Semester-VII

Sr. no	Course Title	Teaching Scheme				Examination Scheme							Credits	
		L	T	P	Contact hrs/wk	Theory	Unit Test	Attendance	TA & Assignments	PR& TW	OR& TW	Total Marks	Theory	TW
1	Compiler Construction and Design	4	-	2	6	60	20	10	10	--	50	150	4	1
2	Computer Forensics and Cyber Laws	3	-	2	5	60	20	10	10	50	-	150	3	1
3	Software Testing	3	-	2	5	60	20	10	10	50	--	150	3	1
4	Elective –III	2	2	-	4	60	20	10	10	--	50	150	2	2
5	Seminar I	-	-	2	2	--	--	--	--	--	50	50		1
6	Project Stage-I	-	-	2	2	--	--		--	--	50	50	-	4
7	Industrial Training	-	--	-	-	--	--		--	--	50	50	-	3
	TOTAL	**12**	**2**	**10**	**24**	**240**	**80**	**40**	**40**	**100**	**250**	**750**	**12**	**13**

Elective III :

1) Web Services
2) Natural Language Processing
3) Network Modeling & Designing
4) Neural Network

Teaching Scheme			Examination Scheme							Credits	
Lecture	Practical	Tutorial	Theory	Unit Test	Attendance	Assignments	PR&TW	OR&TW	Total	Theory	TW
12	10	02	240	80	40	40	100	250	750	12	13

Compiler Construction and Design

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 4 Hrs/Week	**End Semester Examination: 60 Marks**	**Theory:04**
Practical : 2 Hrs/Week	**Internal Assessment:40 Marks**	**Term Work:01**
	Oral and Term Work: 50 Marks	

Course Objectives:

1) Students will understand concepts of compiler phases and design.
2) Students will get deeper insights into the more advanced semantic aspects of programming language and compilers.

Course Prerequisites:

Students should have knowledge of

1) Basic Programming Skills
2) Data Structure Fundamentals.
3) Theory of Automata and Formal Languages

Course Outcome:

Students will be able to:

4) Learn about different phases of a compiler and their functioning.
5) Implement a program to exhibit basic functionalities of compiler.
6) Understand how compilers generate source code to machine code and manages memory during runtime.
7) Acquaint with techniques for simple code optimizations.
8) Use compiler construction tools and softwares like LEX, YACC and FOSS.
9) Know functioning of advanced compilers and advancements in the field.

UNIT-I **Lexical Analysis:** **(06 Hours)**

Language Processor: Preprocessor, compiler, assembler, interpreters, Translation Process, Phases of Compiler, Compiler construction: Design issues, Tools. Lexical Analysis: Role, Regular expressions, Specification and recognition of tokens, LEX, Construction of lexical analyzer using LEX.

UNIT-II **Syntax Analysis:** **(06 Hours)**

Context free grammar, writing a grammar, Top down parsing, Bottom up parsing, LR parsers: LR parsing algorithm, Constructing SLR parsing tables, Constructing canonical LR parsing tables, Constructing LALR parsing tables, Using ambiguous grammars, YACC. Symbol tables: use and need of symbol tables.

UNIT-III **Syntax Translation:** **(06 Hours)**

Syntax directed definition and analysis, Syntax tree construction, Bottom up evaluation, S and L attribute definitions, Top down translation, Space allocation at compile time, Type checking, Type

conversion.

UNIT-IV **Run Time Environment and Intermediate Code Generation**: **(06 Hours)**

Runtime Environment: Storage organization, Stack allocation, Access to non-local data, Heap management, Parameter passing mechanisms, Garbage collection, Dynamic storage allocation techniques.

Intermediate Code Generation: Declaration, Assignment statement, Boolean expression, Case statement, Backpatching, Procedure calls.

UNIT-V **Code Generation:** **(06 Hours)**

Issues in Code generation, Basic Code generation techniques, run time storage management, Basic blocks and Flow graphs, Next-use information, A simple Code generator, DAG representation of Basic blocks, Peephole optimization, Generating code from dags, Code generation algorithms.

UNIT-VI **Code Optimization and Applications:** **(06 Hours)**

Code optimization techniques, Principal Sources of Optimization, Optimization of basic Blocks, Global Data Flow Analysis, Runtime Environments, Source and Target Language issues, Dynamic compilation, Cross compilers, Decompiler, Tools: FOSS, C Compiler, GCC, javac, JIT, Interpreters (JVM/Dalvik).

Assignment List:

1) Analyze source program compilation with respect to compilation phases.
2) Explain the role of lexical analysis in compilation process.
3) Explain in brief i) Top down parsing ii) Bottom up parsing.
4) Write a short note on necessity of type checking and type conversion.
5) Write a procedure to insert an item into a linked list by passing a pointer to the head of the list. Under what parameter passing mechanisms does this procedure work?
6) Discuss dynamic storage allocation techniques.
7) Explain DAG representation of basic blocks with suitable example.
8) Briefly explain runtime storage management in code generation phase.
9) Write a short note on code optimization technique.
10) Enlist and explain advanced compiler tools.

Term Work Assignment List:

1) Understand basic syntax of LEX specifications, built-in functions and variables.
2) Implement a preprocessor for C program.
3) Implement a lexical analyzer for subset of C language.
4) Implement a parser for an expression grammar using YACC and LEX.
5) Write a program to simulate symbol table generator.
6) Implement operations of semantic analysis like type checking,verification of function parameters, variable declarations and coercions etc.

7) Simulation and Demo: Compiler and interpreter using LEX and YACC.
8) Implement intermediate code generator for the Boolean expression in three Address code format.
9) Implement the front end of a compiler that generates the three-address code for a simple language.
10) Generate an appropriate Target Code from the given intermediate code assuming suitable processor details.

Text Books:

1) Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education Edition.
2) J. R. Levin, T. Mason, D. Brown, "Lex and Yacc", O'Reilly.

Reference Books:

1) *Kenneth C. Louden., "Compiler Construction Principles and Practice", Cengage Learning India.*
2) *Andrew Appel and Jens Palsberg., "Modern Compiler Implementation in ML: Basic Techniques", Cambridge University Press.*
3) *Anthony J. Dos Reis, "Compiler Construction Using Java, JavaCC and Yacc", Wiley.*
4) *Keith D. Cooper, Linda Torczon, "Engineering a Compiler", Elsevier.*
5) *Axel T. Schreiner, H. George Friedman Jc, "Introduction to Compiler Construction with Unix", Prentice Hall.*

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III
Unit Test -2 Unit IV, V and VI

Computer Forensics and Cyber Laws

Teaching Scheme	Examination Scheme		Credit Allotted	
Theory : 3Hrs/Week	**End Semester Examination**	**: 60Marks**	**Theory**	**: 03**
Practical : 2 Hrs/Week	**Internal Assessment**	**: 40 Marks**	**Term Work**	**: 01**
	Practical and Term Work	**: 50 Marks**		

Course Objective:
To maintain an appropriate level of awareness, knowledge and skill required to minimize the occurrence and severity of incidents related to forensics and cyber law.

Course Prerequisites:
Students should have knowledge of
1) Basics of data communication.
2) Aware about security issues with digital world.

Course Outcome:
Students will be able to:
1) Understand how to analyze evidences and its use in investigation.
2) Demonstrate data recovery in computer forensic.
3) Analyze hardware and operating systems in cyber security.
4) Demonstrate Computer Forensic tools and Disaster Recovery.
5) Understand Network Forensic and Mobile Network Forensic.
6) Discuss cyber laws.

UNIT-I **Introduction to Computer Forensics:** **(06 Hours)**

computer crimes, evidence, extraction, preservation

Overview: Concept of Computer Forensic, Types of Forensic Science, Storage device, Storage device characteristics, types of storage device.

Forensic Investigator: Role of Computer Forensic Investigator, line of investigation, investigation steps, responsibilities of Computer Forensic Investigator.

Evidence: Definition of evidence, life cycle of evidence, types of evidence, rules for evidence, evidence.

Storage and its Security Incident Response: Introduction, Investigations, Pre-Incident Preparations, Formation of Incident Response Team, Role of Incident Response Team.

UNIT-II **Data recovery:** **(06 Hours)**

Computer crime and Legal issues: Intellectual property, privacy issues, Criminal Justice system for forensic, audit/investigative situations and digital crime scene, investigative procedure/standards for extraction, preservation, and deposition of legal evidence in a court

of law.**Data Recovery:** Definition of data recovery, Identifying hidden data, Encryption/Decryption, Steganography, recovering deleted files.data recovery mechanism, tools used for recovery.**Digital evidence controls:** uncovering attacks that evade detection by Event Viewer, Task Manager, and other Windows GUI tools, data acquisition, disk imaging, recovering swap files, temporary &cache files

UNIT-III **Hardware and Operating Systems:** **(06 Hours)**

Overview of hardware and operating systems: structure of storage media/devices; windows/Macintosh/ Linux -- registry, boot process, file systems, file metadata.**Investigating Logs**: Audit logs and security, system log, remote logging, configuring Windows, logging, setting up remote logging in Windows, event reporter and Application Logs.**Software Reverse Engineering**: defend against software targets for viruses, worms and other malware, improving third-party software library, identifying hostile codes-buffer overflow, provision of unexpected inputs, etc.

UNIT-IV **Computer Forensic tools and Disaster Recovery:** **(06 Hours)**

Computer Forensic tools: X-Ways, Index.dat Analyzer, Data Doctor ,Encase, Helix, FTK, Autopsy, Sleuth kit Forensic Browser, FIRE, Found stone Forensic ToolKit, WinHex, Linux dd and other open source tools. **Disaster Recovery**: Preparing for disaster recovery, backing up data, scheduling backup jobs, restoring data, recovering from server failure, selecting disaster recovery methods.

UNIT-V **Network Forensic and Mobile Network Forensic:** **(06 Hours)**

Network Forensic: Collecting and analyzing network-based evidence, reconstructing web browsing, email activity, and windows registry changes, intrusion detection, tracking offenders, etc. **Mobile Network Forensic**: Introduction, Mobile Network Technology, Investigations, Collecting Evidence, Where to seek Digital Data for further Investigations, Interpretation of Digital Evidence on Mobile Network.

UNIT-VI **Cyber Law:** **(06 Hours)**

Battling Cyber Squatters and Copyright Protection in the Cyber World : Concept of domain name and reply to cyber squatters, meta-tagging, legislative and other innovative moves against cyber squatting, freedom and control on the internet, works in which copyright subsists and meaning of copyright, copyright ownership and assignment, license of copyright, copyright term and respect for foreign works, copyright infringement, offences and remedies, copyright protection and content on the internet, copyright notice, disclaimer and

acknowledgment, downloading for viewing contents, hyper-linking and framing, liability of ISPs for copyright, violation in the cyber world, legal developments in the US, Napster and its cousins, computer software piracy.Licenses and versions of GPL,Trademark, Patent.Digital Signature, Certifying Authorities and E-Governance : Digital signature, digital signature certificate, certifying authorities and liabilities, digital signature Governance in India

Term Work Assignment List:

1. Explain role of Computer Forensic Investigator and investigation steps.
2. Explain life cycle of evidence and its types.
3. Demonstrate deleted data recovery by using suitable tools.
4. Demonstrate setting up remote logging in Windows.
5. Use Computer Forensic tools.
6. Demonstrate backing up data and restoring data.
7. Implement collecting and analyzing network-based evidence.
8. Implement interpretation of digital evidence on mobile network.
9. Design copyright protection in the cyber world.
10. Implement digital signature.

Assignment List:

1. Discuss types of Forensic Science
2. Discuss Intellectual property.
3. Demonstrate data recovery mechanism
4. Demonstrate event reporter and Application Logs
5. Discuss selecting disaster recovery methods
6. Demonstrate computer Forensic tool X-Ways
7. Discuss Collecting and analyzing network-based evidence
8. Demonstrate intrusion detection
9. Demonstrate digital signature certificate heads.
10. Differentiate between Copyright, Patent and Trademark.

Text Books:

1) Jay A. Siegel "Forensic Science: The Basics ", CRC Press.

2) Anthony J. Bertino, "Forensic Science: Fundamentals and Investigations", Cengage Learning.

3) Joe Nickell and John F. Fischer, "Crime Science: Methods of Forensic Detection", Kentuckypress.

4) Sherri Davidoff, Jonathan Ham," Network Forensics: Tracking Hackers Through Cyberspace", Prentice Hall, 2012.

Reference Books:

1) *Stuart H. James and Ph. D., Jon J. Nordby, "Forensic Science: An Introduction to Scientific and Investigative Techniques", 2nd edition.*

2) *Andy Jones and Debi Ashenden, "Risk Management for Computer Security: Protecting Your*

Network & Information Assets".

3) *Colin Evans, "The Casebook of Forensic Detection: How Science Solved 100 of the World's Most Baffling Crimes".*

4) *Edward Amoroso, "Cyber Security, Computer Network Security and Cyber Ethics", 2nd edition by Joseph Migga Kizza.*

5) *Robert McCrie, "Security Operations Management", Second Edition.*

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III

Unit Test -2 Unit IV, V and VI

Software Testing

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/Week	**End Semester Examination : 60 Marks**	**Theory : 03**
Practical : 2 Hrs/Week	**Internal Assessment : 40 Marks**	**Term Work: 01**
	Practical and Term Work : 50 Marks	

Course Objectives:

1) Students will learn the advanced techniques that underlie the practice of software testing.
2) Course will provide deeper insights into quality assurance of developed softwares.

Course Prerequisites:

Students should have knowledge of

Software Development and Software Engineering concepts.

Course Outcome:

Students will be able to:

1) Classify measurement models and software metrics.
2) Perform unit and integration tests by determining test design and test automation.
3) Apply suitable higher order testing techniques and methods in order to achieve verified and validated software by following best testing practices.
4) Understand the methods of software quality measurement.
5) Understand various test processes, fault models and methods of test generation.
6) Acquaint with software automation tools and applications.

UNIT-I **Principles of Testing:** **(06 Hours)**

Purpose of Software Testing, Testing Principles, Goals of Testing, Software components, characteristics, architecture, Software testing life cycle, Testing aspects: Requirements, Test Scenarios, Test cases, Test scripts/procedures. Strategies for Software Testing, Testing Activities, Mistakes, Faults & Failures, Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods, Levels of Testing, White-Box Testing, Black-Box Testing.

UNIT-II **Functional Testing:** **(06 Hours)**

Test Plan, Test Management, Test Execution and Reporting, Test Specialist Skills, Tester's Workbench and Tool Categories, Test Maturity Model and Test Process Assessment, Functionality Matrix (FM), Debugging & Root Cause Analysis, Software Items, Component & Units, Test Bed, Traceability and Testability, Attributes of Testable Requirements, Test Matrix, Types of Testing, Creating Test Cases from Requirements and Use cases, Software Defects: Origins, Classes, cycle, attributes, Need for Testing.

UNIT-III **Higher Order Testing:** **(06 Hours)**

Object Oriented Testing, Specification Based Testing, Performance Testing, Ad-hoc Testing, Usability and Accessibility Testing, Risk-based Testing, Exploratory Testing, Scenario-based Testing, Random Testing Compatibility Testing, User Documentation Testing, Client–Server System Testing, RAD Testing, Configuration Testing, Testing internal Controls, Multiplatform Environment Testing, Security Testing, Web-based System Testing.
IEEE Standards Related to Testing.

UNIT-IV **Software Measurement:** **(06 Hours)**

Objectives, Measurement and Models, Measurement Scales, Classification of Software Measures, Measurement Framework, Software measurement validation, Measuring Internal Product Attributes: Size, structure, Halstead's Software Science, Product Quality Metrics, In-Process Quality Metrics, Software Reliability: Measurement and Prediction, The Rayleigh Model, Exponential Distribution and Reliability Growth Models, SRE process.

UNIT-V **Software Quality Assurance and Test metrics:** **(06 Hours)**

Software Quality Concepts, Planning for SQA, Six Sigma Principles, Malcolm Baldridge Assessment, Edward Deming's Principles, Ishikawa's Seven Basic Tools, Software Maintenance, Software inspection concepts, Software Benchmarks and Baselines, Identifying Software Best and Worst Practices.

Test metrics: Types of metrics, project metrics, Progress metrics, Test Defect metrics, Development defect metrics, Productivity metrics, Release metrics.

UNIT-VI **Automation and Applications:** **(06 Hours)**

Software test automation: Introduction, Scope. Design and architecture for automation: External modules, test cases and test framework modules, tools and result modules, report generator, process model for automation, challenges. Manual testing, Automated Testing Tools & Case studies, Study of Testing tools: QTP, Rational Robot, Winrunner, Loadrunner, Bugzilla, Selenium.

Assignment List:

1) Explain in detail the difference between Software Product and Software Project.
2) Explain the need of Software Testing in software development.
3) Explain software defects with reference to origins, classes and defect repository.
4) What is minimization and prioritization of Test Cases for Regression Testing? Explain with suitable example.
5) Write a short note on 'Quality Standards' of testing.
6) Explain in detail 'Software Reliability'.
7) Enlist different software reliability models, briefly explain each.

8) Explain Defect cycle and Bug execution.
9) Write a short note on tools and models to measure Software Quality.
10) What is the need of regression testing? Which test cases are executed in regression testing?

Term Work Assignment List:

1) Describe architecture, components, characteristics, type, category, types of users and user expectations for given software application.
2) State and describe software development life cycle (SDLC) and software testing life cycle (STLC) phases.
3) Create Functionality Matrix (FM) for any software application.
4) Write down test scenario and test cases on mobile application.
5) Construct Requirement Traceability Matrix (RTM) for software application.
6) Perform following testing for E-commerce application,
   a) Functional Testing b) Performance Testing c) UI testing d) Security testing.
7) Installation and Demo of open source testing tool (Selenium, Bugzilla etc.)
8) Test your project as a software application using any software testing tool.
9) Study different Defect Tracking Tool, and Create Defect report using Bugzilla.
10) Study assignment: Explain Quality attributes of Software Application and differentiate between QA, QC, and QMS.

Text Books:

1) Fenton, Pfleeger, "Software Metrics: A Rigourous and practical Approach", CRC Press.
2) Desikan, Ramesh, "Software Testing: principles and Practices", Pearson Education.

Reference Books:

1) *Burnstein, "Practical Software Testing", Springer International Edition.*
2) *William E. Perry, "Effective Methods for Software Testing", John Wiley and Sons.*
3) *Yogesh Singh, "Software Testing", Cambridge University Press.*
4) *Ronald Radice, "Software Inspections", Tata McGraw Hill.*
5) *Capers Jones, "Software Assessments, Benchmarks, and Best Practices", Addison-Wesley.*
6) *Paul C. Jorgensen, "Software Testing: A Craftsman's Approach",CRC Press.*

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III
Unit Test -2 Unit IV, V and VI

Elective-III: 1) Web Services

Teaching Scheme	Examination Scheme		Credit Allotted
Theory : 3 Hrs/Week	**End Semester Examination**	**: 60 Marks**	**Theory : 03**
Practical : 2 Hrs/Week	**Internal Assessment**	**: 40 Marks**	**Term Work : 01**
	Oral and Term Work	**: 50 Marks**	

Course Objectives:
This course will cover the practical aspects web services in detail. The goal of this course is to introduce the students to the basics of distributed application development. We will introduce the students to Web Services, Applications of Web Services.

Course Prerequisites:
Students should have knowledge of:
1) Understanding the working of Network with TCP / IP.
2) Basic idea of how the Internet Works.
3) .Net and Java Framework Knowledge.

Course Outcome:
Students will be able to:
1) To understand the details of web services technologies like WSDL, UDDI, SOAP.
2) To learn how to implement and deploy web service client and server.
3) To explore interoperability between different frameworks.

UNIT-I **Introduction:** **(06 Hours)**

Evolution and Emergence of Web Services – Evolution of distributed computing, Core distributed computing technologies — client/server, CORBA, JAVA RMI, Microsoft DCOM, MOM, Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA). Introduction to Web Services — The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services. Web Services Architecture — Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication models, basic steps of implementing web services.

UNIT-II **SOAP:** **(06 Hours)**

Fundamentals of SOAP — SOAP Message Structure, SOAP encoding, Encoding of different data types, SOAP message exchange models, SOAP communication and messaging, Java and Axis, limitations of SOAP.

UNIT-III **WSDL:** **(06 Hours)**

Describing Web Services — WSDL — WSDL in the world of Web Services, Web Services life cycle, anatomy of WSDL definition document, WSDL bindings, WSDL Tools, limitations of WSDL.

UNIT-IV **Web Service Discovery:** **(06 Hours)**

Discovering Web Services — Service discovery, role of service discovery in a SQA, service discovery mechanisms, UDDI — UDDI registries, uses of UDDI Registry, Programming with UDDI, UDDI data structures, Publishing API, Publishing, searching and deleting information in a UDDI Registry, limitations of UDD1.

UNIT-V **Web Services Interoperability:** **(06 Hours)**

Web Services Interoperability — Means of ensuring Interoperability, Overview of .NET, Creating a .NET client for an Axis Web Service, creating Java client for a Web service, Challenges in Web Services Interoperability. Web Services Security — XML security frames work, Goals of Cryptography, Digital signature, Digital Certificate, XML Encryption.

UNIT-VI **Designing Web service:** **(06 Hours)**

Java, and .Net Frame Work. Case Studies with Java and .Net.

Term Work Assignment List:

1) Compare different distributed computing technologies likeCORBA, JAVA RMI, Microsoft DCOM, MOM.
2) Implement a simple web service of checking the status of client.
3) Implement SOAP in Java with simple messaging.
4) Identify limitations of SOAP. Suggest the solutions.
5) Study WSDL in detail with respect to WWW.
6) Implement a simple program for discovery.
7) Write a Java program to verify digital signatures.
8) Write a Java program to verify digital certificates.
9) Case Study: Use of Java for Web Services.
10) Case Study: Use of .NET for Web Services.

Text Books:

1) R. Nagappan, R. Skoczylas, R.P. Sriganesh,"Developing Java Web Services", Wiley India.

Reference Books:

1) *James McGovern, Sameer Tyagi etal.,"Java Web Service Architecture", Elsevier*
2) *S. Graham and others"Building Web Services with Java", 2 Edition,Pearson Edn.*

3) *D.A. Chappell & T. Jewell, "Java Web Service"s, O'Reilly,SPD.*

4) *G. Alonso, F. Casati,"Web Service's, Springer.Outcomes*

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III

Unit Test -2 Unit IV, V and VI

Elective III: 2) Natural Language Processing

Teaching Scheme	Examination Scheme		Credit Allotted
Theory : 2 Hrs/Week	**End Semester Examination**	**: 60 Marks**	**Theory : 02**
Tutorial : 2 Hrs/Week	**Internal Assessment**	**: 40 Marks**	**Term Work : 02**
	Oral and Term Work	**: 50 Marks**	

Course Objectives:

1) To understand the concepts of morphology, syntax, semantics and pragmatics of the language.
2) To give introduction of knowledge acquisition, information retrieval and machine translation.

Course Prerequisites:

Students should have knowledge of

1) Probabilities and statistics.
2) Algorithms and programming experience.

Course Outcome:

Students will be able to:

1) Understand the models, methods, and algorithms of statistical Natural Language Processing (NLP).
2) Understand the basic NLP techniques, including syntactic parsing, semantic interpretation, lexical and morphological analysis.
3) Understand machine learning techniques used in NLP, including hidden Markov models and probabilistic context-free grammars.
4) Choose appropriate solutions for solving typical NLP sub problems (tokenizing, tagging, parsing)
5) Understand basics of knowledge representation.
6) Understand resources of natural language data – corpora.

UNIT-I **Language Modeling:** **(06 Hours)**

NLP-Language and Grammar-Processing:Origins and challenges, Language models: Uni-gram, N-gram –Statistical Language Model, NLP Applications.

UNIT-II **Natural Language and Formal Language:** **(06 Hours)**

Text Preprocessing, Regular Expressions and Finite State Automata word recognition, lexicon. Phrases and idioms, word order, agreement, tense, aspect and mood and agreement, Context Free Grammar, spoken language syntax.

UNIT-III **Part of Speech Tagging and Hidden Markov Models:** **(06 Hours)**

The concept of parts-of-speech, Tagging, Tagsets, and Morphology, The Penn Treebank and Brown Corpus. Probabilistic (weighted) finite state automata. Hidden Markov models (HMMs). The Viterbi Algorithms.

UNIT-IV **Grammars & Parsing Algorithms:** **(06 Hours)**

Context-free Grammars, Parsing Regular Grammars, Parsing Context Free Grammars, Example Toy NL Grammar,Shift-Reduce Parsers ,Probabilistic Parsing: Introduction.

UNIT-V **Information Extraction:** **(06 Hours)**

Vector space model, term weighting, homonymy, polysemy, synonymy, Improving user queries. Machine Translation– Overview,Applications of NLP- Spell-checking, Summarization.

UNIT-VI **Linguistics resources:** **(06 Hours)**

Introduction to corpus, elements in balanced corpus, TreeBank, PropBank, WordNet, VerbNet etc. Resource management with XML, Management of linguistic data with the help of GATE, The Semantic Web technologies, ontologies, OWL, NLTK.

Assignment List:

1) Write note on word normalization and stemming. Explain case folding with suitable example.
2) What is significance of decision tree in sentence segmentation also give implementation of decision tree for suitable example.
3) Discuss challenges of Machine translation .What are classical approaches of machine translation?
4) Case study on IBM translation model.
5) Case study on WordVET and VerbNet
6) Study of Hidden Markov Model and POS tagging.
7) Study assignment on Python—Analyzing Text with the Natural Language.
8) Research paper reading, analyzing and demonstrating.
9) Describe various Natural Language representation methods.
10) Describe different techniques for removal of ambiguity.

Term Work Assignment List:

1) Implement bottom up parser for any given grammar.
2) Analysis of natural language using lexical analysis.
3) Case study of any parsing algorithm.
4) Study of clustering algorithm in NLP.
5) Case study: NLP in web mining or text mining.
6) Case study of Viterbi Algorithm.
7) Study of Python features used in NLP.
8) Study assignment of information retrieval techniques.
9) Installation of NTLK Toolkit.
10) Implement program in Python to calculate frequency distribution.

Text Books:

1) Allen, J. "Natural Language Understanding", The Benajmins/Cummings Publishing Company ,Inc. 1994. ISBN 0-8053-0334-0.
2) Daniel Jurafsky and James H Martin. "Speech and Language Processing", 2e, PearsonEducation,

2009.

Reference Books:

1) *James A".Natural language Understanding"2e, Pearson Education, 1994*

2) *Bharati A., Sangal R., Chaitanya V."Natural language processing: a Paninian perspective",PHI, 2000.*

3) *Siddiqui T., Tiwary U. S. "Natural language processing and Information retrieval", OUP, 2008*

4) *NLTK – Natural Language Tool Kit - http://www.nltk.org/*

5) *Journals : Computational Linguistics, Natural Language Engineering, Machine Learning, Machine Translation, Artificial Intelligence.*

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

Elective III :3) Network Modeling & Designing

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 02 Hrs/Week	**End Semester Examination : 60 Marks**	**Theory : 02**
Tutorial : 02 Hrs/Week	**Internal Assessment : 40 Marks**	**Term Work : 02**
	Oraland Term Work : 50 Marks	

Course Objectives:

1) Build an understanding of the fundamental concepts of networking.
2) Familiarize the student with the basic taxonomy and terminology of the networking Design & Modeling.
3) Introduce the student to advanced networking concepts preparing the student for entry Advanced courses in computer networking.
4) Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Course Prerequisites:

Students should have knowledge of

The fundamental concepts of computer networking.

Course Outcome:

Students will be able to:

1) Understand basic network technology.
2) Understand and building the skills of network traffic.
3) Design a network topology.
4) Design a network algorithm.
5) Understand internals of main protocols such as SNMP v1,v2,v3, RMON1, RMON2.
6) Understand the organization of Network Administration.

UNIT-I **Requirements Planning and Choosing Technology:** **(06 Hours)**

User Requirements, documentation and planning, traffic sizing, tuning data size across the network, traffic characteristics, time and delay consideration

UNIT-II **Traffic Engineering and Capacity Planning:** **(06 Hours)**

Poisson Arrivals, Markov processes, Voice traffic modeling, Queuing system models, Markovian queuing system models M/D/1, M/M/1, Bernoulli process, Erlang formulas and M/M/c/e system priority queue system, LAN Traffic Modeling, Availability and Reliability.

UNIT-III **Network Design:** **(06 Hours)**

Designing the network topology and solutions-Top down Approach – Network Design Layers--Application Layer, Premises Architecture or Local Enterprise, Architecture Layer, Access Layer, Backbone Layer, Access Layer Design, Backbone Network Design.

UNIT-IV **Network Design Problem definition:** **(06 Hours)**

Network Design Problem definition : Multipoint line layout heuristics, CMST algorithm, ESAUWilliam's algorithm, Sharma's algorithm, Unified algorithm, Bin packing, Terminal assignments, Concentrator location.

UNIT-V **Network Management Protocols:** **(06 Hours)**

Network Management Protocols: SNMP v1,v2,v3, RMON1, RMON2, Netflow, Syslog. Network Management Standards, ASN.1, encoding structure, Macros, Functional Model.

UNIT-VI **Network Administration:** **(06 Hours)**

Functions and responsibilities, Network planning and implementation, Sub-netting, Bandwidth management, security issues, Tools for BW and security management, modifying network implementation.

Assignment List:

1) Explain in detail 'Requirement paling Traffic sizing of network'.
2) Discuss Various characteristics with time & delay consideration for better network design.
3) List and explain 'Markovian Queen system models'.
4) Discuss LAN traffic modeling with its average and Reliability.
5) Demonstrate Various design approach with respect to design layers for networking.
6) Describe backbone network design.
7) Summarize network design problem definition with various algorithm (CMST, Sharma's, Unified).
8) Justify network management protocol SNMPv1,v2,v3.
9) Draw and explain functions model of network management standard.
10) State various functions and responsibility of network administration.

Term Work Assignment List:

1) Study assignment: Network topology.
2) Simulate Markovian queuing system models.
3) Design LAN traffic model assuming suitable model.
4) Design network of your college considering layers present.
5) Implement CMST algorithm.
6) Implement Bin packing algorithm assuming suitable parameters.
7) Study assignment: Network management protocols.
8) Analyze traffic using traffic monitor analyzer.
9) Demonstrate tools used for network management.
10) Case study: Tools for Security Management.

Text Books:

1) Keshav S., "An Engineering Approach to Computer Networking," AddisonWesley.

Reference Books:

1) *Darren L. Spohn, "Data Network Design", Tata McGraw Hill Edition.*
2) *Mani Subramanian, "Network Management Principles and Practice", Pearson Education.*
3) *James D, "Network Analysis, Architecture, and Design", Morgan Kaufman.*
4) *Robert S Kahn, "Wide Area Network Design", Morgan Kaufman.*

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III
Unit Test -2 Unit IV, V and VI

Elective III: 4) Neural Network

Teaching Scheme	Examination Scheme		Credit Allotted
Theory : 2 Hrs/Week	**End Semester Examination**	**: 60 Marks**	**Theory : 02**
Tutorial : 2 Hrs/Week	**Internal Assessment**	**: 40 Marks**	**Term Work : 02**
	Oral and Term Work	**: 50 Marks**	

Course Objectives:

1) To understand the basics concept of biological Neural Network.
2) To learn the basics concept of artificial Neural Network
3) To analyze applications of ANN
4) To study different pattern recognition application using ANN.
5) To use the practical approach of artificial neural networks in various technical, organizational and economic applications.
6) To learn basic learning algorithms: the delta learning rule, the back-propagation algorithm, self-organized learning, etc.

Course Prerequisites:

Students should have knowledge of

1) Algorithms and programming, data structures.
2) Probability theory, calculus etc.

Course Outcome:

Students will be able to:

1) Analyze the role of neural networks in engineering, artificial intelligence, and cognitive modelling.
2) Understand the differences between for supervised and unsupervised learning.
3) Designing of single and multi-layer feed-forward neural networks.
4) Understand the concept of generalization and function approximation.
5) Understand the concepts and techniques of neural networks through the study of the most important neural network models.
6) Analyze the sufficient theoretical background to be able to reason about the behavior of neural networks.
7) Develop an application of neural network, and to know what steps to take to improve performance.

UNIT-I **Introduction and Basics of Artificial Neural Networks:** **(06 Hours)**

Introduction to Neural Networks, Features of ANN, Structure of Biological Neural Network, Comparison of BNN and ANN, Characteristics of neural network, Artificial Neural Model: McCulloch – Pitts model, Perceptron, Adaline model, Learning process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive Learning, Supervised and Unsupervised Learning,, Topology of neural network architecture.

UNIT-II **Architectures of Neural Networks:** **(06 Hours)**

Architecture of Feedforward and Feedbacknetwork, Single layer ANN, Multilayer perceptron, Perceptron Learning Algorithm, Perceptron Coverage Therom, Backpropagation Learning, input - hidden and output layer computation, Backpropagation algorithm, applications, Selection of tuning parameters in BPN, Limitation of Backpropagation Algorithm.

UNIT-III **Associative Memories, Activation & Synaptic Dynamics:** **(06 Hours)**

Basic Concepts, Linear Associator, Basic Concepts of Recurrent Autoassociative Memory: Retrieval Algorithm, Storage Algorithm, Performance Considerations, Performance Analysis of Recurrent Autoassociative Memory, Bidirectional Associative Memory: Memory Architecture, Association Encoding and Decoding, Stability Considerations, Memory Example and Performance Evaluation, Improved Coding of Memories, Multidirectional Associative Memory, Associative Memory of Spatio-temporal Patterns, Introduction To Activation, Activation Dynamics models, Basics of Synaptic Dynamics models, Stability and Convergence.

UNIT-IV **Basic functional units of ANN:** **(06 Hours)**

Basic feedforward, Basic feedback, and basic competitive learning neural network, Feedforward neural networks: Linear responsibility X-OR problem and solution, Analysis of pattern mapping networks summary of basic gradient search methods, Feedback neural networks Pattern storage networks, stochastic networks and simulated annealing, Boltzmann machine and Boltzmann learning**.**

UNIT-V **Competitive learning, Matching and Self-Organizing Networks:** **(06 Hours)**

Components of CL network pattern clustering and feature mapping network, Hamming Net and MAXNET, Unsupervised Learning of Clusters: Clustering and Similarity Measures, Winner-Take-All Learning, Recall Mode, Initialization of Weights, Separability Limitations, Counter propagation Network, Feature Mapping, Self-organizing Feature Maps, ART networks, Features of ART models, character recognition using ART network, Cluster Discovery Network (ART1)**.**

UNIT-VI **Applications of ANN:** **(06 Hours)**

Linear Programming Modeling Network, Robot Control, Pattern association, Pattern classification and pattern mapping tasks, Pattern classification – Recognition of Olympic games symbols, Recognition of printed Characters, Recognition of handwritten characters,

Connectionist Expert Systems for Medical Diagnosis
NET Talk: to convert English text to speech. Recognition of consonant vowel (CV) segments, texture classification and segmentation

Assignment List:

1) Draw and Explain structure and working of Biological Neural Network

2) Write note on:
   a) Mc Culloch – Pitts model
   b) Adaline model

3) Explain when, where and why it is sensible to use the sigmoid (logistic) function as the activation function in a Back-Propagation network.

4) Describe how the basic Back-Propagation Learning Algorithm for Multi-Layer Perceptron (MLP) networks is related to gradient descent learning.

5) Explain the significance of each of the following theorems: (a) Cohen-Grossberg theorem (b) Cohen-Grossberg-Kosko theorem (c) Adaptive bidirectional associative memory theorem

6) Consider a stochastic unit with a bipolar I-1, 11 output function. The probability distribution for the unit is given by $P(s = 1 |x) = 1/(1+ \exp (-2 \lambda x))$ If the learning of the stochastic unit is based on gradient descent on the error between the desired and the average output, show that the resulting learning law is the same as the learning law obtained using delta learning for a deterministic unit with hyperbolic tangent as the output function.

7) How to perform the following tasks by a Boltzmann machine? (a) Pattern completion (b) Pattern association (c) Pattern recall from noisy input.

8) What is meant by full free energy and clamped free energy in a Boltzmann machine? How do you interpret the Boltzmann learning in terms of full free energy and clamped free energy?

9) Explain the Components of CL network pattern clustering and feature mapping network.

10) Explain the process of character recognition using ART network.

11) What is the significance of neural networks in the NETtalk application?

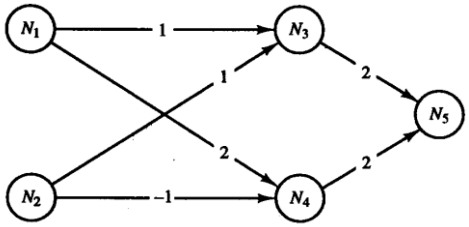
12) Explain how a constraint satisfaction model can be exploited for improving the recognition accuracy for. CV units.

Term Work Assignment List:

1) Consider the Neural Network of McCulloch-Pitts neurons shown in Figure. Each neuron(other the the input neuron N_1 and $N_{2)\ has}$ a threshold of 2.

a) Define the purpose of neuron N_5 at time t in terms of the activations of the input neurons, N_1 and N_2, at the appropriate time.

b) Show the activation of each neuron that results from the input signa of N_1= 1, N_2=0 at t=0



2) What is Learning Process of Neural Network? Explain in Detail the types of Learning in NN.

3) Write and Explain Perceptron Learning algorithm and Perceptron Coverage Therom.

4) Write a program implementing the error back-propagation training algorithm (EBPTA) for user-selectable I, J, and K values for a single hidden layer network. Learning constant η should be user-selectable; no momentum term is needed. The initial weights for the network should be selected at random. Provisions for specification of input pattern(s) and the desired response(s) should be made in order to initiate and carry out the training. Use bipolar continuous perceptrons

5) Assume that a linear associator has been designed using the crosscorrelation matrix for heteroassociative association of p orthonormal patterns. Subsequently, another orthonormal pattern $s^{(p+1)}$ associated with $f^{(p+l)}$ must be stored. An incremental change in the weight matrix needs to be performed using the cross-correlation concept. Prove that the association $s^{(p+1)->}f^{(p+1)}$ results in no noise term present at the output

6) The weight matrix of the temporal associative memory is known as

$$\mathbf{W} = \begin{bmatrix} -1 & 3 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 & 3 \\ -1 & -1 & 3 & -1 & -1 \\ -1 & 3 & -1 & -1 & -1 \\ 3 & -1 & -1 & 3 & 1 \end{bmatrix}$$

Knowing that a vector $s^{(1)} = [\ -\ 1\ 1\ -\ 1\ -\ 1\ 1\ 1]^t$ belongs to a sequence, find the remaining vectors of the sequence. Having found the full sequence, verify that encoding it actually yields the weight matrix **W** as specified in the problem. Calculate the noise term vectors generated at each recall step and determine that they are suppressed during the thresholding operation.

7) Explain the Concept of Feed Forword and Feed back NN with suitable Example.

8) Consider the ART1 neural net with four F1 units and three F2 units. After some training, the weights are as follows:

Bottom-up weights b_{ij}

0.67	0.0	0.2
0.0	0.0	0.2
0.0	0.0	0.2
0.0	0.67	0.2

Top-down weights t_{ji}

1	0	0	0
0	0	0	1
1	1	1	1

Determine the new weight matrices after the vector (0,0,1,1) is presented if
a) the vigilance parameter is 0.3.
b) the vigilance parameter is 0.7.

9) The MAXNET with four output nodes, p = 4, receives the input vector

$\mathbf{y}^0 = [0.5\ 0.6\ 0.7\ 0.8]^t$

(a) Find the εvalue that would be required to suppress the output of the weakest node exactly to the zero value after the first cycle.

(b) Find subsequent responses of the network, $\mathbf{y}^1$and y^2, for the computed value of ε**.**

10) Develop a multilayer feedforward character classifier for five printed digits shown as 5 X 5 black-white pixel maps on Figure. Devise a suitable network architecture for a local representation classifier. Prepare the set of five inputloutput binary training vector pairs.Train the network for zero decision errors. Perform the recall of nondistorted digits by reusing the training input data. Perform the evaluation of the classifier by recalling digits distorted by the center pixel (pixel 13) of the 5 X 5 field being white rather than black. Evaluate the classifier by recalling digits distorted by reversal of input pixels 12, 13, and 14.

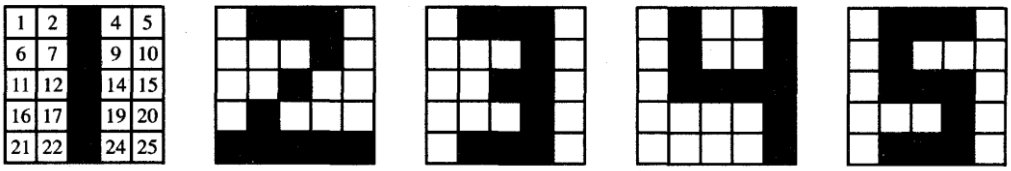


Figure. Pixel maps for digit recognition network in problem.

Text Books:

1) Stuart Russel, Peter Norvig, "Artificial Intelligence – A Modern Approach.

2) Patrick Henry Winston, "Artificial Intelligence", Pearson Education.

3) L. Fausett, "Fundamentals of Neural Networks: Architectures, Algorithms, and Applications", Prentice-Hall.

4) Jacek M. Zurada, Introduction to Artificial Neural Systems, PWS Publishing.

Reference Books:

1) *B. Yegnanarayana ,"Artificial neural Networks", PHI Publication.*

2) *S. Raj sekaran , Vijayalakshmi Pari, "Neural networks, Fuzzy logic and Genetic Algorithms", PHI Publication.*

3) *Laurene Fausett, "Fundamentals of Neural Networks: Architectures, Algorithms, and Applications", Prentice Hall International.*

4) *Satish Kumar, "Neural Networks", McGraw Hill publication.*

5) *B. D. Ripley, "Pattern Recognition and Neural Networks", Cambridge University Press*

6) *Simon Haykin, "Neural Networks: A Comprehensive Foundation", pearson Education.*

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

Seminar I

Teaching Scheme	Examination Scheme	Credit Allotted
Practical: 02Hrs/Week	Oral and Term Work: 50 Marks	Term Work: 04

Course Objectives:

1)To improvise presentation, technical documentation and communication skills.

2)To learn recent technologies and understand it's functioning.

Course Prerequisites:

Students should have knowledge of

1)Source of good research articles.

2)Basic knowledge of mathematical modeling.

Course Outcome:

Students will be able to:

1) Learn documentation of the seminar report.

2) Learn to communicate effectively.

3) Analyze the recent technologies.

4) Present their idea and convey the concepts.

5) Use the research material in the project.

6) Understand to draft research paper.

Guidelines for the project:

1) Refer quality research article from IEEE, Springer, Elsevier and ACM

2) Select a domain of interest and use of it in developing the project.

3) Check the demand and future scope of that topic to utilize it for research or startup.

4) Check the feasibility of research considering technology, timeline, available resources.

5) Propose novel approach to deal with the future scope mentioned in the paper.

6) Check plagiarism and quality of contents.

7) Prepare a presentation and documentation of your seminar.

Exam

Parameter	Marks
Novelty	10
Understanding of Mathematical Model	05
Presentation Skills	05
Publication or Demonstration	05

Project Stage - I

Teaching Scheme	Examination Scheme	Credit Allotted
Practical : 02 Hrs/Week	**Oral and Term Work : 50 Marks**	**Term Work : 04**

Course Objectives:

1) To apply concepts mathematics and basic science while doing literature survey.
2) To plan the project by assigning tasks per user.
3) To coordinate the project with project partners.

Course Prerequisites:

Students should have knowledge of

1) Logic used in programming language.
2) Basic concepts of database.

Course Outcome:

Students will be able to:

1) Identify the problem in the existing system.
2) Learn various approaches to deal with problem.
3) Decide best solution for optimization to solve the problem.
4) Learn management of project.
5) Propose novel approach to solve a problem.
6) Apply skills that they have acquired.

Guidelines for the project:

1) Prepare plan by following standards of project planning.
2) Select domain by using quality research papers like IEEE, Springer, Elsevier, ACM.
3) Analyze every approach by doing literature survey (preferably transaction journal of current year).
4) Identify the problem in the existing system.
5) Design solution by using mathematical model and prove it hypothetically.
6) Check the feasibility for implementation.
7) Select tools and technologies suitable for the implementation.
8) Prepare presentation, report and research paper on literature survey (To be submitted in IEEE transaction for critical analysis and uniqueness in contents and approaches).

Examination

Parameter	Marks
Selection of problem for betterment of a life	**2.5**
Analysis of Literature survey	**05**
Finalizing problem statement	**2.5**
Design of project plan	**05**
Mathematical Modeling	**05**
Review of paper by publishing agency – like IEEE, Springer, ACM, Elsevier, EOS, Scopus Indexed journals only	**05**

Industrial Training

Examination Scheme **Credit Allotted**
Oral and Term Work: 50 Marks **Term Work: 03**

Course Objectives:

1) To apply industry standards and technologies.
2) To learn to be good team player to coordinate tasks assigned at industry during the training.

Course Prerequisites:
Students should have knowledge of
Knowledge of Programming, Database Management, Software Engineering.

Course Outcome:
Students will be able to:
1) Learn to implement knowledge gained.
2) Learn to be a good team player.
3) Understand of work culture at industry.
4) Design efficient tools and techniques.
5) Apply the techniques and tools learnt.
6) Bridge the gap between industry and institute.

Guidelines for the Industrial Training:
1) Submit acceptance letter issued from organization before undergoing for the training.
2) Undergo for industrial training for 45 days in industries preferably government organization and NASSCOM listed organizations.
3) Apply the techniques and tools learnt during the curriculum.
4) Understand the new technologies for accomplishing the tasks.
5) Prepare Presentation and Reports based on the work completed at industry.
6) Maintain Log book and prepare day to day activity chart and get it authorized by concerned person from industry.
7) Work sincerely to grab opportunities for sponsored projects as well as job.

Exam Parameter	**Marks**
Presentation	**10**
Log Book	**10**
Demonstration of skills acquired	**05**

Semester-VIII

Sr.no	Course Title	Teaching Scheme				Examination Scheme							Credits	
		L	T	P	Contact hrs/wk	Theory	Unit Test	Attendance	TA & Assignments	Practical& TW	Oral& TW	Total Marks	Theory	TW
1	Web Engineering	2	1	2	5	60	20	10	10	50	--	150	3	1
2	Component Engineering	2	1	2	5	60	20	10	10	--	50	150	3	1
3	Mobile Computing	2	1	-	3	60	20	10	10	--	--	100	3	-
4	Distributed Computing	2	1	-	3	60	20	10	10	--	--	100	3	-
5	Elective-IV	2	--	--	2	60	20	10	10	--	--	100	2	-
6	IT Lab-V	-	--	2	2	--	--	--	--	50	--	50	-	1
7	Project stage - II	-	-	4	4	--	--	--	--	50	50	100	-	8
	TOTAL	**10**	**04**	**10**	**24**	**300**	**100**	**50**	**50**	**150**	**100**	**750**	**14**	**11**
	Environmental Studies	**4**	**-**	**-**	**4**	**100**	**-**	**-**	**-**	**-**	**-**	**100**	**-**	**-**

Elective-IV :

1)Advanced TCP/IP

2)Genetic Algorithm

3) Network Security and Cryptography

4)Semantic Web Mining

Teaching Scheme			Examination Scheme							Credits	
Lecture	Practical	Tutorial	Theory	Unit Test	Attendance	Assignments	PR+TW	OR+TW	Total	Theory	TW
10	10	04	300	100	50	50	150	100	750	14	11

Web Engineering

Teaching Scheme	Examination Scheme		Credit Allotted
Theory : 2Hrs/Week	**End Semester Examination**	**: 60 Marks**	**Theory: 03**
Tutorial : 1Hr/Week	**Internal Assessment**	**: 40 Marks**	**Term Work: 01**
Practical : 2Hrs/Week	**Practical and Term Work**	**: 50 Marks**	

Course Objectives:

1) Learn web application architectures.
2) Learn to model web applications.
3) Understand testing techniques for web applications.

Course Prerequisites:

Students should have knowledge of

1) Basic concepts of Software engineering.
2) Basic concepts of HTML, XML, CSS.

Course Outcome:

Students will be able to:

1) Understand categories and characteristics of web applications.
2) Understand client and server side technologies.
3) Understand Web Application Architectures.
4) Design model for Web Applications.
5) Design various Web Applications.
6) Test various Web Applications.

UNIT-I **Introduction to web engineering:** **(06 Hours)**

Motivation, Evolution and need for web engineering, Categories of web applications, Characteristics of web applications: Product related, Usage related, Development related.

Requirements Engineering

Introduction, Fundamentals, Requirements engineering activities, Requirements engineering specifics in web engineering, Adapting requirements engineering methods to web application development, Principles for requirements engineering of web applications, Requirement types, Tools.

UNIT-II **Technologies for Web Applications:** **(06 Hours)**

Client Side Technologies:HTML, HTML basic concepts, Static and Dynamic HTML, DHTML, XML, XSL,JavaScript.Server Side Technologies:Servelet, URI handlers, Middlewares, Web services.

UNIT-III **Web Application Architectures:** **(06 Hours)**

Introduction, Specifics of web application architecture, Layered

architectures(2-layer,N-layer),Database centric architectures, Data aspect architectures, Architectures for web document management, Components of generic web application architecture.

UNIT-IV Modeling Web Applications: (06 Hours)

Introduction, Modeling specifics in web applications, Modeling requirements, Hypertext modeling, Content modeling, Access modeling concepts, Customization modeling, Presentation modeling

UNIT-V Web Application Design: (06 Hours)

Web design from an evolutionary perspective, Software design, Information design, Problems in integrated web design, Presentation design, Device independent development, Interaction design, Navigation design, Designing link internals, Functional design.

UNIT-VI Testing Web Applications: (06 Hours)

Objectives of testing, Levels of testing, Test approaches, Test schemes, Test methods and techniques, Test automation, Test driven development, Test tools, Advantages and Disadvantages of automated test.

Web Project Management:

Understanding scope, defining framework activities, Web team building, Risk management, Schedule development, Quality management, Change management, Project tracking

Assignment List:

1) Explain evolution and need of web engineering
2) Describe requirement engineering methods for web application development
3) Explain in detail client side technologies for web applications
4) Explain in detail server side technologies for web applications
5) Describe various web application architectures
6) Explain in detail components of generic web application architecture
7) Explain various modeling techniques of web applications.
8) Describe various designing methods of web applications
9) Study of latest testing techniques of web applications
10) A case study on designing and testing websites

Term Work Assignment List:

1) A case study on any static websites like wikipedia, college websites, etc
2) A case study on any dynamic websites like E-commerce, social networking sites,etc
3) Design a client-side form validation webpage using javascript
4) Create a web application for student database

5) Design and develop IT department website
6) Design and develop E-commerce website
7) A case study on methodology, techniques and tools used in designing websites
8) A case study on latest testing techniques of web applications
9) Create a mini project using html, css and javascript
10) Test mini project using any testing methodology

Text Books:

1) Roger S.Pressman,DavidLowe,"Web Engineering",TataMcGraw Hill Publication,2007
2) GertiKappel, Birgit Proll, "Web Engineering", John Wiley and Sons Ltd, 2006
3) GertiKappel, Birgit Proll, Siegried Reich, Werner Retschitzegger,"Web Engineering: The Discipline of Systematic Development of Web Applications",Wiley,2006

Reference Books:

1) *"Web Engineering: A Practitioner's Approach"Roger Pressman and David Lowe, McGraw-Hill, 2009.*
2) *Moller, "An Introduction to XML and Web Technologies" , Pearson Education New Delhi, 2009*
3) *"Web Engineering: Principles and Techniques",Woojong Suh,Idea Group Inc.,2005*
4) *"Web Engineering:Managing Diversity and complexity of web application development",Springer,2001*

Syllabus for Unit Test:

Unit Test -1 **Unit I, II and III**
Unit Test -2 **Unit IV, V and VI**

Component Engineering

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 02 Hrs/Week	**End Semester Examination : 60 Marks**	**Theory : 03**
Practical : 02 Hrs/Week	**Internal Assessment : 40 Marks**	**Term Work : 01**
Tutorial : 01 Hr/Week	**Oral and Term Work : 50 Marks**	

Course Objectives:

1) To learn evolution of distributed computing.
2) To provide students with fundamental knowledge needed to design and implement object-oriented client-server applications.
3) To understand the object models
4) To design a framework to bridge the gap. In this framework, inter-component communication is separated from the components and handled by ports and links which deal with infrastructure level middleware and protocols, including CORBA

Course Prerequisites:

Students should have knowledge of

1) Object Oriented Programming.
2) Distributed System.
3) Java Programming and Applications.

Course Outcome:

Students will be able to:

1) Learn objectifying enterprise system.
2) Understand the component architecture.
3) Use CORBA Technology and the Java™ Platform Standard Edition.
4) Learn the issues regarding the designing of distributed objects.
5) Understand Object Reuse.
6) Analyze Java component technologies.

UNIT-I **Object Technology:** **(06 Hours)**

A typical OO system, Object Oriented concepts, Advantages of the client model, integrating object technology with Enterprise systems: Objectifying individual Modules, Objectifying Conventional Architecture model, Using OO language in an OO architecture Model, Objectifying enterprise system.

UNIT-II **Component Technology:** **(06 Hours)**

Component concepts, characteristics Of components, component and Objects, Modules, callbacks, fundamental properties of Component technology ,component Architecture, Interfaces – specification, Component Models objects, components and middleware ,Components and Object-Oriented Implementations, Bridging the Gap: Framework and Composition

UNIT-III **CORBA Component Technologies:** **(06 Hours)**

Introduction to Java and CORBA,Object Request Broker,System object model,CORBA's Objective and design criteria CORBA services-overview, information management services Model driven architecture

UNIT-IV **Distributed Object Technology:** **(06 Hours)**

Evolution Of Distributed Systems, Characteristics of Distributed Systems, Study of Distributed Objects, Characteristics of distributed Objects, Methods in distribution, Issues in designing of distributed objects, Need of multitier architecture, Evolution of multitier Architecture

UNIT-V **Interfaces in COM and DCOM:** **(06 Hours)**

Introduction to COM, OLE/ActiveX, DCOM and .NET,Introduction to interfaces, Interface definition Language,(IDL), COM – interface and versioning and object reuse

COM services: Dispatch interface, connectable objects

UNIT-VI **Java Based Component Models:** **(06 Hours)**

Introduction to Java Component Technologies EJB and Java Bean, Threads Introduction, Threads-state transition diagram, example

Enterprise Java Beans: EJB architecture, Enterprise JavaBeans and JavaBeans.

Types of Beans : Session beans- Stateful and stateless session beans, Entity beans and Message driven beans

Distributed Object Model : Introduction RMI,RMI Architecture ,RMI Service.

Assignments List:

1) Implement polynomial as an object in C++.
2) Create an RMI Application.
3) Explain CORBA component model.
4) Explain information management services.
5) Sketch simple components and define their interface.
6) Explain of evolution of multitier Architecture.
7) Discuss interfaces in COM and DCOM.
8) Write simple banking application program using CORBA IDL.
9) Write java component technologies EJB and Java Bean.
10) Create a Java Bean connecting to Google API.

Term Work Assignments List:

1) Describe Integrating object technology with Enterprise systems.
2) Explain the software architecture in object oriented programming.
3) Enlist and describe characteristics of components.

4) Explain object request broker.
5) Elaborate Evolution of Distributed Systems.
6) What is the Need of multitier architecture? Elaborate evolution of multitier Architecture.
7) Describe Interfaces in COM and DCOM.
8) Describe Component Technologies EJB and Java Bean.
9) Describe Enterprise Java Beans.
10) Describe RMI Architecture and RMI Service.

Text Books:

1) G. Sudha Sadasivam," Component Based Technology", Wiley India Edition
2) Paul Allen, Stuart Frost, "Component-Based Development for Enterprise Systems: Applying the SELECT Enterprise ", Cambridge University Press
3) Clemens Szyperski, "Component Software: Beyond Object-Oriented Programming", Pearson Education publishers, 2003

Reference Books:

1) Ed Roman, "Mastering Enterprise Java Beans", John Wiley & Sons Inc., 1999.
2) Mowbray, "Inside CORBA", Pearson Education, 2003.
3) Freeze, "Visual Basic Development Guide for COM & COM+", BPB Publication, 2001.
4) Hortsamann, Cornell, "CORE JAVA Vol-II" Sun Press, 2002.

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III
Unit Test -2 Unit IV, V and VI

Mobile Computing

Teaching Scheme	Examination Scheme		Credit Allotted
Theory : 02 Hrs/Week	**End Semester Examination**	**: 60 Marks**	**Theory : 03**
Tutorial : 01 Hr/Week	**Internal Assessment**	**: 40 Marks**	

Course Objectives:

1) To study wireless network for clear understanding of Mobile Network.
2) To understand important terms of data communication required for mobile computing.
3) To apply knowledge of mobile computing for understanding of applications on operating systems used for mobile.

Course Prerequisites:

Students should have knowledge of

1) Operating system.
2) Network communication.

Course Outcome:

Students will be able to:

1) Understand mobile network.
2) Learn mobile communication technologies.
3) Understand GSM.
4) Analyze OS used in Mobile.
5) Design application on Android platform.
6) Design application on ios platform.

UNIT-I **Introduction to Mobile Computing:** **(06 Hours)**

Introduction to wireless Network, Concept of Mobile Computing, principles of Mobile Computing, usage of MAC in Mobile computing, types of Sharing of wireless channels: FDMA, TDMA, CDMA. MAC layer, issues in wireless communication.

UNIT-II **Mobile Network:** **(06 Hours)**

Introduction to IP, static and dynamic IP, usage of TCP/IP for communication, IPV6, acknowledgment, wireless network: allocation of channel, interferences, concept of handoffs and management of location, LAN, PAN, Bluetooth, ZigBee

UNIT-III **Architecture of GSM:** **(06 Hours)**

GSM Architectures, Radio Interfaces, PLMN Interface, Protocols Localization, Calling, SMS service, Modulation, Multiplexing, controlling the medium access, spread spectrum, methods of coding, CDMA, IMT 2000, WCDMA and CDMA 2000, 4G Networks, introduction to 5G, concept of GPRS.

UNIT-IV **Mobile Data communication:** **(06 Hours)**

Communication Asymmetry, classic cation of data delivery mechanism, data dissemination Broadcast models, selective tuning and indexing techniques, synchronization, synchronization software for mobile devices, synchronization protocols.

UNIT-V **Mobile Operating System:** **(06 Hours)**

Functions of operating system in mobile, Concept of kernel, interfacing between O.S. used in mobile and hardware, Mobile Computing Environment, protocols used, security in mobile operating system.

UNIT-VI **Mobile Application Development:** **(06 Hours)**

Android App development, Android SDK, publishing play store, ios app development, Windows phone app development, publicizing and monetization of App.

Assignment List:

1) Draw and explain wireless architecture.
2) Explain mobile communication in detail.
3) Explain different layers in mobile network.
4) Explain synchronization protocol.
5) Explain MANET in detail.
6) Explain characteristics of mobile OS.
7) Write a complete process of GSM tracking of a mobile.
8) Case study on mobile agents.
9) Implement login system using android sdk.
10) Implement login system using ios.

Text Books:

1) Jochen Schiller, "Mobile communications", Addison wisely, Pearson Education
2) Dr. Sunil kumar S. Manavi, Mahabaleshwar S. Kakkasageri, Wireless and Mobile Networks, concepts and protocols, Wiley, India.

Reference Books:

1) *T. Rappaport, "Wireless Communication: Principles and Practice", Pearson Education.*
2) *Reza B'Far (Ed), "Mobile Computing Principles", Cambridge University Press.*
3) *AndrewTanenbaum, Modern Operating System, 3rd/e, Pearson Education International, ISBN Q-lB- lBMST-L.*
4) *Digital Content: iOS Technology Overview: IOSTechOverview.pdf, Apple Inc. Copyright 2014.*

Syllabus for Unit Test:

Unit Test -1 **Unit I, II and III**
Unit Test -2 **Unit IV, V and VI**

Distributed Computing

Teaching Scheme	Examination Scheme		Credit Allotted
Theory : 2 Hrs/Week	**End Semester Examination**	**: 60 Marks**	**Theory :03**
Tutorial : 1 Hr/Week	**Internal Assessment**	**: 40 Marks**	

Course Objectives:
The course is aimed to provide an understanding of key concepts underlying the function of distributed computing systems along with issues in its design and implementation.

Course Prerequisites:
Students should have knowledge of
1) Fundamentals of Data Structures, Operating Systems, Networking concepts.

Course Outcome:
Students will be able to:
1) Understand the fundamentals of distributed computing environment.
2) Implement inter process communication.
3) Learn of process and threads and implement threads.
4) Understand the concepts of clock synchronization and distributed transaction.
5) Learn distributed file system and distributed shared memory.
6) Understand the concepts of distributed system security.

UNIT-I **Fundamentals:** **(06 Hours)**

Definition and evolution of Distributed Computing System, Models and Types of Distributed Computing Systems, Issues and Goals in designing Distributed System, Distributed Computing Environment, Peer to peer systems and its middleware, Routing overlays, Mobile and Ubiquitous computing.

UNIT-II **Communication:** **(06 Hours)**

Inter process communication (IPC): Introduction and need
Message Passing system: Desirable features of good message passing system, Issues in IPC, Group and multicast communication,
Remote Procedure Calls (RPC): The RPC Model, Implementation of RPC mechanisms (Stubs and marshalling)
Java RMI: Architecture, Implementation (Stubs and Skeletons)
Web services and SOAP.

UNIT-III **Processes and Threads:** **(06 Hours)**

Process Migration: Introduction, Features, Mechanisms, Advantages, use in heterogeneous systems.
Threads: Concept, Motivation, Models, Issues, Synchronization, Scheduling, Implementing.

UNIT-IV Synchronization and Distributed Transactions: (06 Hours)

Clock synchronization: Drifting, Issues, Algorithms, Event Ordering
Deadlock: Conditions, Modeling, Handling, Avoidance, Prevention, Detection, Election Algorithms
Distributed Transaction: Introduction, Locks, Optimistic Concurrency Control, Timestamp Ordering

UNIT-V Distributed File system and Distributed Shared memory: (06 Hours)

Distributed Files Systems: Advantages, Features, Models, Caching, Replication, Fault Tolerance
Distributed Shared Memory: Architecture, Design and Implementation Issues, Advantages, Granularity, Structure of Shared Space, Consistency Models, Replacement Strategy, Thrashing

UNIT-VI Distributed System Security: (06 Hours)

Distributed System Security: Goals, Design Principles, Attacks, Confinement Problem, Cryptography, Authentication, Access control, Digital Signatures.

Assignment List:

1) Study the details of IPC mechanism used by Sun RPC for DCE
2) Implement Java RMI client and server programs using stub and skeleton.
3) Elaborate the life cycle of process and threads.
4) Implement Threads in java and explain each step of its life cycle.
5) Compare the various algorithms available for clock synchronization.
6) Study any one journal paper which has proposed/ implemented any new mechanism for concurrency control.
7) Case study of Open Software Foundation's distributed file service.
8) Study of any one journal paper which has implemented/ proposed any one meachnism related to any issue of distributed shared memory.
9) Consider any one security mechanism you know and discuss how it achieves the goals and design principles of distributed system security.
10) Study any real-time security attack and propose alternate strategies that could have been used to counteract those.

Text Books:

1) Pradeep K. Sinha, "Distributed Operating Systems: Concepts and Design", Wiley-IEEE Press.
2) Andrew S. Tanenbaum, Maarten van Steen, "Distributed Systems: Principles and Paradigms", Prentice Hall India Learning Private Limited, Second edition
3) George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, "Distributed Systems: Concepts and Design", Pearson Education India; 5th edition

Reference Books:

1) *Ajay D. Kshemkalyani, Mukesh Singhal, "Distributed Computing: Principles, Algorithms, and Systems", Cambridge University Press- South Asian edition*

2) *Abraham Silberschatz, Peter B. Galvin, Greg Gagne , "Operating System Concepts", Wiley, 8th Edition*

3) *Andrew S. Tanenbaum, "Distributed Operating Systems", Pearson, 2nd edition*

4) *Cay Horstmann and Gary Cornell, Core Java, Volume II - Advanced Features, Prentice Hall, 7 edition.*

Syllabus for Unit Test:

Unit Test -1 **Unit I, II and III**

Unit Test -2 **Unit IV, V and VI**

Elective-IV : 1) Advance TCP/IP

Teaching Scheme	Examination Scheme		Credit Allotted
Theory : 2 Hrs/ Week	**End Semester Examination**	**: 60 Marks**	**Theory : 02**
	Internal Assessment	**: 40 Marks**	

Course Objectives:
The course is headed for afford theoretical and practical understanding regarding the TCP/IP networking. Concepts similar to multiplexing, switching, addressing, naming, quality of service, routing, flow and congestion control are explored all the way through their implementation in TCP/IP protocol suite.

Course Prerequisites:
Students should have knowledge of
1) A preliminary TCP/IP course or else has equivalent knowledge.
2) TCP/IP and it's configuration in addition to a operational knowledge of LAN plus WAN networking.
3) An admiration of the TCP/IP suit of protocols in addition to protocol stacks.

Course Outcome:
Students will be able to:
1) Enumerate layers of the OSI model as well as TCP/IP.
2) Describe the functioning of Internet Protocol.
3) Demonstration IP Address of allocation methods.
4) Understand and building the skills of routing mechanisms and sub netting.
5) Explain the Transmission Control Protocol concepts.
6) Understand the basic structure of IP Version 6.

UNIT-I **Introduction:** **(06 Hours)**

History of TCP/IP :The Internet, TCP/IP Architecture, The TCP/IP Suite. Standards Bodies – ISO, Open System Interconnection. ISO- OSI 7 - layer model, Layered Protocols Model, TCP/IPwithProtocol Encapsulation.

UNIT-II **Internet Protocol (IP):** **(06 Hours)**

What is Internet Protocol, IPv4 Address Classes, Classful IPv4 Address Ranges, Internet Protocol Addressing, Multicast Addresses, IPv4 Reserved Addresses.IPv4 Address Assignment, IPv4 Private Network Addressing, Internet Protocol Routing, The IPv4 Header, Protocol Numbers, IP Fragmentation.
IP Precedence (Type Of Service), Differentiated Services – DiffServ, Per Hop Behavior (PHB), Commonly Used DSCP's.

UNIT-III **Address Resolution and Address Allocation** **(06 Hours)**

Address Allocation :
Dynamic IP Address Allocation – RARP, BOOTP, BOOTP Message

format, Operations. Dynamic IP Address Allocation – DHCP, The DHCP Server, DHCP Address Acquisition States, DHCP Operations, DHCP Relay, Windows DHCP Commands.

Address Resolution:

Address Resolution Protocol (ARP), Default Gateway, Connecting Hosts – Similar Network, Connecting Hosts – Dissimilar Network, ARP Message Format, Network Protocol Analyzers.

UNIT-IV **Internet Protocol Routing:** **(06 Hours)**

Introduction to Routers and Routing,Structure of a Basic Router,Types of Routing -Static Routing, Dynamic Routing, Distance-Vector, Link State, Hop Count, Metrics and Costs. Routing Protocols, Protocols of Dynamic Routing, Protocol Comparison. The Default Route.

UNIT-V **Host to Host Communication and IP Address Translation:** **(06 Hours)**

Transmission Control Protocol (TCP) Concepts, Simple Reliability, TCP Segment, Port Numbers (TCP), Connection Set-up (TCP), Connection Closure (TCP),Protocol of Sliding Windows, User Datagram Protocol (UDP), UDP Segment, UDP vs. TCP.

IP Address Translation :

Network Address Translation, Configuring NAT, Port Address Translation with NAT, Dynamic NAT with Port Address Translation.

UNIT-VI **IP Version 6:** **(06 Hours)**

Introduction: What is IPv6? , Comparison of IPv4 VS IPv6, IPv6 Header. Address Representation, Address Types of IPv6, UnicastIPv6, AnycastIPv6, IPv6 extension headers. DNS enhancements for IPv6.

Assignment List:

1) Define following 1) Talk 2) Echo 3) Ping Network Commands.
2) Describe (RCE) Remote Command Execution.
3) Discuss simulating of ARP /RARP.
4) Relate how HTTP used for web page upload as well as Download.
5) Define TCP module Implementation. (TCP services).
6) Define how File Transfer within client-server architecture by subsequent methods.
(a) TCP/IP (b) USING RS232C.
7) Illustrate Remote Method Invocation (RMI).
8) Explain IPv6 with header format.
9) Outline Case study regarding the different routing algorithms to choose the network path by its best possible and economical during data transfer. • Shortest path routing• Flooding • Distance vector.
10) Write Case study of building a firewall for BVDUCOEP campus network.

Text Books:

1) Dougles E.Comer, "Internetworking with TCP/IP–Principles, Protocols & Architecture", Pearson education, 4th Edition, 2000.

2) Behrouz A. Forouzam, TCP/IP Protocol Suite, Tata McGraw Hill, 4th Edition 2010.

Reference Books:

1) *Douglas E.Comer, Internetworking with TCP/IP, 5th Edition Pearson Education Asia 2005.*

2) *Behrouz Forouzan, "TCP/IP protocol suite",Tata Mc Grawhill, Fourth Edition,2012.*

3) *Richard Stevens, — TCP/IP Illustrated, Vol 1,2,3 Pearson education India, 1st edition,2001.*

4) *Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw-Hill, 2004.*

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III

Unit Test -2 Unit IV, V and VI

Elective IV: 2) Genetic Algorithm

Teaching Scheme	Examination Scheme		Credit Allotted	
Theory : 2 Hrs/Week	**End Semester Examination**	**: 60 Marks**	**Theory**	**: 02**
	Internal Assessment	**: 40 Marks**		

Course Objectives:

1) Learn basics of Evolutionary Computation and Genetic Algorithm.
2) Understand terminologies and operators of GA.
3) Understand Advanced operators and techniques in Genetic Algorithm.
4) classify of GA Algorithms.
5) Implement Genetic Programming.
6) Understand practical approach of Genetic Algorithm Optimization Problems.

Course Prerequisites:

Students should have knowledge of

1) A programming language.
2) Linear algebra, probability and calculus.

Course Outcome:

Students will be able to:

1) Analyze the concept of evolutionary computation.
2) Understand the basic concepts of genetic algorithms.
3) Understand the result of applying various genetic operators.
4) Develop GA problem using different GA operators.
5) Understand about the way GA is used and the domain of application.
6) Develop a different application using GA Optimization problem.

UNIT-I **Evolutionary Computation and Introduction to Genetic Algorithms:** **(06 Hours)**

Introduction to Evolutionary Computation, Historical Development of EC, Features of Evolutionary Computation, Applications of Evolutionary Computation, Introduction to Genetic Algorithm: Biological Background, What is Genetic Algorithm? Conventional Optimization and Search, A Simple Genetic Algorithm, Comparison of Genetic Algorithm with Other Optimization Techniques, Advantages and Limitations of Genetic Algorithm, Applications of Genetic Algorithm. Theoretical Analysis of Evolutionary Algorithms: Schema theorems, convergence of the algorithms, computational time complexity of the algorithms, no free lunch theorem, Evolutionary applications to medicine and public health, Applications of evolutionary biology for veterinarians.

UNIT-II **Terminologies and Operators of GA:** **(06 Hours)**

Introduction, Key Elements, Genes, Populations, Data, Search Strategies, Encoding, Breeding, Search Termination (Convergence Criteria), Why do Genetic Algorithms Work?, Solution Evaluation , Search Refinement, Constraints, Fitness Scaling, Example Problems: Maximizing a function, Travelling Salesman Problem.

UNIT-III **Advanced Operators and Techniques in Genetic Algorithm:** **(06 Hours)**

Introduction, Diploidy, Dominance and Abeyance, Multiploid, Inversion and Reordering, Niche and Speciation, Few Micro-operator, Non-binary Representation, Multi-Objective Optimization, Combinatorial Optimizations, Knowledge Based Techniques.

UNIT-IV **Classification of Genetic Algorithm:** **(06 Hours)**

Introduction, Simple Genetic Algorithm (SGA), Parallel and Distributed Genetic Algorithm (PGA and DGA), Hybrid Genetic Algorithm (HGA), Adaptive Genetic Algorithm(AGA), Fast Messy Genetic Algorithm (Fm GA), Independent Sampling Genetic Algorithm(ISGA)**.**

UNIT-V **Genetic Programming:** **(06 Hours)**

Introduction, Comparison of GP with Other Approaches, Primitives of Genetic Programming, Attributes in Genetic Programming, Steps of Genetic Programming, Characteristics of Genetic Programming, Application of Genetic Programming, Haploid Genetic Programming with Dominance.

UNIT-VI **Genetic Algorithm Optimization Problems:** **(06 Hours)**

Introduction, Fuzzy Optimization Problems: Fuzzy Multi objective Optimization, Interactive Fuzzy Optimization Method, Genetic Fuzzy Systems. Multi objective Reliability Design: Network Reliability Design, Bicriteria Reliability Design. Combinational Optimization problem: Linear Integral Model, Applications of Combinatorial Optimization Methods. Scheduling Problems: Genetic Algorithm for Job Shop Scheduling Problems (JSSP). Transportation Problems: Genetic Algorithm in Solving Transportation, Location-Allocation Problems with Euclidean Distances. Network Design and Routing Problems: Planning of Passive Optical Networks, Planning of Packet Switched Networks, Optimal Topological Design of All Terminal Networks, Learning with Genetic Fuzzy Systems: An Application, Pittsburgh Approach

Assignment List:

1) Define Evolutionary computation? State three fundamental features of biological evolutionary computation.

2) Explain difference between Genetic algorithm and Genetic Programming. Describe how evolutionary computation is applied to engineering applications.

3) Give a suitable example for the Genetic Algorithm principle "Survival of the fittest".

4) What is Search space? Describe various conventional optimization and search techniques.

5) How genetic algorithms work? Explain the building block hypothesis and schema theorem.

6) Find the safe light combinations for 8 traffic lights, four of which are vehicle lights having four possible colors (red, yellow/red, yellow and green) and the other four pedestrian lights having only two colors (red and green).

7) Describe the various knowledge-based techniques that improve the efficiency of simple genetic algorithm.

8) Implement Travelling Salesman Problem using advanced operators and techniques.

9) Discuss the operations involved in the Fast messy Genetic Algorithm.

10) Build a C program to implement simple genetic algorithm for a multi objective optimization problem.

11) Discuss the crossover and mutation operation of GP. Explain with suitable examples, the characteristics of GP.

12) Write a computer program to implement GP for a function optimization problem.

Text Books:

1) Mitchell Melanie, "An Introduction to Genetic Algorithms", MIT publications.

2) S.Rajasekaran, G.A.Vijayalakshmi Pai, " Neural Networks, Fuzzy Logic and Genetic Algorithms ", PHI.

Reference Books:

1) *S.N.Sivanandam, S.N.Deepa, "Introduction to Genetic Algorithms", Springer Publications.*

2) *David A, "An Introduction to Genetic Algorithms for Scientists and Engineers", World Scientific Publishing.*

3) *David E. Gold Berg, "Genetic Algorithms in Search, Optimization & Machine Learning", Pearson Education.*

4) *L. D. Davis, Evolutionary algorithms, Springer-Verlag, 1999.*

5) *K. Deb, Multi-Objective Optimization Using Evolutionary Algorithms, Wiley and Sons, 2009.*

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III

Unit Test -2 Unit IV, V and VI

Elective-IV :3) Network Security and Cryptography

Teaching Scheme	Examination Scheme	Credit Allotted
Theory: 02 Hrs/Week	End Semester Examination : 60 Marks	Theory: 02
	Internal Assessment : 40 Marks	

Course Objectives:

1) To know the main beliefs of encryption algorithms, public key cryptography.
2) To Depth knowledge regarding authentication.
3) To understand the application level security mechanisms.
4) To be familiar with the network security tools in addition to applications.

Course Prerequisites:

Students should have knowledge of

1) Computer Networks & Security associated issues.
2) Some understanding of linear algebra as well as statistics.

Course Outcome:

Students will be able to:

1) Recognize the methods of conventional encryption.
2) Understand the concepts of number theory and public key encryption.
3) Learn Hash functions and authentication.
4) Understand stream cipher models and various block cipher.
5) Learn the system level security used.
6) Distinguish the network security tools along with applications.

UNIT-I **Introduction to Mathematical Foundation:** **(06 Hours)**

Introduction to Security trends, Attacks along with services, Classical Crypto systems, Types of ciphers – LFSR sequences. Overview on Modern Cryptography.
Finite Fields and Number Theory: Groups, Rings, Fields-Modular arithmetic-Euclids algorithm-Finite fields- Polynomial Arithmetic – Prime numbers-Fermats and Eulers theorem-Testing for primality. The Chinese remainder theorem- Discrete logarithms.

UNIT-II **Network Security Model:** **(06 Hours)**

The OSI security architecture, Network security Model, Model for CNSS Security, Access and Information Security, Approaches toward Information Security Implementation, The Security Systems Development Life Cycle. Model for Symmetric cipher, techniques of Substitution, Techniques of Transposition, Rotor machines, Steganography, Simplified DES, Principles of Block cipher.

UNIT-III **Public Key Cryptography&Block Ciphers:** **(06 Hours)**

Data Encryption Standard (DES) – Principals of Block cipher,
Modes of operation for Block cipher. Advanced Encryption Standard (AES), Triple DES, Algorithm forBlowfish-RC5.
Public key cryptography: Public key cryptosystemsPrinciple's, The RSA algorithm, Key management, Diffie Hellman Key exchange, Elliptic curve cryptography, Elliptic curve arithmetic,
Other attacks on RSA and Semantic Security of RSA. Primarily test, Cayley Purser algorithm, Factoring Technique, Probabilistic public key encryption.

UNIT-IV **Hash Functions and Authentication:** **(06 Hours)**

Requirements of Authentication,Functionsof Authentication. Message Authentication Codes (MAC) - Hash Functions,Security of hash function and MAC, MD5, SHA, HMAC, CMAC, RIPEMD.
Digital signature: Protocols for Authentication, Digital Signature Standard (DSA), Digital signatures -RSA, SecureID, ElGamal, DSA Quantum Cryptography-Okamoto to Uchiyama cryptosystem.

UNIT-V **System Security and Security Practice:** **(06 Hours)**

Introduction to Applications for Authentication, Kerberos – X.509 Authentication services, Internet Firewalls for Trusted System: Roles of Firewalls, Terminology related to Firewall. Types of Firewalls,Secure Electronic Transaction (SET) for E-Commerce Transactions.
Intruder: Intrusion detection system, Virus furthermore related threats, Countermeasures, Principle's of Firewalls design. Trusted systems – Realistic implementation of cryptography along with security.

UNIT-VI **Network Security:** **(06 Hours)**

Introduction to Security Services intended for E-mail-attacks possible through E-mail, Establishing privacy of keys, source authentication, Integrity of Message -Non-Repudiation-Pretty Good Privacy (PGP), S/MIME.
Internet Protocol (IP) Security: Abstract of IPSec, IPv4 and IPv6, Authentication Header, Encapsulation Security Payload (ESP), Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding).
Web Security: SSL/TLS Essential Protocol-computing the keys, authentication of client, PKI as deployed by SSL Attacks fixed in v3.

Assignment List:

1) Explain Port Scanning via virtual network environment accessible through a VPN connection.

2) Extend Network Intrusion Detection via virtual network environment accessible throughout a VPN connection.

4) Describe Public Key Security Experimenting with RSA, Encryption as well as Decryption.

5) Explain Host - Based Intrusion Detection with virtual network environment accessible through a VPN connection.

6) SummarizeMan-in-the-Middle Attackswithexample.

7) DefineRemote buffer overflow attack.

8) Explain Logic-based Authentication and Authorization.

9) State Android security auditing with Genymotion virtual machine and Burp Suite proxy.

10) Illustrate Capturing and monitoring android network traffic.

Text Books:

1) Atul Kahate, "Cryptography and Network Security", Tata McGraw-Hill, 2003.

2) William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.

3) Wade Trappe, Lawrence C Washington, " Introduction to Cryptography with coding theory", 2nd ed, Pearson, 2007.

Reference Books:

1) *Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002.*

2) *Behrouz A. Ferouzan, "Cryptography & Network Security", Tata Mc Graw Hill, 2007.*

3) *Charlie Kaufman and Radia Perlman, Mike Speciner, "Network Security, Second Edition, Private Communication in Public World", PHI 2002.*

4) *Bruce Schneier and Neils Ferguson, "Practical Cryptography", First Edition, Wiley Dreamtech India Pvt Ltd, 2003.*

5) *Man, Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.*

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III

Unit Test -2 Unit IV, V and VI

Elective: 4) Semantic Web Mining

Teaching Scheme	Examination Scheme		Credit Allotted
Theory : 02 Hrs/Week	End Semester Examination	: 60 Marks	Theory: 02
	Internal Assessment	: 40 Marks	

Course Objectives:

1) Understand a detailed overview of the data mining process and techniques, specifically those that are relevant to Web mining.
2) Understand the basics of Information retrieval and Web search with special emphasis on web crawling.
3) Apply the use of machine learning approaches for Web Content Mining.
4) Understand the role of hyper links in web structure mining.
5) Learn the various aspects of web usage mining.

Course Prerequisites:

Students should have knowledge of

1) Concepts of data mining.
2) Concepts of Web Technology/Web Engineering.

Course Outcome:

Students will be able to:

1) Build a sample search engine using available open source tools.
2) Identify the different components of a web page that can be used for mining.
3) Apply machine learning concepts to web content mining.
4) Implement Page Ranking algorithm and modify the algorithm for mining information.
5) Design a system to harvest information available on the web to build recommender systems.
6) Analyze social media data using appropriate data/web mining techniques and modify an existing search engine to make it personalized.

UNIT-I Introduction: (06 Hours)

Introduction – Web Mining – Theoretical background –Algorithms and techniques – Association rule mining – Sequential Pattern Mining -Information retrieval and Web search – Information retrieval Models-Relevance Feedback- Text and Web page Pre-processing – Inverted Index – Latent Semantic Indexing – Web Search – Meta-Search – Web Spamming. The Syntactic and the Semantic Web, Logics of the Semantic Web. The world of the semantic web-WWW-Meta data-Search engine-Search engine for traditional web-Semantic web-Search engine for semantic web-Traditional web to semantic web.

UNIT-II Semantic Web Technology : (06 Hours)

RDF,- Elements of RDF, Basic Syntax and Fundamental rules of RDF-Aggregation-Distributed information-RDFS-core elements of

RDFS-Ontology-Taxonomy-Inferencing based on RDF schema**.**
OWL: OWL syntax, OWL and RDF semantics, OWL document, Using OWL to define classes-Set operators-Enumerations-Define propertiesontologymatching-Three faces of OWL-Validate OWL.
Swoogle : FOAF-Semantic markup-Issues-prototype system-Design of Semanticweb search engine-Discovery and indexation-prototype system-case study.

UNIT-III **Web Content Mining & Semantic Web Services;** **(06 Hours)**

Web Content Mining – Supervised Learning – Decision tree - Naïve Bayesian Text Classification -Support Vector Machines - Ensemble of Classifiers. Unsupervised Learning - K-means Clustering - Hierarchical Clustering –Partially Supervised Learning – Markov Models - Probability-BasedClustering - Evaluating Classification and Clustering – Vector Space Model – Latent semanticIndexing – Automatic Topic Extraction - Opinion Mining and Sentiment Analysis – Document Sentiment Classification. Introduction to web services- SOA, Limitations of web services. Semantic web services-OWL-S-Upper ontology-WSDL-S,OWL-S to UDDImapping ,Design of the search engine,implementations.

UNIT-IV **Web Link Mining :** **(06 Hours)**

Link mining, common link mining tasks, link-based object ranking
Web Link Mining – Hyperlink based Ranking – Introduction -Social Networks Analysis- Co-Citation and Bibliographic Coupling - Page Rank -Authorities and Hubs -Link-Based Similarity Search - Enhanced Techniques for Page Ranking - Community Discovery – Web Crawling -A Basic Crawler Algorithm- Implementation Issues-Universal Crawlers- Focused Crawlers- Topical Crawlers- Evaluation - Crawler Ethics and Conflicts - New Developments

UNIT-V **Structured Data Extraction:** **(06 Hours)**

Structured Data Extraction: Wrapper Generation – Preliminaries-Wrapper Induction- Instance-Based Wrapper Learning ·- Automatic Wrapper Generation: Problems - String Matching and Tree Matching - Multiple Alignment - Building DOM Trees - Extraction Based on a Single List Page and Multiple pages- Introduction to Schema Matching - Schema-Level Match -Domain and Instance-Level Matching – Extracting and Analyzing Web Social Networks.

UNIT-VI **Web Usage Mining & Semantic Web Applications:** **(06 Hours)**

Web Usage Mining - Click stream Analysis -Web Server Log Files - Data Collection and Pre-Processing - Cleaning and Filtering- Data Modeling for Web Usage Mining - The BIRCH Clustering Algorithm -Affinity Analysis and the A Priori Algorithm – Binning. Discovery and Analysis of Web Usage Patterns – Modeling user interests –

Probabilistic Latent Semantic Analysis – Latent Dirichlet Allocation Model– Applications- Collaborative Filtering- Recommender Systems – Web Recommender systems based on User and Item – PLSA and LDA Models . Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics,Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services,Semantic Search Technology, Web Search Agents and Semantic Methods.

Assignment List:

1) Discuss the Meta-Search and Web Spamming concepts in detail.

2) Determine the location of a resource with the help of ontologies and reasoning using router.

3) What are various steps in designing a search engine? Take a case study of designing your own search engine.

4) Design a crawler program to list out the URL's on the page, modify the program for again crawl those founded URL's to find more URL's using High speed computer (Hint : call the **crawl_site** function to **crawl** a **URL**.).

5) Write a Script/ program to perform Analysis of User's Browsing Behavior and Their Categorization Using Markov Chain Model.

6) What are various applications of semantic web? What are web search agents? Explain in detail.

Text Books:

1) Bing Liu, " Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (Data-Centric Systems and Applications)", Springer; 2nd Edition 2009.

2) GuandongXu ,Yanchun Zhang, Lin Li, "Web Mining and Social Networking: Techniques and Applications", Springer; 1st Edition.2010.

3) "Thinking on the Web" - Berners Lee, Godel and Turing, Wiley inter science, 2008.

4) "Social Networks and the Semantic Web", Peter Mika, Springer, 2007.

Reference Books:

1) *Zdravko Markov, Daniel T. Larose, "Data Mining the Web: Uncovering Patterns in Web Content, Structure, and Usage", John Wiley & Sons, Inc., 2007.*

2) *SoumenChakrabarti, "Mining the Web: Discovering Knowledge from Hypertext Data", Morgan Kaufmann; edition 2002.*

3) *Adam Schenker, "Graph-Theoretic Techniques for Web Content Mining", World Scientific Pub Co Inc , 2005.*

4) *Min Song, Yi Fang and Brook Wu, "Handbook of research on Text and Web mining technologies", IGI global, information Science Reference – imprint of :IGI publishing, 2008.*

Syllabus for Unit Test:

Unit Test -1 **Unit I, II and III**

Unit Test -2 **Unit IV, V and VI**

ITL-V

Teaching Scheme	Examination Scheme	Credit Allotted
Practical : 02 Hrs/Week	**Practical and Term Work: 50 Marks**	**Term Work: 01**

Course Objectives:
1) Understand emerging Web technologies concepts and tools.
2) Understand client side and server side scripting languages and validation techniques.
3) Learn database access technologies and state management techniques.
4) Develop real life Web applications using ASP.NET and PHP.

Course Prerequisites:
Students should have knowledge of
1) Knowledge of programming language C, C++.
2) Knowledge of application development tool.

Course Outcome:
Students will be able to:
1) Design web applications using ASP.NET.
2) Use ASP.NET controls in web applications.
3) Implement ASP.NET web applications.
4) Design database driven ASP.NET web applications and web services.
5) Implement Object handling using Collections and Generics.
6) Implement Database Connectivity using LINQ and ADO.NET.

UNIT-I **Introduction of .NET:** **(06 Hours)**

Evolution of .NET, Benefits of .NET framework, Introduction to Visual Studio, Introducing C#, Namespaces, Classes, Objects and Structs, Object-Oriented Programming, Pointers, Delegates and Events

UNIT-II **Data Access with ADO.NET and Working with LINQ:** **(06 Hours)**

Understanding Databases, Understanding SQL, Understanding ADO.NET,Data Reader, Creating Command Object, Working with DataAdapter,

Defining LINQ Queries, Exploring standard Query Operators, Introducing LINQ to Objects, Introducing LINQ to ADO.NET

UNIT-III **Collections and Generics:** **(06 Hours)**

System.Collections.Concurrent namespace, SortedSet<T> class, Understanding Collections, Collection classes in .NET, Understanding Generics, Generic Collection Classes in .NET, Creating your own Generic Classes

UNIT-IV **Threading:** **(06 Hours)**

The Thread Class, Difference between Processes and Threads, Working with Thread, Multithreading, Thread Priorities, Thread States, Thread Synchronization, Joining Threads

UNIT-V **Web Applications:** **(06 Hours)**

Developing a Web Application, Application Structure and State, Web Forms: Standard Controls, Navigation Controls: Tree View, Menu and Site Map Path, Validation Controls, Introducing Web Parts Controls, Working with Database Controls.

UNIT-VI **Managing Web Applications:** **(06 Hours)**

Managing Web Applications: The ASP.NET Configuration File, The process model Configuration, Configuring ASP.NET Applications in IIS

Working with Login Controls: The Login Control, The LoginView Control, The Login Status Control, The LoginName Control,

Working with User Profiles: Understanding ProfileProvider Class, Creating Authenticated Profiles, Creating Custom Profile Provider

Assignment List:

1) Accepting and validating user entered data using ASP.NET.
2) Accepting and validating book catalog information using validating controls.
3) Write a program to demonstrate session management in ASP.Net.
4) Display database contents from SQL server or Oracle database using SQL Command class from ASP.NET.
5) Display parameterized data using SQLDataReader and GridView in ASP.NET.
6) Database access using DataSet in ASP.NET.
7) Displaying data using DataView in ASP.NET.
8) Write a program to read, add, update and delete record from database using ADO.Net control SqlDataSource.
9) Create a login page in your web application. Login page musthave user name and password fields. If user enters correct ID,Password, he must be redirected to the homepage of your website.
10) Create a webpage, that allows user to add a new username ifuser doesn't exist in the database. Also, create a forgotpassword link, to redirect user to set up his new password on authentication.

Text Books:

1) .NET 4.5 Programming 6-in-1, Black Book, *Kogent Learning Solutions Inc.*

Reference Books:

1) *ASP.NET 4.5, Covers C# and VB Codes, Black Book; Kogent Learning Solutions Inc.*

2) *C# 2012 Programming Black Book Covers .NET 4.5; Kogent Learning Solutions Inc.*

3) *Professional ASP.NET 4.5 in C# and VB; Jason N. Gaylord, Christian Wenz, Pranav Rastogi, Todd Miranda, Scott Hanselman, Scott Hunter; Web Platform Team, Microsoft*

4) *Beginning ASP.NET for Visual Studio 2015 Paperback – 18 Apr 2016 by William Penberthy*

Project Stage - II

Teaching Scheme	Examination Scheme		Credit Allotted
Practical : 04 Hrs/Week	**Oral and Term Work**	**: 50 Marks**	**Term Work : 08**
	Practical and Term Work	**: 50 Marks**	

Course Objectives:

1) To choose the hardware, software needed according to the proposed in the design.
2) To check the quality of work and adherence to the requirements by rigorous testing.
3) To implement requirements mentioned in the design.

Course Prerequisites:

Students should have knowledge of

1) Platform, programming languages.
2) Hardware, drivers and tools required at various phases of SDLC.

Course Outcome:

Students will be able to:

1) Implement solution for the given problem.
2) Learn various ways to tackle the new problem faced during the development of project.
3) Implement the code to minimize time and space required by setting new benchmarks.
4) Coordinate with project mates to solve the problem.
5) Apply integration of software and/or hardware components, APIs, modules.
6) Apply concepts learn in Seminar, In-plant training, Project Stage –I to effectively implement the project.

Guidelines for the project

1) Divide the work according to the plan.
2) Focus on the solution to excel the research or startup in respective domain.
3) Apply deadline, quality checks for every phase of project development.
4) Identify novel component to draft patent and copyright accordingly.
5) Present the implementation work in research journals and conferences.
6) Target to prepare a research proposal to acquire a grant for the institute.

Exam

Parameter	Marks
Implementation of project according to the work and quality.	**10**
Validation of Results	**10**
Contribution in terms of novelty	**10**
Comments received from journals like IEEE, Springer, Elsevier, ACM, WOS and Scopus indexed journals.	**10**
Patent, copyright, Application for grant.	**10**