ACE
Engineering College
An Autonomous Institution
(NBA ACCREDITED B.TECH COURSES: EEE, ECE, MECH, CIVIL & CSE, ACCORDED NAAC 'A'GRADE)
Ghatkesar, Hyderabad- 501 301

R20 -B.TECH. FOUR YEAR DEGREE COURSE
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
COURSE STRUCTURE

III Year							I Semester
S.No.	Course Type	Course Code	Course Title	Periods Per Week			Credits
				L	T	P	
1	PCC	CS501PC	Formal Languages & Automata Theory	3	0	0	3
2	PCC	CS502PC	Software Engineering	3	0	0	3
3	PCC	CS503PC	Computer Networks	3	0	0	3
4	PCC	CS504PC	Web Technologies	3	0	0	3
			Professional Elective-I				
5	PEC	CS511PE	Information Theory & Coding	3	0	0	3
		CS512PE	Advanced Computer Architecture				
		CS513PE	Data Analytics				
		CS514PE	Image Processing				
		CS515PE	Principles of Programming Languages				
			Professional Elective –II				
6	PEC	CS521PE	Computer Graphics	3	0	0	3
		CS522PE	Advanced Operating Systems				
		CS523PE	Informational Retrieval Systems				
		CS524PE	Distributed Databases				
		CS525PE	**Artificial Intelligence**				
7	PCC	CS505PC	Software Engineering Lab	0	0	3	1.5
8	PCC	CS506PC	Computer Networks & Web Technologies Lab	0	0	3	1.5
9	HSMC	EN508HS	Advanced Communication Skills Lab	0	0	2	1
10	MC	*MC510	Intellectual Property Rights	3	0	0	0
			Total	**21**	**0**	**8**	**22**

Note: *MC = Satisfactory/Unsatisfactory

S.No.	Course Type	Course Code	Course Title	L	T	P	Credits
III Year							II Semester
1	PCC	CS601PC	Machine Learning	3	1	0	4
2	PCC	CS602PC	Compiler Design	3	1	0	4
3	PCC	CS603PC	Design and Analysis of Algorithms	3	1	0	4
			Professional Elective – III				
4	PEC	CS611PE	Concurrent Programming	3	0	0	3
		CS612PE	Network Programming				
		CS613PE	Scripting Languages				
		CS614PE	Mobile Application Development				
		CS615PE	Software Testing Methodologies				
5	OEC		Open Elective-I	3	0	0	3
6	PCC	CS604PC	Machine Learning Lab	0	0	3	1.5
7	PCC	CS605PC	Compiler Design Lab	0	0	3	1.5
			Professional Elective - III Lab				
8	PEC	CS621PE	Concurrent Programming Lab	0	0	2	1
		CS622PE	Network Programming Lab				
		CS623PE	Scripting Languages Lab				
		CS624PE	Mobile Application Development Lab				
		CS625PE	Software Testing Methodologies Lab				
9	MC	*MC609	Environmental Science	3	0	0	0
10	MC	*MC610	Cyber Security	3	0	0	0
			Total	21	3	8	22

Note: *MC = Satisfactory/Unsatisfactory

*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 – I
CS600OE	Entrepreneurship
CS601OE	Fundamentals of Management for Engineers
CS602OE	Cyber Law & Ethics

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

IV Year — **I Semester**

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

S.No.	Course Type	Course Code	Course Title	L	T	P	Credits
IV Year							**II Semester**
				Periods Per Week			**Credits**
				L	T	P	
1	HSMC	SM801MS	Organizational Behaviour	3	0	0	3
2	PEC		Professional Elective – VI				
		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

Syllabus

S.No.	Course Type	Course Code	Course Title	Periods Per Week			Credits
				L	T	P	
1	PCC	CS501PC	Formal Languages & Automata Theory	3	0	0	3
2	PCC	CS502PC	Software Engineering	3	0	0	3
3	PCC	CS503PC	Computer Networks	3	0	0	3
4	PCC	CS504PC	Web Technologies	3	0	0	3
			Professional Elective-I				
5	PEC	CS511PE	Information Theory & Coding	3	0	0	3
		CS512PE	Advanced Computer Architecture				
		CS513PE	Data Analytics				
		CS514PE	Image Processing				
		CS515PE	Principles of Programming Languages				
			Professional Elective –II				
6	PEC	CS521PE	Computer Graphics	3	0	0	3
		CS522PE	Advanced Operating Systems				
		CS523PE	Informational Retrieval Systems				
		CS524PE	Distributed Databases				
		CS525PE	**Artificial Intelligence**				
7	PCC	CS505PC	Software Engineering Lab	0	0	3	1.5
8	PCC	CS506PC	Computer Networks & Web Technologies Lab	0	0	3	1.5
9	HSMC	EN508HS	Advanced Communication Skills Lab	0	0	2	1
10	MC	*MC510	Intellectual Property Rights	3	0	0	0
			Total	**21**	**0**	**8**	**22**

Note: *MC = Satisfactory/Unsatisfactory

CS501PC: FORMAL LANGUAGES AND AUTOMATA THEORY

B.Tech. III Year I Semester								

Course Code	Category	Hours/Week			Credits	Maximum Marks		
CS501PC	**PCC**	**L**	**T**	**P**	**C**	**CIA**	**SE E**	**Total**
		3	0	0	3	30	70	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil		Total Classes: 50

Prerequisite: Mathematical Knowledge at pre-university level

Course Objectives: The course should enable the students to:

- To provide introduction to some of the central ideas of theoretical computer science from the perspective of formal languages.
- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- Classify machines by their power to recognize languages.
- Employ finite state machines to solve problems in computing.
- To understand deterministic and non-deterministic machines.
- To understand the differences between decidability and undecidability.

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

- Able to understand the concept of abstract machines and their power to recognize the languages.
- Able to employ finite state machines for modeling and solving computing problems.
- Able to design context free grammars for formal languages.
- Able to distinguish between decidability and undecidability.
- Able to gain proficiency with mathematical tools and formal methods.

Unit -1	Finite Automata	No. of Classes: 09

Introduction to Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.
Nondeterministic Finite Automata: Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.
Deterministic Finite Automata: Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA, Moore and Melay machines

Unit - 2	Regular Expressions	No. of Classes: 10

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.
Pumping Lemma for Regular Languages, Statement of the pumping lemma, Applications of the Pumping Lemma.
Closure Properties of Regular Languages: Closure properties of Regular languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata.

Unit - 3	Context-Free Grammars	No. of Classes: 11

Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Tress, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages.

Push Down Automata: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state, Acceptance by empty stack, Deterministic Pushdown Automata. From CFG to PDA, From PDA to CFG.

Unit - 4	Normal Forms for Context- Free Grammars	No. of Classes: 10

Normal Forms for Context- Free Grammars: Eliminating useless symbols, Eliminating €-Productions. Chomsky Normal form Griebech Normal form.

Pumping Lemma for Context-Free Languages: Statement of pumping lemma, Applications

Closure Properties of Context-Free Languages: Closure properties of CFL's, Decision Properties of CFL's

Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine

Unit - 5	Undecidability	No. of Classes: 10

Types of Turing machine: Turing machines and halting

Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages, Post's Correspondence Problem, Modified Post Correspondence problem, Other Undecidable Problems, Counter machines.

Text Books:
1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekaran, 2nd edition, PHI.

Reference Books:
1. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. A Text book on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
4. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.

Web References:
https://nptel.ac.in/courses/111/103/111103016/

E-Text Books:
- https://www.iitg.ac.in/dgoswami/Flat-Notes.pdf
- https://www.tutorialspoint.com/automata_theory/automata_theory_tutorial.pdf
- https://fall14cs.files.wordpress.com/2017/04/an-introduction-to-formal-languages-and-automata-5th-edition-2011.pdf

CS502PC: SOFTWARE ENGINEERING

B.Tech. III Year I Semester								

Course Code	Category	Hours/Week			Credits	Maximum Marks		
CS502PC	**PCC**	**L**	**T**	**P**	**C**	**CIA**	**SE E**	**Total**
		3	0	0	3	30	70	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 50

Prerequisite: Mathematical Knowledge at pre-university level

Course Objectives: The course should enable the students to:

- The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large soft ware development projects.
- Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

Unit -1	Process models	No. of Classes: 09

Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths.
A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI), process patterns, process assessment, personal and team process models.
Process models: The waterfall model, incremental process models, evolutionary process models, the unified process.

Unit - 2	Software Requirements	No. of Classes: 09

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.
Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.
System models: Context models, behavioral models, data models, object models, structured methods.

Unit - 3	Design Engineering	No. of Classes: 10

Design Engineering: Design process and design quality, design concepts, the design model.
Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

Unit - 4	Testing Strategies	No. of Classes: 11

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

Unit - 5	Risk management	No. of Classes: 11

Metrics for Process and Products: Software measurement, metrics for software quality.

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.

Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

Text Books:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, Mc Graw Hill, International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

Reference Books:

1. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
2. Software Engineering principles and practice- Waman S Jawadekar, The Mc Graw-Hill Companies.
3. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

Web References:
https://nptel.ac.in/courses/106/105/106105182/

E-Text Books:
https://www.tutorialspoint.com/software_engineering/software_engineering_tutorial.pdf
https://www.oreilly.com/library/view/software-engineering-at/9781492082781/
https://www.geektonight.com/software-engineering-notes/

CS503PC: COMPUTER NETWORKS

B.Tech. III Year I Semester								

Course Code	Category	Hours/Week			Credits	Maximum Marks		
CS503PC	PCC	**L**	**T**	**P**	**C**	**CIA**	**SE E**	**Total**
		3	0	0	3	30	70	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil		Total Classes: 50

Prerequisite: 1. A course on "Programming for problem solving"

2. A course on "Data Structures"

Course Objectives: The course should enable the students to:

- The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
- Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

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

1. Gain the knowledge of the basic computer network technology.
2. Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
3. Obtain the skills of subnetting and routing mechanisms.
4. Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.

Unit -1	Physical Layer	No. of Classes: 09

Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.
Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.

Unit - 2	Data link layer	No. of Classes: 09

Data link layer: Design issues, framing, Error detection and correction.
Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel.
Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols.
Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

Unit - 3	Network Layer	No. of Classes: 10

Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing,

Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

Unit - 4	Transport Layer	No. of Classes: 11

Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.

Unit - 5	Application Layer	No. of Classes: 11

Application Layer –Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video.

Text Books:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

Reference Books:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

Web References:
https://nptel.ac.in/courses/106/105/106105183/

E-Text Books:
https://www.cse.iitk.ac.in/users/dheeraj/cs425/
https://ncert.nic.in/textbook/pdf/lecs110.pdf

CS504PC: WEB TECHNOLOGIES

Course Code	Category	Hours/Week			Credits	Maximum Marks		
B.Tech. III Year I Semester								
		L	**T**	**P**	**C**	**CIA**	**SE E**	**Total**
CS504PC	PCC	3	0	0	3	30	70	100
Contact Classes: 50	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 50**		

Prerequisite:

Course Objectives: The course should enable the students to:

1. To introduce PHP language for server-side scripting
2. To introduce XML and processing of XML Data with Java
3. To introduce Server-side programming with Java Servlets and JSP
4. To introduce Client-side scripting with Javascript and AJAX.

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

1. gain knowledge of client-side scripting, validation of forms and AJAX programming
2. understand server-side scripting with PHP language
3. understand what is XML and how to parse and use XML Data with Java
4. To introduce Server-side programming with Java Servlets and JSP

Unit -1	Introduction to PHP	No. of Classes: 11

Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc.,
Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies
File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

Unit - 2	XML	No. of Classes: 11

HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets;
XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

Unit - 3	Servlets	No. of Classes: 10

Introduction to Servlets: Common Gateway Interface (CGt), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

Unit - 4	JSP	No. of Classes: 9

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages,

Using Cookies and session for session tracking, connecting to database in JSP.		
Unit - 5	**Client-side Scripting**	**No. of Classes: 9**

Client-side Scripting: Introduction to Javascript, Javascript language – declaring variables, scope of variables, functions. event handlers (onclick, onsubmit etc.), Document Object Model, Form validation.

Text Books:

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill

Reference Books:

1. Web Programming, building internet applications, Chris Bates 2″ edition, Wiley Dreamtech
2. Java Server Pages —Hans Bergsten, SPD O'Reilly,
3. Java Script, D.Flanagan
4. Beginning Web Programming-Jon Duckett WROX.
5. Programming world wide web, R.W.Sebesta, Fourth Edition, Pearson.
6. Internet and World Wide Web — How to program. Dietel and Nieto, Pearson.

Web References:

https://www.w3resource.com/
https://onlinecourses.swayam2.ac.in/nou20_cs05/preview
https://freevideolectures.com/course/3140/internet-technologies

E-Text Books:

https://www.ncertbooks.guru/web-technology-pdf/
https://www.cs.uct.ac.za/mit_notes/web_programming.html

CS511PE: INFORMATION THEORY & CODING (Professional Elective - I)

B.Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS511PE	PEC	3	0	0	3	30	70	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 50

Prerequisite: Digital Communications

Course Objectives: The course should enable the students to:

- To acquire the knowledge in measurement of information and errors.
- Understand the importance of various codes for communication systems
- To design encoder and decoder of various codes.
- ☐ To known the applicability of source and channel codes

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

- Learn measurement of information and errors.
- Obtain knowledge in designing various source codes and channel codes
- Design encoders and decoders for block and cyclic codes
- Understand the significance of codes in various applications

Unit -1	Coding for Reliable Digital Transmission and storage	No. of Classes: 11

Coding for Reliable Digital Transmission and storage
Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.
Source Codes: Shannon-fano coding, Huffman coding

Unit - 2	Linear Block Codes	No. of Classes: 11

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

Unit - 3	Cyclic Codes	No. of Classes: 10

Cyclic Codes: Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

Unit - 4	Convolutional Codes	No. of Classes: 9

Convolutional Codes: Encoding of Convolutional Codes- Structural and Distance Properties, state, tree, trellis diagrams, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding

and Sequential Decoding, Applications of Convolutional codes in ARQ system.		
Unit - 5	**BCH Codes**	**No. of Classes: 9**

BCH Codes: Minimum distance and BCH bounds, Decoding procedure for BCH codes, Syndrome computation and iterative algorithms, Error locations polynomials for single and double error correction.

Text Books:

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J.Costello,Jr, Prentice Hall, Inc 2014.
2. Error Correcting Coding Theory-Man Young Rhee, McGraw – Hill Publishing 1989

Reference Books:

1. Digital Communications- John G. Proakis, 5th ed., , TMH 2008.
2. Introduction to Error Control Codes-Salvatore Gravano-oxford
3. Error Correction Coding – Mathematical Methods and Algorithms – Todd K.Moon, 2006, Wiley India.
4. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Edition, 2009, TMH.

Web References:
https://nptel.ac.in/courses/117/101/117101053/

E-Text Books:
http://www.nitjsr.ac.in/course_assignment/EC23EC4211ITC_PPT.pdf
https://www.researchgate.net/publication/297737420_Information_Theory_and_Coding_Wiley_India_2015_by_Dr_Muralidhar_Kulkarni_Dr_Shivaprakash_K_S

CS512PE: ADVANCED COMPUTER ARCHITECTURE (Professional Elective - I)

B.Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS512PE	PEC	3	0	0	3	30	70	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 50

Prerequisite: Computer Organization

Course Objectives: The course should enable the students to:

- To impart the concepts and principles of parallel and advanced computer architectures.
- To develop the design techniques of Scalable and multithreaded Architectures.
- To Apply the concepts and techniques of parallel and advanced computer architectures
- To design modern computer systems

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

- Computational models and Computer Architectures.
- Concepts of parallel computer models.
- Scalable Architectures, Pipelining, Superscalar processors, multiprocessors

Unit -1	Theory of Parallelism	No. of Classes: 10

Theory of Parallelism, Parallel computer models, The State of Computing, Multiprocessors and Multicomputers, Multivector and SIMD Computers, PRAM and VLSI models, Architectural development tracks, Program and network properties, Conditions of parallelism, Program partitioning and Scheduling, Program flow Mechanisms, System interconnect Architectures**.**

Unit - 2	Principals of Scalable performance	No. of Classes: 10

Principals of Scalable performance, Performance metrics and measures, Parallel Processing applications, Speed up performance laws, Scalability Analysis and Approaches, Hardware Technologies, Processes and Memory Hierarchy, Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology.

Unit - 3	Bus Cache and Shared memory	No. of Classes: 11

Bus Cache and Shared memory, Backplane bus systems, Cache Memory organizations, Shared- Memory Organizations, Sequential and weak consistency models, Pipelining and superscalar techniques, Linear Pipeline Processors, Non-Linear Pipeline Processors, Instruction Pipeline design, Arithmetic pipeline design, superscalar pipeline design.

Unit - 4	Parallel and Scalable Architectures	No. of Classes: 9

Parallel and Scalable Architectures, Multiprocessors and Multicomputers, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of Multicomputers, Message-passing Mechanisms, Multivetor and SIMD computers, Vector Processing Principals, Multivector Multiprocessors, Compound Vector processing, SIMD computer Organizations,
The connection machine CM-5,

Unit - 5	Multithreaded and Dataflow Architectures	No. of Classes: 10

Scalable, Multithreaded and Dataflow Architectures, Latency-hiding techniques, Principals of Multithreading, Fine-Grain Multicomputers, Scalable and multithreaded Architectures, Dataflow and hybrid Architectures.

Text Books:

1. Advanced Computer Architecture Second Edition, Kai Hwang, Tata McGraw Hill Publishers.

Reference Books:

1. Computer Architecture, Fourth edition, J. L. Hennessy and D.A. Patterson. ELSEVIER.
2. Advanced Computer Architectures, S.G. Shiva, Special Indian edition, CRC, Taylor &Francis.
3. Introduction to High Performance Computing for Scientists and Engineers, G. Hager and G. Wellein, CRC Press, Taylor & Francis Group.
4. Advanced Computer Architecture, D. Sima, T. Fountain, P. Kacsuk, Pearson education.
5. Computer Architecture, B. Parhami, Oxford Univ. Press.

Web References:
https://nptel.ac.in/courses/106/103/106103206/

E-Text Books:

CS513PE: DATA ANALYTICS (Professional Elective - I)

B.Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS513PE	PEC	3	0	0	3	30	70	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 50

Prerequisite: 1. A course on "Database Management Systems".

2. Knowledge of probability and statistics.

Course Objectives: The course should enable the students to:

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
- To understand the various search methods and visualization techniques.

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

- Understand the impact of data analytics for business decisions and strategy
- Carry out data analysis/statistical analysis
- To carry out standard data visualization and formal inference procedures
- Design Data Architecture
- Understand various Data Sources

Unit -1	Data Management	No. of Classes: 11

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality(noise, outliers, missing values, duplicate data) and Data Processing & Processing.

Unit - 2	Data Analytics	No. of Classes: 11

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

Unit - 3	Regression	No. of Classes: 10

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.
Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

Unit - 4	Object Segmentation	No. of Classes: 9

Object Segmentation: Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc.

Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction		
Unit - 5	**Data Visualization**	**No. of Classes: 9**

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

Text Books:

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

Reference Books:

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway Labs Jeffrey D Ullman Stanford Univ.

Web References:
https://nptel.ac.in/noc/courses/noc17/SEM2/noc17-mg24/

E-Text Books:
https://files.eric.ed.gov/fulltext/ED536788.pdf
https://srdas.github.io/Papers/DSA_Book.pdf

CS514PE: IMAGE PROCESSING (Professional Elective - I)

B.Tech. III Year I Semester									

Course Code	Category	Hours/Week			Credits	Maximum Marks			
		L	T	P	C	CIA	SEE	Total	
CS514PE	PEC	3	0	0	3	30	70	100	

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 50

Prerequisite:

1. Students are expected to have knowledge in linear signals and systems, Fourier Transform, basic linear algebra, basic probability theory and basic programming techniques; knowledge of Digital Signal Processing is desirable.

2. A course on "Computational Mathematics"

3. A course on "Computer Oriented Statistical Methods"

Course Objectives: The course should enable the students to:

- Provide a theoretical and mathematical foundation of fundamental Digital Image Processing concepts.
- The topics include image acquisition; sampling and quantization; preprocessing; enhancement; restoration; segmentation; and compression.

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

- Demonstrate the knowledge of the basic concepts of two-dimensional signal acquisition, sampling, and quantization.
- Demonstrate the knowledge of filtering techniques.
- Demonstrate the knowledge of 2D transformation techniques.
- Demonstrate the knowledge of image enhancement, segmentation, restoration and compression techniques.

Unit -1	Digital Image Fundamentals	No. of Classes: 10

Digital Image Fundamentals: Digital Image through Scanner, Digital Camera. Concept of Gray Levels. Gray Level to Binary Image Conversion. Sampling and Quantization. Relationship between Pixels. Imaging Geometry. 2D Transformations-DFT, DCT, KLT and SVD.

Unit - 2	Image Enhancement	No. of Classes: 11

Image Enhancement in Spatial Domain Point Processing, Histogram Processing, Spatial Filtering, Enhancement in Frequency Domain, Image Smoothing, Image Sharpening.

Unit - 3	Image Restoration	No. of Classes: 10

Image Restoration Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

Unit - 4	Image Segmentation	No. of Classes: 10

Image Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation.

Unit - 5	Image Compression	No. of Classes: 9

Image Compression Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

Text Books:

1. Digital Image Processing: R.C. Gonzalez & R. E. Woods, Addison Wesley/ Pearson Education, 2nd Ed, 2004..

Reference Books:

1. Fundamentals of Digital Image Processing: A. K. Jain, PHI.
2. Digital Image Processing using MAT LAB: Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins: Pearson Education India, 2004.
3. Digital Image Processing: William K. Pratt, John Wilely, 3rd Edition, 2004.

Web References:
https://nptel.ac.in/courses/117/105/117105135/

E-Text Books:
http://library.iiests.ac.in:30000/dqpas/pdf/Contents_Image_Processing_Ajoy_Kumar_Ray.pdf
https://nitsri.ac.in/Department/Electronics%20&%20Communication%20Engineering/IP_Resources-converted.pdf

B.Tech. III Year I Semester								

Course Code	Category	Hours/Week			Credits	Maximum Marks		
CS515PE	PEC	**L**	**T**	**P**	**C**	**CIA**	**SE E**	**Total**
		3	0	0	3	30	70	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil		Total Classes: 50

Prerequisite:

1. A course on "Mathematical Foundations of Computer Science"

2. A course on "Computer Programming and Data Structures"

Course Objectives: The course should enable the students to:

- Introduce important paradigms of programming languages
- To provide conceptual understanding of high-level language design and implementation
- Topics include programming paradigms; syntax and semantics; data types, expressions and statements; subprograms and blocks; abstract data types; concurrency; functional and logic programming languages; and scripting languages

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

- Acquire the skills for expressing syntax and semantics in formal notation
- Identify and apply a suitable programming paradigm for a given computing application
- Gain knowledge of and able to compare the features of various programming languages

Unit -1	Preliminary Concepts	No. of Classes: 9

Preliminary Concepts: Reasons for Studying Concepts of Programming Languages, Programming Domains, Language Evaluation Criteria, Influences on Language Design, Language Categories, Language Design Trade-Offs, Implementation Methods, Programming Environments

Syntax and Semantics: General Problem of Describing Syntax and Semantics, Formal Methods of Describing Syntax, Attribute Grammars, Describing the Meanings of Programs

Unit - 2	Names, Bindings, and Scopes	No. of Classes: 11

Names, Bindings, and Scopes: Introduction, Names, Variables, Concept of Binding, Scope, Scope and Lifetime, Referencing Environments, Named Constants

Data Types: Introduction, Primitive Data Types, Character String Types, User Defined Ordinal Types, Array, Associative Arrays, Record, Union, Tuple Types, List Types, Pointer and Reference Types, Type Checking, Strong Typing, Type Equivalence

Expressions and Statements: Arithmetic Expressions, Overloaded Operators, Type Conversions, Relational and Boolean Expressions, Short Circuit Evaluation,

Assignment Statements, Mixed-Mode Assignment

Control Structures – Introduction, Selection Statements, Iterative Statements, Unconditional Branching, Guarded Commands.

Unit - 3	Subprograms and Blocks	No. of Classes: 12

Subprograms and Blocks: Fundamentals of Sub-Programs, Design Issues for Subprograms, Local Referencing Environments, Parameter Passing Methods, Parameters that Are Subprograms, Calling Subprograms Indirectly, Overloaded Subprograms, Generic Subprograms, Design Issues for Functions, User Defined Overloaded Operators, Closures, Coroutines

Implementing Subprograms: General Semantics of Calls and Returns, Implementing Simple Subprograms, Implementing Subprograms with Stack-Dynamic Local Variables, Nested Subprograms, Blocks, Implementing Dynamic Scoping

Abstract Data Types: The Concept of Abstraction, Introductions to Data Abstraction, Design Issues, Language Examples, Parameterized ADT, Encapsulation Constructs, Naming Encapsulations

Unit - 4	Concurrency	No. of Classes: 9

Concurrency: Introduction, Introduction to Subprogram Level Concurrency, Semaphores, Monitors, Message Passing, Java Threads, Concurrency in Function Languages, Statement Level Concurrency.

Exception Handling and Event Handling: Introduction, Exception Handling in Ada, C++, Java,Introduction to Event Handling, Event Handling with Java and C#.

Unit - 5	Functional Programming Languages	No. of Classes: 10

Functional Programming Languages: Introduction, Mathematical Functions, Fundamentals of Functional Programming Language, LISP, Support for Functional Programming in Primarily Imperative Languages, Comparison of Functional and Imperative Languages

Logic Programming Language: Introduction, an Overview of Logic Programming, Basic Elements of Prolog, Applications of Logic Programming.

Scripting Language: Pragmatics, Key Concepts, Case Study: Python – Values and Types, Variables, Storage and Control, Bindings and Scope, Procedural Abstraction, Data Abstraction, Separate Compilation, Module Library. (Text Book 2)

Text Books:

1. Concepts of Programming Languages Robert. W. Sebesta 10/E, Pearson Education.
2. Programming Language Design Concepts, D. A. Watt, Wiley Dreamtech, 2007.

Reference Books:

1. Programming Languages, 2nd Edition, A.B. Tucker, R. E. Noonan, TMH.
2. Programming Languages, K. C. Louden, 2nd Edition, Thomson, 2003

Web References:
https://nptel.ac.in/courses/106/102/106102067/

E-Text Books:
https://www.cs.bgu.ac.il/~mira/ppl-book-full.pdf

CS521PE: COMPUTER GRAPHICS (Professional Elective - II)

B.Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS521PE	PEC	3	0	0	3	30	70	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 50

Prerequisite:

1. Familiarity with the theory and use of coordinate geometry and of linear algebra such as matrix multiplication.

2. A course on "Computer Programming and Data Structures"

Course Objectives: The course should enable the students to:

- The aim of this course is to provide an introduction of fundamental concepts and theory of computer graphics.
- Topics covered include graphics systems and input devices; geometric representations and 2D/3D transformations; viewing and projections; illumination and color models; animation; rendering and implementation; visible surface detection;

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

- Acquire familiarity with the relevant mathematics of computer graphics.
- Be able to design basic graphics application programs, including animation
- Be able to design applications that display graphic images to given specifications

Unit -1	Introduction	No. of Classes: 11

Introduction: Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices
Output primitives: Points and lines, line drawing algorithms (Bresenham's and DDA Algorithm), midpoint circle and ellipse algorithms
Polygon Filling: Scan-line algorithm, boundary-fill and flood-fill algorithms

Unit - 2	2-D geometrical transforms	No. of Classes: 11

2-D geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems
2-D viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland algorithms, Sutherland –Hodgeman polygon clipping algorithm.

Unit - 3	3-D object representation	No. of Classes: 9

3-D object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon rendering methods.

Unit - 4	3-D Geometric transformations	No. of Classes: 9

3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.
3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

Unit - 5	Computer animation	No. of Classes: 10

Computer animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications
Visible surface detection methods: Classification, back-face detection, depth-buffer, BSP-tree methods and area sub-division methods

Text Books:

1. "Computer Graphics C version", Donald Hearn and M. Pauline Baker, Pearson Education
2. "Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.
3. Computer Graphics, Steven Harrington, TMH

Reference Books:

1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
3. 3. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.

Web References:
https://nptel.ac.in/courses/106/103/106103224/

E-Text Books:
http://www.cse.iitm.ac.in/~vplab/courses/CG/PDF/INRODUCTION1.pdf
https://www.iitmandi.ac.in/academics/senate_courses/CS451.pdf

CS522PE: ADVANCED OPERATING SYSTEMS (Professional Elective - II)

B.Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
CS522PE	PEC	3	0	0	3	30	70	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 50

Prerequisite:

Course Objectives: The course should enable the students to:

- To study, learn, and understand the main concepts of advanced operating systems (parallel processing systems, distributed systems, real time systems, network operating systems, and open source operating systems)
- Hardware and software features that support these systems.

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

- Understand the design approaches of advanced operating systems
- Analyze the design issues of distributed operating systems.
- Evaluate design issues of multi processor operating systems.
- Identify the requirements Distributed File System and Distributed Shared Memory.
- Formulate the solutions to schedule the real time applications.

Unit -1	Architectures of Distributed Systems	No. of Classes: 10

Architectures of Distributed Systems: System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives.
Theoretical Foundations: Inherent Limitations of a Distributed System, Lamport's Logical Clocks, Vector Clocks, Causal Ordering of Messages, Termination Detection.

Unit - 2	Based Algorithms	No. of Classes: 10

Based Algorithms: Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm,
Token-Based Algorithms: Suzuki-Kasami's Broadcast Algorithm, Singhal's Heurisric Algorithm, Raymond's Heuristic Algorithm.

Unit - 3	Distributed Deadlock Detection	No. of Classes: 9

Distributed Deadlock Detection: Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection, Centralized- Deadlock – Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical
Deadlock Detection Algorithms

Unit - 4	Multiprocessor System Architectures	No. of Classes: 10

Multiprocessor System Architectures: Introduction, Motivation for multiprocessor Systems, Basic Multiprocessor System Architectures **Multi Processor Operating Systems**: Introduction, Structures of Multiprocessor Operating Systems, Operating Design Issues, Threads, Process Synchronization, Processor Scheduling.
Distributed File Systems: Architecture, Mechanisms for Building Distributed File Systems, Design Issues

Unit - 5	Distributed Scheduling	No. of Classes: 11

Distributed Scheduling: Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration
Distributed Shared Memory: Architecture and Motivation, Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issues

Text Books:

1. Advanced Concepts in Operating Systems, Mukesh Singhal, Niranjan G. Shivaratri, Tata McGraw-Hill Edition 2001

Reference Books:

1. Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall, Edition – 2, 2007

Web References:

E-Text Books:

CS523PE: INFORMATION RETRIEVAL SYSTEMS (Professional Elective - II)

B.Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS523PE	PEC	3	0	0	3	30	70	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 50

Prerequisite:

1. Data Structures

Course Objectives: The course should enable the students to:

- To learn the important concepts and algorithms in IRS
- To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.

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

- Ability to apply IR principles to locate relevant information large collections of data
- Ability to design different document clustering algorithms
- Implement retrieval systems for web search tasks.
- Design an Information Retrieval System for web search tasks.

Unit -1	Information Retrieval Systems	No. of Classes: 11

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses
Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous
Capabilities

Unit - 2	Cataloging and Indexing	No. of Classes: 11

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction
Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models

Unit - 3	Automatic Indexing	No. of Classes: 9

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages
Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

Unit - 4	User Search Techniques	No. of Classes: 10

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext
Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies

Unit - 5	Text Search Algorithms	No. of Classes: 09

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems
Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval

Text Books:

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer

Reference Books:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval By Yates and Neto Pearson Education.

Web References:

E-Text Books:

CS524PE: DISTRIBUTED DATABASES (Professional Elective - II)

B.Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS524PE	PEC	3	0	0	3	30	70	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 50

Prerequisite:

1. A course on "Database Management Systems"

Course Objectives: The course should enable the students to:

- The purpose of the course is to enrich the previous knowledge of database systems and exposing the need for distributed database technology to confront with the deficiencies of the centralized database systems.
- Introduce basic principles and implementation techniques of distributed database systems.
- Equip students with principles and knowledge of parallel and object-oriented databases.
- Topics include distributed DBMS architecture and design; query processing and optimization; distributed transaction management and reliability; parallel and object database management systems.

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

- Understand theoretical and practical aspects of distributed database systems.
- Study and identify various issues related to the development of distributed database system.
- Understand the design aspects of object-oriented database system and related development.

Unit -1	Introduction	No. of Classes: 11

Introduction; Distributed Data Processing, Distributed Database System, Promises of DDBSs, Problem areas.
Distributed DBMS Architecture: Architectural Models for Distributed DBMS, DDMBS Architecture.
Distributed Database Design: Alternative Design Strategies, Distribution Design issues, Fragmentation, Allocation.

Unit - 2	Query processing and decomposition	No. of Classes: 11

Query processing and decomposition: Query processing objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data.
Distributed query Optimization: Query optimization, centralized query optimization, distributed query optimization algorithms.

Unit - 3	Transaction Management	No. of Classes: 9

Transaction Management: Definition, properties of transaction, types of transactions, distributed concurrency control: serializability, concurrency control mechanisms & algorithms, time - stamped & optimistic concurrency control Algorithms, deadlock Management.

Unit - 4	Distributed DBMS Reliability	No. of Classes: 10

Distributed DBMS Reliability: Reliability concepts and measures, fault-tolerance in distributed systems, failures in Distributed DBMS, local & distributed reliability protocols, site failures and network partitioning.

Parallel Database Systems: Parallel database system architectures, parallel data placement, parallel query processing, load balancing, database clusters.

Unit - 5	Distributed object Database Management Systems	No. of Classes: 09

Distributed object Database Management Systems: Fundamental object concepts and models, object distributed design, architectural issues, object management, distributed object storage, object query Processing.

Object Oriented Data Model: Inheritance, object identity, persistent programming languages, persistence of objects, comparison OODBMS and ORDBMS

Text Books:

1. M. Tamer OZSU and Patuck Valduriez: Principles of Distributed Database Systems, Pearson Edn. Asia, 2001.
2. Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.

Reference Books:

1. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: "Database Systems: The Complete Book", Second Edition, Pearson International Edition

Web References:

E-Text Books:

CS525PE: ARTIFICIAL INTELLIGENCE (Professional Elective - II)

Course Code	Category	Hours/Week			Cre dits	Maximum Marks		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
CS525PE	**PEC**	3	0	0	3	30	70	100

B.Tech. III Year I Semester

Contact Classes:50	Tutorial Classes:	Practical Classes: Nil	Total Classes:50

Prerequisite:
- A course on "Computer Programming and Data Structures"
- A course on "Advanced Data Structures"
- A course on "Design and Analysis of Algorithms"
- A course on "Mathematical Foundations of Computer Science"
- Some background in linear algebra, data structures and algorithms, and probability will all be helpful

Course Objectives:
- To train the students to understand different types of AI agents, various AI search algorithms, fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation, reasoning. Study of Markov Models enable the student ready to step into applied AI.

Course Outcomes:
- Ability to formulate an efficient problem space for a problem expressed in natural language.
- Select a search algorithm for a problem and estimate its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique for a given problem.
- Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.

Unit - 1	**Basic Search Strategies**	No. of Classes: 09

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents
Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

Unit - 2	**Advanced Search**	No. of Classes: 09

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning
Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

Unit - 3	**Advanced Knowledge Representation and Reasoning**	No. of Classes: 10

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Nonmonotonic Reasoning, Other Knowledge Representation Schemes
Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks

Unit - 4	Learning	No. of Classes: 10

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

Unit - 5	Expert Systems	No. of Classes: 12

Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

Text Books:
1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice-Hall, 2010.

Reference Books:
1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.

2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

Web References:
https://nptel.ac.in/courses/106/102/106102220/

E-Text Books:
https://cse.iitkgp.ac.in/~pallab/ai.slides/lec1.pdf
https://www.cet.edu.in/noticefiles/271_AI%20Lect%20Notes.pdf

CS505PC: SOFTWARE ENGINEERING LAB

B.Tech. III Year I Semester									
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**			
CS505PC	**PCC**	**L**	**T**	**P**	**C**	**CIA**	**SE E**	**Tota l**	
		0	0	3	1.5	30	70	100	
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 45**				**Total Classes: 45**			

Prerequisite:

1. A course on "Programming for Problem Solving"
2. A Course on "Software Engineering"

Course Objectives: At the end of the course students should be able to:

1. To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

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

- Ability to translate end-user requirements into system and software requirements

- Ability to generate a high-level design of the system from the software requirements

- Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

List of Experiments:

Do the following 8 exercises for any two projects given in the list of sample projects or any other projects:
1. Development of problem statement.
2. Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents.
3. Preparation of Software Configuration Management and Risk Management related documents.
4. Study and usage of any Design phase CASE tool
5. Performing the Design by using any Design phase CASE tools.
6. Develop test cases for unit testing and integration testing
7. Develop test cases for various white box and black box testing techniques.

Sample Projects:
1. Passport automation System
2. Book Bank
3. Online Exam Registration
4. Stock Maintenance System
5. Online course reservation system

6. E-ticketing
7. Software Personnel Management System
8. Credit Card Processing
9. E-book management System.
10. Recruitment system

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, Mc Graw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

REFERENCE BOOKS:

List of Equipment/Software (with Specifications or Range) Required:

IBM Rational software architect

CS506PC: COMPUTER NETWORKS AND WEB TECHNOLOGIES LAB

B.Tech. III Year I Semester									

Course Code	Category	Hours/Week			Credits	Maximum Marks		
CS506PC	PCC	L	T	P	C	CIA	SE E	Tota l
		0	0	3	1.5	30	70	100

Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45	Total Classes: 45

Prerequisite:

Course Objectives: At the end of the course students should be able to:

- To understand the working principle of various communication protocols.
- To understand the network simulator environment and visualize a network topology and observe its performance
- To analyze the traffic flow and the contents of protocol frames

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

- Implement data link layer farming methods

- Analyze error detection and error correction codes.

- Implement and analyze routing and congestion issues in network design.

- Implement Encoding and Decoding techniques used in presentation layer

- To be able to work with different network tools

Computer Networks List of Experiments:

1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijsktra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting technique used in buffers.
10.   Wireshark
    a. Packet Capture Using Wire shark
    b. Starting Wire shark
    c. Viewing Captured Traffic

   d. Analysis and Statistics & Filters.
11. How to run Nmap scan
12. Operating System Detection using Nmap
13. Do the following using NS2 Simulator
   a. NS2 Simulator-Introduction
   b. Simulate to Find the Number of Packets Dropped
   c. Simulate to Find the Number of Packets Dropped by TCP/UDP
   d. Simulate to Find the Number of Packets Dropped due to Congestion
   e. Simulate to Compare Data Rate& Throughput.
   f. Simulate to Plot Congestion for Different Source/Destination
   g. Simulate to Determine the Performance with respect to Transmission of Packets

Web Technologies Experiments

1. Write a PHP script to print prime numbers between 1-50.
2. PHP script to
   a. Find the length of a string.
   b. Count no of words in a string.
   c. Reverse a string.
   d. Search for a specific string.
3. Write a PHP script to merge two arrays and sort them as numbers, in descending order.
4. Write a PHP script that reads data from one file and write into another file.
5. Develop static pages (using Only HTML) of an online book store. The pages should resemble: www.amazon.com. The website should consist the following pages.
   i. Home page
   ii. Registration and user Login
   iii. User Profile Page
   iv. Books catalog
   v. Shopping Cart
   vi. Payment By credit card
   vii. Order Conformation
6. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
7. Create and save an XML document on the server, which contains 10 users information. Write a program, which takes User Id as an input and returns the user details by taking the user information from the XML document.
8. Install TOMCAT web server. Convert the static web pages of assignments 2 into dynamic web pages using servlets and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.
9. Redo the previous task using JSP by converting the static web pages of assignments 2 into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database. Follow the MVC architecture while doing the website.

TEXT BOOKS:

1. WEB TECHNOLOGIES: A Computer Science Perspective, Jeffrey C. Jackson, Pearson Education

REFERENCE BOOKS:

1. Deitel H.M. and Deitel P.J., "Internet and World Wide Web How to program", Pearson International, 2012, 4th Edition.

2. J2EE: The complete Reference By James Keogh, McGraw-Hill

3. Bai and Ekedhi, The Web Warrior Guide to Web Programming, Thomson

4. Paul Dietel and Harvey Deitel," Java How to Program", Prentice Hall of India, 8th Edition

5. Web technologies, Black Book, Dreamtech press.

6. Gopalan N.P. and Akilandeswari J., "Web Technology", Prentice Hall of India

List of Equipment/Software (with Specifications or Range) Required:
- Linux
- PHP
- Tomcat
- Mysql
- XAMPP/LAMP
- ECLIPSE

EN508HS: ADVANCED COMMUNICATION SKILLS LAB

B.Tech. III Year I Semester									
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**			
EN508HS	**HSMC**	L	T	P	C	CIA	SEE	Total	
		0	0	2	1	30	70	100	
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 45**				**Total Classes: 45**			

Prerequisite:

Course Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.

- Further, they would be required to communicate their ideas relevantly and coherently in writing.

- To prepare all the students for their placements.

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

INTRODUCTION:
The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.
The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:
- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

SYLLABUS:
The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** -
Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.

3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/Technical report writing/* – planning for writing – improving one's writing.

4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/ emails/assignments etc.

5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

4. MINIMUM REQUIREMENT:
The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural
facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- ☐ Headphones of High quality

TEXT BOOKS:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

REFERENCE BOOKS:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007

2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.

3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.

4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.

5. English Vocabulary in Use series, Cambridge University Press 2008.

6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012.Cengage Learning.

7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.

8. Job Hunting by Colm Downes, Cambridge University Press 2008.

9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata McGraw-Hill 2009.

List of Equipment/Software (with Specifications or Range) Required:

SUGGESTED SOFTWARE:
The software consisting of the prescribed topics elaborated above should be procured and used.
- Oxford Advanced Learner's Compass, 7th Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

<p style="text-align:center">***MC510: INTELLECTUAL PROPERTY RIGHTS**</p>

B.Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIA**	**SE E**	**Total**
*MC510	**MC**	3	0	0	0	-	100	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 50

Prerequisite:

Course Objectives: The course should enable the students to:

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

Unit -1	Introduction	No. of Classes: 12

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

Unit - 2	Trade Marks	No. of Classes: 12

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

Unit - 3	Law of copy rights	No. of Classes: 8

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

Unit - 4	Trade Secrets	No. of Classes: 7

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation. Unfair competition: Misappropriation right of publicity, false advertising.

Unit - 5	New development of intellectual property	No. of Classes: 11

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.
International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

Text Books:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha

ganguli, Tata McGraw Hill Publishing company ltd
Reference Books:
Web References: https://nptel.ac.in/courses/110/105/110105139/
E-Text Books https://www.icsi.edu/docs/webmodules/Publications/9.4%20Intellectual%20Property%20Rights.pdf https://cdn3.euraxess.org/sites/default/files/domains/tr/th2020_ipr_brochure_eng_apr17.pdf

Syllabus

III Year							II Semester
S.No.	**Course Type**	**Course Code**	**Course Title**	**Periods Per Week**			**Credits**
				L	**T**	**P**	
1	PCC	CS601PC	Machine Learning	3	1	0	4
2	PCC	CS602PC	Compiler Design	3	1	0	4
3	PCC	CS603PC	Design and Analysis of Algorithms	3	1	0	4
			Professional Elective – III				
4	PEC	CS611PE	Concurrent Programming	3	0	0	3
		CS612PE	Network Programming				
		CS613PE	Scripting Languages				
		CS614PE	Mobile Application Development				
		CS615PE	Software Testing Methodologies				
5	OEC		Open Elective-I	3	0	0	3
6	PCC	CS604PC	Machine Learning Lab	0	0	3	1.5
7	PCC	CS605PC	Compiler Design Lab	0	0	3	1.5
			Professional Elective - III Lab				
8	PEC	CS621PE	Concurrent Programming Lab	0	0	2	1
		CS622PE	Network Programming Lab				
		CS623PE	Scripting Languages Lab				
		CS624PE	Mobile Application Development Lab				
		CS625PE	Software Testing Methodologies Lab				
9	MC	MC609	Environmental Science	3	0	0	0
10	MC		Cyber Security	3	0	0	0
Total				**21**	**3**	**8**	**22**

Note: *MC = Satisfactory/Unsatisfactory

*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 – I
CS600OE	Entrepreneurship
CS601OE	Fundamentals of Management for Engineers
CS602OE	Cyber Law & Ethics

CS601PC: MACHINE LEARNING

B.Tech. III Year II Semester								

Course Code	Category	Hours/Week			Credits	Maximum Marks		
CS601PC	**PCC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	1	0	4	30	70	100

Contact Classes: 45	Tutorial Classes: 5	Practical Classes: Nil	Total Classes: 50

Prerequisite: 1. Data Structures
               2. Knowledge on statistical methods

Course Objectives:

1. This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
2. To understand computational learning theory.

3. To study the pattern comparison techniques.

Course Outcomes:

1. Understand the concepts of computational intelligence like machine learning

2. Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
3. To Understand the Neural Networks and its usage in machine learning application.

Unit - 1	Introduction	No. of Classes:9

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias**.**

Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

Unit - 2	Artificial Neural Networks	No. of Classes:9

Artificial Neural Networks-1– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.

Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

Unit - 3	Bayesian learning	No. of Classes:9

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.

Computational learning theory – Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning.

Instance-Based Learning- Introduction, *k*-nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

Unit - 4	Genetic Algorithms	No. of Classes:9

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

Reinforcement Learning – Introduction, the learning task, *Q*–learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

Unit - 5	Analytical Learning	No. of Classes:9

Analytical Learning-1- Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.

Analytical Learning-2-Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.

Combining Inductive and Analytical Learning – Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis.

Text Books:
1. Machine Learning – Tom M. Mitchell, - MGH

Reference Books:
1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

Web References:
https://nptel.ac.in/courses/106/106/106106139/

E-Text Books:
http://192.168.8.214/ACE%20INTRANET/E-Books/CSE%20BOOKS/
https://ai.stanford.edu/~nilsson/MLBOOK.pdf
https://www.ibm.com/downloads/cas/GB8ZMQZ3

CS602PC: COMPILER DESIGN

B.Tech. III Year II Semester								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
CS602PC	**PCC**	3	1	0	4	30	70	100
Contact Classes: 45	**Tutorial Classes: 5**	**Practical Classes: Nil**				**Total Classes: 50**		

Prerequisite: 1. A course on "Formal Languages and Automata Theory"
      2. A course on "Computer Organization and architecture"
      3. A course on "Computer Programming and Data Structures

Course Objectives:

- Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
- Topics include phases of compiler, parsing, syntax directd translation, type checking use of symbol tables, code optimization techniques, intermediate code generation, code generation and data flow analysis.

Course Outcomes:

- Demonstrate the ability to design a compiler given a set of language features.
- Demonstrate the the knowledge of patterns, tokens & regular expressions for lexical analysis.
- Acquire skills in using lex tool & yacc tool for devleoping a scanner and parser.
- Design and implement LL and LR parsers
- Design algorithms to do code optimization in order to improve the performance of a program in terms of space and time complexity.
- Design algorithms to generate machine code.

Unit - 1	**Lexical Analysis**	**No. of Classes:8**

Introduction: The structure of a compiler, the science of building a compiler, programming language basics
Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata, From Regular Expressions to Automata, Design of a Lexical-Analyzer Generator, Optimization of DFA-Based Pattern Matchers.

Unit - 2	**Syntax Analysis**	**No. of Classes:8**

Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing,Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars and Parser Generators.

Unit - 3	**Syntax-Directed Translation**	**No. of Classes:10**

Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.
Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code, Types

and Declarations, Type Checking, Control Flow, Switch-Statements, Intermediate Code for Procedures.

Unit - 4	Run-Time Environments	No. of Classes:10

Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection.

Code Generation: Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation.

Unit - 5	Machine-Independent Optimization	No. of Classes:9

Machine-Independent Optimization: The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination,Loops in Flow Graphs.

Text Books:
1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam,Ravi Sethi, Jeffry D. Ullman.

Reference Books:
1. Lex & Yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
2. Compiler Construction, Louden, Thomson.

Web References:
https://nptel.ac.in/courses/106/104/106104123/
https://onlinecourses.nptel.ac.in/noc21_cs07/preview

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

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

https://www.geektonight.com/compiler-design-notes/

CS603PC: DESIGN AND ANALYSIS OF ALGORITHMS

B.Tech. III Year II Semester								

Course Code	Category	Hours/Week			Credits	Maximum Marks		
CS603PC	**PCC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	1	0	4	30	70	100

Contact Classes: 45	Tutorial Classes: 5	Practical Classes: Nil	Total Classes: 50

Prerequisite:
 1. A course on "Computer Programming and Data Structures"

 2. A course on "Advanced Data Structures" A course on "Formal Languages and Automata Theory

Course Objectives:

* Introduces the notations for analysis of the performance of algorithms.
* Introduces the data structure disjoint sets.
* Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
* Describes how to evaluate and compare different algorithms using worst-, average-, and best case analysis.
* Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

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	**Divide and conquer**	No. of Classes:9

Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation.
Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

Unit - 2	**Disjoint Sets**	No. of Classes:9

Disjoint Sets: Disjoint set operations, union and find algorithms
Backtracking: General method, applications, n-queen's problem, sum of subsets problem, graph coloring

Unit - 3	**Dynamic Programming**	No. of Classes:9

Dynamic Programming: General method, applications- Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

Unit - 4	**Greedy method**	No. of Classes:9

Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.		
Unit - 5	**Branch and Bound**	**No. of Classes:9**
Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution. **NP-Hard and NP-Complete problems**: Basic concepts, non deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.		

Text Books:
1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan,University Press.

Reference Books:
1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C.Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons.

Web References:
https://nptel.ac.in/courses/106/101/106101060/

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

https://www.cse.iitd.ac.in/~ssen/csl356/root.pdf

CS611PE: CONCURRENT PROGRAMMING (Professional Elective - III)

B.Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS611PE	PEC	3	0	0	3	30	70	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 50

Prerequisite:

 1. A course on "Operating Systems"

 2. A course on "Java Programming"

Course Objectives:

- To explore the abstractions used in concurrent programming

Course Outcomes:

 1. Ability to implement the mechanisms for communication and co-ordination among concurrent processes.
 2. Ability to understand and reason about concurrency and concurrent objects
 3. Ability to implement the locking and non-blocking mechanisms
 4. Ability to understand concurrent objects

Unit - 1	Mutual Exclusion	No. of Classes:11

Introduction - Shared Objects and Synchronization, A Fable, Properties of Mutual Exclusion, The Moral,The Producer–Consumer Problem, The Harsh Realities of Parallelization.
Mutual Exclusion - Time, Critical Sections, 2-Thread Solutions, The Peterson Lock, The Filter Lock,Lamport's Bakery Algorithm.

Unit - 2	Concurrent Objects	No. of Classes:11

Concurrent Objects - Concurrency and Correctness, Sequential Objects, Quiescent consistency,Sequential Consistency, Linearizability, Linearization Points, Formal Definitions
Linearizability, Compositional Linearizability, The Nonblocking Property, Progress conditions,Dependent Progress Conditions, The Java Memory Model, Locks and synchronized Blocks, Volatile Fields, Final Fields.

Unit - 3	Synchronization	No. of Classes:10

Synchronization Operations, Consensus Numbers, Consensus Protocols, The compareAndSet() Operation, Introduction Universality, A Lock-Free Universal, Construction Wait-Free Universal Construction, Spin Locks , Test-And-Set Locks

Unit - 4	Linked Lists	No. of Classes:9

Linked Lists: The Role of Locking, Introduction, List-Based Sets, Concurrent Reasoning, Coarse-Grained Synchronization, Fine-Grained Synchronization, Optimistic Synchronization, Lazy Synchronization, Non-Blocking Synchronization

Unit - 5	Concurrent Queues	No. of Classes:9

Concurrent Queues and the ABA Problem, Concurrent Stacks and Elimination, Transactional Memories

Text Books:

1. The Art of Multiprocessor Programming, by Maurice Herlihy and Nir Shavit, Morgan Kaufmman Publishers, 1st Edition, Indian Reprint 2012.

Reference Books:

1. Java Concurrency in Practice by Brian Goetz, Tim Peierls, Joshua Block, Joseph Bowbeer,David Holmes and Doug Lea, Addison Wesley, 1st Edition, 2006.
2. 2. Concurrent Programming in Java™: Design Principles and Patterns, Second Edition by Doug Lea, Publisher: Addison Wesley, Pub Date: October 01, 1999.

Web References:

https://nptel.ac.in/courses/106/102/106102163/

E-Text Books:

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

https://i.unu.edu/media/unu.edu/publication/1562/report325.pdf/

CS612PE: NETWORK PROGRAMMING (Professional Elective - III)

B.Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS612PE	PEC	3	0	0	3	30	70	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 50

Course Objectives:

- To understand inter process and inter-system communication
- To understand socket programming in its entirety
- To understand usage of TCP/UDP / Raw sockets
- To understand how to build network applications

Course Outcomes:

- To write socket API based programs
- To design and implement client-server applications using TCP and UDP sockets
- To analyze network programs

Unit - 1	Sockets	No. of Classes:9

Introduction to Network Programming: OSI model, Unix standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application.
Sockets: Address structures, value – result arguments, Byte ordering and manipulation function and related functions Elementary TCP sockets – Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

Unit - 2	TCP client server	No. of Classes:11

TCP client server: Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host.
Elementary UDP sockets: Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP.
I/O Multiplexing: I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server.

Unit - 3	Socket options	No. of Classes:10

Socket options: getsockopt and setsockopt functions. Socket states, Generic socket option IPV6 socket option ICMPV6 socket option IPV6 socket option and TCP socket options.
Advanced I/O Functions-Introduction, Socket Timeouts, recv and send Functions,readv and writev Functions, recvmsg and sendmsg Functions, Ancillary Data, How Much Data Is Queued?, Sockets and Standard I/O, T/TCP: TCP for Transactions.

Unit - 4	Elementary name and Address conversions	No. of Classes:11

Elementary name and Address conversions: DNS, gethost by Name function, Resolver option,Function and IPV6 support, uname function, other networking information.
Daemon Processes and inetd Superserver – Introduction, syslogd Daemon, syslog

Function,daemon_init Function, inetd Daemon, daemon_inetd Function

Broadcasting- Introduction, Broadcast Addresses, Unicast versus Broadcast, dg_cli Function Using Broadcasting, Race Conditions

Multicasting- Introduction, Multicast Addresses, Multicasting versus Broadcasting on A LAN,Multicasting on a WAN, Multicast Socket Options, mcast_join and Related Functions, dg_cli Function Using Multicasting, Receiving MBone Session Announcements, Sending and Receiving, SNTP: Simple Network Time Protocol, SNTP (Continued)

Unit - 5	SOCK_PACKET	No. of Classes:9

Raw Sockets-Introduction, Raw Socket Creation, Raw Socket Output, Raw Socket Input, Ping Program,Traceroute Program, An ICMP Message Daemon,

Datalink Access- Introduction, BPF: BSD Packet Filter, DLPI: Data Link Provider Interface, Linux:

SOCK_PACKET, libpcap: Packet Capture Library, Examining the UDP Checksum Field.

Remote Login: Terminal line disciplines, Pseudo-Terminals, Terminal modes, Control Terminals, rlogin Overview, RPC Transparency Issues.

Text Books:
1. UNIX Network Programming, by W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Pearson Education
2. UNIX Network Programming, 1st Edition, - W. Richard Stevens. PHI.

Reference Books:

1. UNIX Systems Programming using C++ T CHAN, PHI.
2. UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls, Pearson Education
3. Advanced UNIX Programming 2nd Edition M. J. ROCHKIND, Pearson Education

Web References:

https://onlinecourses.nptel.ac.in/noc20_cs23/preview

https://nptel.ac.in/courses/106/105/106105183/

E-Text Books:

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

https://www.geektonight.com/network-programming-notes/

CS613PE: SCRIPTING LANGUAGES (Professional Elective - III)

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		B.Tech. III Year II Semester						
		L	T	P	C	CIA	SEE	Total
CS613PE	PEC	3	0	0	3	30	70	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 50

Prerequisite:

1. A course on "Computer Programming and Data Structures"
2. A course on "Object Oriented Programming Concepts"

Course Objectives:

- This course introduces the script programming paradigm
- Introduces scripting languages such as Perl, Ruby and TCL.
- Learning TCL

Course Outcomes:

- Comprehend the differences between typical scripting languages and typical system and application programming languages
- Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem
- Acquire programming skills in scripting language

Unit - 1	Introduction	No. of Classes:9

Introduction: Ruby, Rails, The structure and Excution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Webservers, SOAP and webservices RubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling

Unit - 2	Extending Ruby	No. of Classes:9

Extending Ruby: Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System,Embedding Ruby to Other Languages, Embedding a Ruby Interperter

Unit - 3	PERL and Scripting	No. of Classes:10

Introduction to PERL and Scripting
Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Namesand Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern andregular expressions, subroutines.

Unit - 4	Advanced perl	No. of Classes:11

Advanced perl
Finer points of looping, pack and unpack, filesystem, eval, data structures, packages, modules, objects,interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Isses.

Unit - 5	TCL	No. of Classes:11

TCL

TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts

Internet Programming, Security Issues, C Interface.

Tk

Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

Text Books:
1. The World of Scripting Languages, David Barron,Wiley Publications.
2. Ruby Progamming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pramatic Progammers guide by Dabve Thomas Second edition

Reference Books:

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J. Lee and B. Ware (Addison Wesley) Pearson Education.

2. Perl by Example, E. Quigley, Pearson Education.

3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.

4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.

5. Perl Power, J. P. Flynt, Cengage Learning.

Web References:

https://nptel.ac.in/courses/106/102/106102067/

E-Text Books:

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

CS614PE: MOBILE APPLICATION DEVELOPMENT (Professional Elective - III)

B.Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS614PE	**PEC**	3	0	0	3	30	70	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 50

Prerequisite:

1. Acquaintance with JAVA programming
2. A Course on DBMS

Course Objectives:

- To demonstrate their understanding of the fundamentals of Android operating systems
- To improves their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on mobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

Course Outcomes:

- Student understands the working of Android OS Practically.
- Student will be able to develop Android user interfaces
- Student will be able to develop, deploy and maintain the Android Applications.

Unit - 1	Introduction	No. of Classes:9

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools

Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

Unit - 2	Android User Interface	No. of Classes:9

Android User Interface: Measurements – Device and pixel density independent measuring UNIT - s

Layouts – Linear, Relative, Grid and Table Layouts

User Interface (UI) Components – Editable and non-editable TextViews, Buttons, Radio and Toggle

Buttons, Checkboxes, Spinners, Dialog and pickers

Event Handling – Handling clicks or changes of various UI components

Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment

transactions, interfacing between fragments and Activities, Multi-screen Activities

Unit - 3	Intents and Broadcasts	No. of Classes:10

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit
Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS
Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity
Notifications – Creating and Displaying notifications, Displaying Toasts

Unit - 4	Persistent Storage	No. of Classes:11

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

Unit - 5	Database	No. of Classes:11

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

Text Books:
>	1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012
>	2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

Reference Books:
1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

Web References:
https://nptel.ac.in/courses/106/106/106106156/

https://nptel.ac.in/courses/106/106/106106222/

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

https://www.cs.cmu.edu/~bam/uicourse/830spring09/BFeiginMobileApplicationDevelopment.pdf

http://projanco.com/Library/Android%20App%20Development%20in%20Android%20Studio%20-%20Java%20plus%20Android%20edition%20for%20beginners.pdf

CS615PE: SOFTWARE TESTING METHODOLOGIES (Professional Elective - III)

B.Tech. III Year II Semester								

Course Code	Category	Hours/Week			Credits	Maximum Marks		
CS615PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 50

Prerequisite:

1. A course on "Software Engineering"

Course Objectives:

- To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
- To develop skills in software test automation and management using latest tools.

Course Outcomes:

- Design and develop the best test strategies in accordance to the development model.

Unit - 1	Introduction	No. of Classes:10

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs
Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

Unit - 2	Transaction Flow Testing	No. of Classes:10

Transaction Flow Testing: transaction flows, transaction flow testing techniques. Dataflow testing:
Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing. Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

Unit - 3	Paths	No. of Classes:10

Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.
Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

Unit - 4	State Graphs	No. of Classes:10

State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips.

Unit - 5	Graph Matrices	No. of Classes:10

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like JMeter or Win-runner).

Text Books:

      1. Software Testing techniques - Baris Beizer, Dreamtech, second edition.
      2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.

Reference Books:

1. The craft of software testing - Brian Marick, Pearson Education.

2. Software Testing Techniques – SPD(Oreille)

3. Software Testing in the Real World – Edward Kit, Pearson.

4. Effective methods of Software Testing, Perry, John Wiley.

5. Art of Software Testing – Meyers, John Wiley.

Web References:

https://onlinecourses.nptel.ac.in/noc20_cs19/preview

E-Text Books:

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

CS604PC: MACHINE LEARNING LAB

B.Tech. III Year II Semester								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
CS604PC	**PCC**	L	T	P	C	CIA	SEE	Total
		0	0	3	1.5	30	70	100
Contact Classes: Nil		**Practical Classes: 45**				**Total Classes: 45**		

Course Objectives: The objective of this lab is to get an overview of the various machine learning techniques and can able to demonstrate them using python.

Course Outcomes: After the completion of the course the student can able to:
- understand complexity of Machine Learning algorithms and their limitations;
- understand modern notions in data analysis-oriented computing;
- be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;
- Be capable of performing experiments in Machine Learning using real-world data.

List of Experiments:

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is theprobability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%)

2. Extract the data from database using python

3. Implement k-nearest neighbours classification using python

4. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k-means clustering with 3 means (i.e., 3 centroids)
   VAR1 VAR2 CLASS
   1.713 1.586 0
   0.180 1.786 1
   0.353 1.240 1
   0.940 1.566 0
   1.486 0.759 1
   1.266 1.106 0
   1.540 0.419 1
   0.459 1.799 1
   0.773 0.186 1

5. The following training examples map descriptions of individuals onto high, medium and low credit-worthiness.
   medium skiing design single twenties no -> highRisk
   high golf trading married forties yes -> lowRisk
   low speedway transport married thirties yes -> medRisk
   medium football banking single thirties yes -> lowRisk
   high flying media married fifties yes -> highRisk

low football security single twenties no -> medRisk
medium golf media single thirties yes -> medRisk
medium golf transport married forties yes -> lowRisk
high skiing banking single thirties yes -> highRisk
low golf unemployed married forties yes -> highRisk

Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `medRisk' in the dataset?

6. Implement linear regression using python.

7. Implement Naïve Bayes theorem to classify the English text

8. Implement an algorithm to demonstrate the significance of genetic algorithm

9. Implement the finite words classification system using Back-propagation algorithm

List of Equipment/Software (with Specifications or Range) Required:

A Computer System with Ubuntu operating system and Jupiter note book

CS605PC: COMPILER DESIGN LAB

B.Tech. III Year II Semester								
Course Code	**Category**	**Hours/Week**			**Cre dits**	**Maximum Marks**		
CS605PC	**PCC**	L	T	P	C	CIA	SEE	Total
		0	0	3	1.5	30	70	100
Contact Classes: Nil		**Practical Classes: 45**				**Total Classes: 45**		

Prerequisites
1. A Course on "Objected Oriented Programming through Java"

Co-requisites:
1. A course on "Web Technologies"

Course Objectives:
1. To provide hands-on experience on web technologies
2. To develop client-server application using web technologies
3. To introduce server-side programming with Java servlets and JSP
4. To understand the various phases in the design of a compiler.
5. To understand the design of top-down and bottom-up parsers.
6. To understand syntax directed translation schemes.
7. To introduce lex and yacc tools.

Course Outcomes:
1. Design and develop interactive and dynamic web applications using HTML, CSS, JavaScript
2. and XML
3. Apply client-server principles to develop scalable and enterprise web applications.
4. Ability to design, develop, and implement a compiler for any language.
5. Able to use lex and yacc tools for developing a scanner and a parser.
6. Able to design and implement LL and LR parsers.

List of Experiments:

Compiler Design Experiments
1. Write a LEX Program to scan reserved word & Identifiers of C Language
2. Implement Predictive Parsing algorithm
3. Write a C program to generate three address code.
4. Implement SLR(1) Parsing algorithm
5. Design LALR bottom up parser for the given language
<program> ::= <block>
<block> ::= { <variabledefinition> <slist> }
| { <slist> }
<variabledefinition> ::= int <vardeflist> ;
<vardeflist> ::= <vardec> | <vardec> , <vardeflist>
<vardec> ::= <identifier> | <identifier> [<constant>]
<slist> ::= <statement> | <statement> ; <slist>
<statement> ::= <assignment> | <ifstatement> | <whilestatement>
| <block> | <printstatement> | <empty>
<assignment> ::= <identifier> = <expression>
| <identifier> [<expression>] = <expression>
<ifstatement> ::= if <bexpression> then <slist> else <slist> endif
| if <bexpression> then <slist> endif
<whilestatement> ::= while <bexpression> do <slist> enddo
<printstatement> ::= print (<expression>)

<expression> ::= <expression> <addingop> <term> | <term> | <addingop> <term>
 <bexpression> ::= <expression> <relop> <expression>
<relop> ::= < | <= | == | >= | > | !=
<addingop> ::= + | -
<term> ::= <term> <multop> <factor> | <factor>
<multop> ::= * | /
<factor> ::= <constant> | <identifier> | <identifier> [<expression>]
| (<expression>)
<constant> ::= <digit> | <digit> <constant>
<identifier> ::= <identifier> <letterordigit> | <letter>
<letterordigit> ::= <letter> | <digit>
<letter> ::= a|b|c|d|e|f|g|h|i|j|k|l|m|n|o|p|q|r|s|t|u|v|w|x|y|z
<digit> ::= 0|1|2|3|4|5|6|7|8|9
<empty> has the obvious meaning
Comments (zero or more characters enclosed between the standard C/Java-style comment brackets
/*...*/) can be inserted. The language has rudimentary support for 1-dimensional arrays. The
declaration int a[3] declares an array of three elements, referenced as a[0], a[1] and a[2]. Note
also that you should worry about the scoping of names.
A simple program written in this language is:
{ int a[3],t1,t2;
t1=2;
a[0]=1; a[1]=2; a[t1]=3;
t2=-(a[2]+t1*6)/(a[2]-t1);
if t2>5 then
print(t2);
else {
int t3;
t3=99;
t2=-25;
print(-t1+t2*t3); /* this is a comment
on 2 lines */
}
endif
 }

List of Equipment/Software (with Specifications or Range) Required:

A Computer System with Ubuntu operating system and GCC Compiler, lex, yaac

CS621PE: CONCURRENT PROGRAMMING LAB (Professional Elective - III)

Course Code	Category	Hours/Week			Cre dits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS621PE	PEC	0	0	2	1	30	70	100

Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45	Total Classes: 45

B.Tech. III Year II Semester

Course Objectives:

List of Experiments:

1. Design and implement Two-thread mutual exclusion algorithm (Peterson's Algorithm) using multithreaded programming.
2. Design and implement Filter Lock algorithm and check for deadlock-free and starvation-free conditions using multithreaded programming.
3. Design and implement Lamport's Bakery Algorithm and check for deadlock-free and starvationfree conditions using multithreaded programming.
4. Design and implement Lock-based concurrent FIFO queue data structure using multithreaded programming.
5. Design a consensus object using read–write registers by implementing a deadlock-free or starvation-free mutual exclusion lock. (Use CompareAndSet( ) Primitive).
6. Design and implement concurrent List queue data structure using multithreaded programming.(Use Atomic Primitives)
7. Design and implement concurrent Stack queue data structure using multithreaded programming. (Use Atomic Primitives)
8. Design and implement concurrent FIFO queue data structure using multithreaded programming. (Use Atomic Primitives)

List of Equipment/Software (with Specifications or Range) Required:

A Computer System with Ubuntu operating system and GCC Compiler

CS622PE: NETWORK PROGRAMMING LAB (Professional Elective - III)

B.Tech. III Year II Semester									
Course Code	**Category**	**Hours/Week**			**Cre dits**	**Maximum Marks**			
		L	T	P	C	CIA	SEE	Total	
CS622PE	**PEC**	0	0	2	1	30	70	100	
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 45**				**Total Classes: 45**			

Course Objectives:

- To understand inter process and inter-system communication

- To understand socket programming in its entirety

- To understand usage of TCP/UDP / Raw sockets

- To understand how to build network applications

Course Outcomes:

- To write socket API based programs

- To design and implement client-server applications using TCP and UDP sockets

- To analyze network programs

List of Experiments:

1. Implement programs for Inter Process Communication using PIPE, Message Queue and Shared Memory.
2. Write a programme to create an integer variable using shared memory concept and increment the variable simultaneously by two processes. Use semaphores to avoid race conditions.
3. Design TCP iterative Client and server application to reverse the given input sentence
4. Design TCP iterative Client and server application to reverse the given input sentence
5. Design TCP client and server application to transfer file
6. Design a TCP concurrent server to convert a given text into upper case using multiplexing system call "select"
7. Design a TCP concurrent server to echo given set of sentences using poll functions
8. Design UDP Client and server application to reverse the given input sentence
9. Design UDP Client server to transfer a file
10. Design using poll client server application to multiplex TCP and UDP requests for converting a given text into upper case.
11. Design a RPC application to add and subtract a given pair of integers

TEXT BOOKS:
1. UNIX Network Programming, by W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Pearson
Education.
2. UNIX Network Programming, 1st Edition, - W. Richard Stevens. PHI.

List of Equipment/Software (with Specifications or Range) Required:

A Computer System with Ubuntu operating system and GCC Compiler, java

Course Code	Category	Hours/Week			Cre dits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS623PE	PEC	0	0	2	1	30	70	100
Contact Classes: Nil	**Tutorial Classes: NIl**	**Practical Classes: 45**				**Total Classes: 45**		

B.Tech. III Year II Semester

Prerequisites: Any High-level programming language (C, C++)

Course Objectives:

- To Understand the concepts of scripting languages for developing web based projects

- To understand the applications the of Ruby, TCL, Perl scripting languages

Course Outcomes:

- Ability to understand the differences between Scripting languages and programming languages

- Able to gain some fluency programming in Ruby, Perl, TCL

List of Experiments:

1. Write a Ruby script to create a new string which is n copies of a given string where n is a nonnegative integer
2. Write a Ruby script which accept the radius of a circle from the user and compute the parameter and area.
3. Write a Ruby script which accept the user's first and last name and print them in reverse order with a space between them
4. Write a Ruby script to accept a filename from the user print the extension of that.
5. Write a Ruby script to find the greatest of three numbers
6. Write a Ruby script to print odd numbers from 10 to 1
7. Write a Ruby scirpt to check two integers and return true if one of them is 20 otherwise return their sum
8. Write a Ruby script to check two temperatures and return true if one is less than 0 and the other is greater than 100
9. Write a Ruby script to print the elements of a given array
10. Write a Ruby program to retrieve the total marks where subject name and marks of a student stored in a hash
11. Write a TCL script to find the factorial of a number
12. Write a TCL script that multiplies the numbers from 1 to 10
13. Write a TCL script for Sorting a list using a comparison function
14. Write a TCL script to (i)create a list (ii)append elements to the list (iii)Traverse the list (iv)Concatenate the list
15. Write a TCL script to comparing the file modified times.
16. Write a TCL script to Copy a file and translate to native format.
17. a) Write a Perl script to find the largest number among three numbers.
    b) Write a Perl script to print the multiplication tables from 1-10 using

subroutines.
18. Write a Perl program to implement the following list of manipulating functions
    a)Shift
    b)Unshift
    c) Push
19. a) Write a Perl script to substitute a word, with another word in a string.
    b) Write a Perl script to validate IP address and email address.
20. Write a Perl script to print the file in reverse order using command line arguments

TEXT BOOKS:

List of Equipment/Software (with Specifications or Range) Required:

Perl , Ruby and tcl

Course Code	Category	Hours/Week			Cre dits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
CS624PE	**PEC**	0	0	2	1	30	70	100

B.Tech. III Year II Semester

Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45	Total Classes: 45

Prerequisites:

Course Objectives:

- To learn how to develop Applications in android environment.

- To learn how to develop user interface applications.

- To learn how to develop URL related applications.

Course Outcomes:

- Student understands the working of Android OS Practically.

- Student will be able to develop user interfaces.

- Student will be able to develop, deploy and maintain the Android Applications.

List of Experiments:

1. Create an Android application that shows Hello + name of the user and run it on an emulator.
   (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login

name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.

7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored.
   Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.
9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.
10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.
11. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.
12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.
13. Create an application that shows the given URL (from a text field) in a browser.

TEXT BOOKS:

List of Equipment/Software (with Specifications or Range) Required:

Android SDK

CS625PE: SOFTWARE TESTING METHODOLOGIES LAB (Professional Elective - III)

B.Tech. III Year II Semester									
Course Code	**Category**	**Hours/Week**			**Cre dits**	**Maximum Marks**			
		L	T	P	C	CIA	SEE	Total	
CS625PE	**PEC**	0	0	2	1	30	70	100	
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 45**				**Total Classes: 45**			

Prerequisites: A basic knowledge of programming.

Course Objectives:

- To provide knowledge of Software Testing Methods.

- To develop skills in software test automation and management using latest tools.

Course Outcomes:

- Design and develop the best test strategies in accordance to the development model.

List of Experiments:

1. Recording in context sensitive mode and analog mode
2. GUI checkpoint for single property
3. GUI checkpoint for single object/window
4. GUI checkpoint for multiple objects
5. a) Bitmap checkpoint for object/window
   b) Bitmap checkpoint for screen area
6. Database checkpoint for Default check
7. Database checkpoint for custom check
8. Database checkpoint for runtime record check
9. a) Data driven test for dynamic test data submission
   b) Data driven test through flat files
   c) Data driven test through front grids
   d) Data driven test through excel test
10. a) Batch testing without parameter passing
    b) Batch testing with parameter passing
11. Data driven batch
12. Silent mode test execution without any interruption
13. Test case for calculator in windows application

TEXT BOOKS:

List of Equipment/Software (with Specifications or Range) Required:

Star UML or Rational rose

*MC609: Environmental Science

B.Tech. III Year II Semester								
Course Code	**Category**	**Hours/Week**			**Cre dits**	**Maximum Marks**		
*MC609	**MC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Tota l**
		3	0	0	0	0	70	100
Contact Classes: 50		**Practical Classes: Nil**				**Total Classes: 50**		

Course Objectives:

1. Understanding the importance of ecological balance for sustainable development.

2. Understanding the impacts of developmental activities and mitigation measures

3. Understanding the environmental policies and regulations

Course Outcomes:

1. Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations   which in turn helps in sustainable development

Unit - 1	**Ecosystems**	No. of Classes:9

Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

Unit - 2	**Natural Resources**	No. of Classes:9

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems.
Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

Unit - 3	**Biodiversity And Biotic Resources**	No. of Classes:9

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

Unit - 4	**Environmental Pollution**	No. of Classes:9

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards.
Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil.

Noise Pollution: Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management.

Pollution control technologies:

Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental**

Problems and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions /Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

Unit - 5	Environmental Policy, Legislation & EIA	No. of Classes:9

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socioeconomical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).

Towards Sustainable Future: Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

Reference Books:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

Web References:

https://nptel.ac.in/courses/120/108/120108004/

https://nptel.ac.in/courses/127/105/127105018/

E-Text Books:

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

https://www.hzu.edu.in/bed/E%20V%20S.pdf

*MC610: CYBER SECURITY

B.Tech. III Year II Semester									

Course Code	Category	Hours/Week			Credits	Maximum Marks		
*MC610	**MC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	0	0	70	100

Contact Classes: 50		Practical Classes: Nil	Total Classes: 50

Course Objectives:

1. To familiarize various types of cyber-attacks and cyber-crimes
2. To give an overview of the cyber laws
3. To study the defensive techniques against these attacks

Course Outcomes:

The students will be able to understand cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.

Unit - 1	**Introduction to Cyber Security:**	No. of Classes:9

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

Unit - 2	**Cyberspace and the Law & Cyber Forensics**	No. of Classes:9

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy.
Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

Unit - 3	**Cybercrime**	No. of Classes:9

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

Unit - 4	**Cyber Security**	No. of Classes:9

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations. Cybercrime and Cyber terrorism: Introduction, intellectual

property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

Unit - 5	Privacy Issues	No. of Classes:9

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Cybercrime: Examples and Mini-Cases

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.

Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

Text Books:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley

2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

Reference Books:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

Web References:

https://onlinecourses.swayam2.ac.in/cec20_cs15/preview

E-Text Books:

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

Syllabus

S.No.	Course Type	Course Code	Course Title	Periods Per Week			Credits
IV Year							**I Semester**
				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

CS701PC: CRYPTOGRAPHY AND NETWORK SECURITY (PC)

B.Tech. IV Year I Semester								

Course Code	Category	Hours/Week			Cre dits	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, 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

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

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

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:
-

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, Kircho⊥-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

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

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

B.Tech. IV Year I Semester								

Course Code	Category	Hours/Week			Cre dits	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 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

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

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

CS714PE: CLOUD COMPUTING (Professional Elective - IV)

B.Tech. IV Year I Semester								
Course Code	**Category**	**Hours/Week**			**Cre dits**	**Maximum Marks**		
CS714PE	**PCC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		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,

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

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

B.Tech. IV Year I Semester								
Course Code	**Category**	**Hours/Week**			**Cre dits**	**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,

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

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.

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/

CS722PE: REAL TIME SYSTEMS (Professional Elective - V)

B.Tech. IV Year I Semester								

Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
CS722PE	**PCC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		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.

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

CS723PE: SOFT COMPUTING (Professional Elective - V)

B.Tech. IV Year I Semester								

Course Code	Category	Hours/Week			Cre dits	Maximum Marks		
CS723PE	**PCC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		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

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

CS724PE: INTERNET OF THINGS (Professional Elective - V)

B.Tech. IV Year I Semester								

Course Code	Category	Hours/Week			Cre dits	Maximum Marks		
CS724PE	**PCC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		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

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

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

B.Tech. IV Year I Semester									

Course Code	Category	Hours/Week			Credits	Maximum Marks		
CS725PE	**PCC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		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.

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

CS703PC: CRYPTOGRAPHY AND NETWORK SECURITY LAB (PC)

B.Tech. IV Year I Semester								
Course Code	**Category**	**Hours/Week**			**Cred its**	**Maximum Marks**		
CS703PC	**PCC**	**L**	**T**	**P**	**C**	**CIA**	**SE E**	**Tota l**
		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

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

SM801MS: ORGANIZATIONAL BEHAVIOUR (PC)

B.Tech. IV Year II Semester								
Course Code	**Category**	**Hours/Week**			**Cre dits**	**Maximum Marks**		
SM801MS	**HSMC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		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 -

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

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.

Us nit - 4	Graph Algorithms	No. of Classes: 10

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

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

CS812PE: DISTRIBUTED SYSTEMS (Professional Elective - VI)

B.Tech. IV Year II Semester								

Course Code	Category	Hours/Week			Credits	Maximum Marks		
CS812PE	**PCC**	L	T	P	C	CIA	SEE	Total
		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

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

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

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

CS814PE: HUMAN COMPUTER INTERACTION (Professional Elective - VI)

B.Tech. IV Year II Semester								
Course Code	**Category**	**Hours/Week**			**Cre dits**	**Maximum Marks**		
CS814PE	**PCC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		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

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

CS815PE: CYBER FORENSICS (Professional Elective - VI)

B.Tech. IV Year II Semester								
Course Code	**Category**	**Hours/Week**			**Cre dits**	**Maximum Marks**		
CS815PE	**PCC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		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

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