es/Varios-2/Computer%20Forensics%20and%20Cyber%20Crime%20An%20Introduction.pdf

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