Kurukshetra University										
Bachelor of Technology (Information Technology)										
Credit-Based Scheme of Studies/Examination										
Semester VII(w.e.f. session 2021-2022)										
S. No.	**Course Code**	**Subject**	**L:T:P**	**Hours /Week**	**Credits**	**Examination Schedule (Marks)**				**Duration of Exam (Hrs)**
						Major Test	**Minor Test**	**Practical**	**Total**	
1	PE	Elective-IV	3:0:0	3	3	75	25	0	100	3
2	PE	Elective-V	3:0:0	3	3	75	25	0	100	3
3	OE	Open Elective-II	3:0:0	3	3	75	25	0	100	3
4	PROJ-IT-401A	Project-II	0:0:12	12	6	0	40	60	100	3
5	PE-IT-D415A	Server side programming Lab	0:0:3	3	1.5	0	40	60	100	3
6	PE-IT-D417A	Python Programming Lab	0:0:3	3	1.5	0	40	60	100	3
Total				**27**	**18**	**225**	**195**	**180**	**600**	
7	SIM-401A*	Seminar on Summer Internship	2:0:0	2	0	0	50	0	50	

PE Elective-IV	**PE Elective-V**
Advanced Computer Networks: PE-IT-D401A	Software Testing: PE-IT-D407A
Parallel Computing: PE-IT-D403A	Software Project management:PE-IT-D409A
Complier Design: PE-IT-D405A	Distributed Operating System: PE-IT-D411A
OE Elective-II	Natural Language Processing: PE-IT-D413A
Cyber Law and Ethics: OE-IT-401A	
Signal and System: OE-IT-403A	
Neural Networks and Deep Learning: OE-IT-405A	
Digital Signal Processing: OE-IT-407A	

The course of both PE & OE will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.

PE-IT-D401A	Advanced Computer Networks						
L	**T**	**P**	**Credit**	**Major Test**	**MinorTest**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize different protocols & applications of computer networks.**						
Course Outcomes							
CO 1	To study MAC protocols for High speed networks.						
CO 2	To study IPv6 addressing schemes.						
CO 3	To study wireless application protocol for communication.						
CO 4	To study the concepts to manage networks.						

UNIT – 1

Introduction: Overview of computer networks, seven-layer architecture, TCP/IP suite of protocols, etc. MAC protocols for high-speed LANS, MANs, and wireless LANs. (For example, FDDI, DQDB, HIPPI, Gigabit Ethernet, Wireless Ethernet, etc.)

UNIT-2

Fast access technologies (For example, ADSL, Cable Modem, etc.).

Overview of IPv6, IPv6 & TCP/IP stack,IPv6 protocol architecture, IPv6 address basics, address notation, unicast address, multicast address , IPv6 headers, Routing table problem, static & automatic address configuration, neighbor discovery, stateless address auto configuration, Interoperation concepts ofIPv4/IPv6.

UNIT-3

Mobility in networks, Mobile IP. Security related issues in mobile IP. IP Multicasting. Multicast protocols, address assignments, session discovery, etc.

Network security at various layers. Secure-HTTP, SSL, ESP, Authentication header, Key, distribution protocols.Digital signatures, digital certificates.

UNIT-4

The Wireless Applications Protocols, applications environment, wireless application protocol client software, wireless application protocol gateways, implementing enterprise wireless application protocol strategy and Security Issues in Wireless LAN. Wireless network management, GPRS, and VOIP services.

Network Management: Introduction, LAN, SNMP, and CMIP. Issues in the management of large networks. Multicast: IGMP, PIM, DVMRP

Text Books:

1. W.R. Stevens. TCP/IP Illustrated, Volume 1: The protocols, Addison Wesley,1994.
2. G.R. Wright. TCP/IP Illustrated, Volume 2: The Implementation, Addison Wesley,1995.

References Books:

1. W.R. Stevens. TCP/IP Illustrated, Volume 3: TCP for Transactions, HTTP, NNTP, and the Unix Domain Protocols, Addison Wesley,1996.
2. R. Handel, M.N. Huber, and S. Schroeder. ATM Networks. Concepts, protocols, Applications, Addison Wesley,1998.
3. William Stalling, Wireless Communications and Networks. Prentice Hall2002.

PE-IT-D403A	Parallel Computing						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3Hr**
Purpose	**To enable students to compare various architectural taxonomies and design paradigms of parallel computers and computational models, parallelism approaches, performance metrics and techniques to parallelize and schedule loops and their programming constructs.**						
Course Outcomes							
CO 1	Classify various synchronous and asynchronous paradigms of parallel computing as well as identify some of the taxonomies for architectural classification of parallel						
CO 2	Compare various parallel computation models and approaches and describe different performance metrics in parallel computers.						
CO 3	Distinguish shared memory and distributed memory multiprocessors and explain various parallel programming models and relative advantages and disadvantages of interconnection networks based on network parameters for reliable connections and achieving efficient speed.						
CO 4	Examine various techniques of parallelizing loops and sequential programs and scheduling.						

Unit-I

Introduction: The state of computing, system attributes to performance, Paradigms of parallel computing: Synchronous – Vector/ Array, SIMD, systolic, Asynchronous- MIMD, reduction paradigm. Hardware Taxonomy: Flynn's classification, Feng's classification, handler's classification. Software taxonomy: Kung's taxonomy.

Unit-II

Abstract parallel computational models: combinational circuits, sorting network, PRAM models, VLSI complexity model, Interconnections RAMs, Parallelism approaches- data parallelism, control parallelism, Conditions of parallelism: Data, control and resource dependencies, Hardware and software parallelism. Performance metrics: Laws governing performance measurements, Metrics-speedups, efficiency, utilization, communication overheads, single/ multiple program performances.

Unit-III

Parallel processors: taxonomy and topology: shared memory multi processors, distributed memory multicomputer, static and dynamic interconnections. Parallel programming: shared memory programming, distributed memory programming, object oriented programming, data parallel programming, functional and data flow programming.

Unit-IV

Scheduling and parallelization: Loop parallelization and pipelining-Loop transformation theory, parallelization and wave fronting, tiling and localization, software pipelining, Scheduling parallel programs, program partitioning and scheduling: Grain size, latency, grain packing and scheduling, loop scheduling, Parallelization of sequential programs.

Text Books

1. Kai Hwang and NareshJotwani, Advanced Computer Architecture, Second Edition,McGraw Hill, New Delhi, India, 2012.
2. M.J. Quinn, Parallel Computing: Theory and Practice, Second Edition, McGraw Hill,New Delhi, India, 2008.
3. D.Sima, T.Fountain, P.Kasuk, Advanced Computer Architecture-A Design spaceApproach, Pearson Education,India, 2009.

Reference Books

1. J. L. Hennessy and D. A. Patterson, Computer Architecture: A Quantitative approach, 5th Edition, Morgan Kaufmann/Elsevier-India.
2. T.G.Lewis, Parallel Programming: A machine Independent approach, IEEE Computer Society Press,Los Alamitos, 1994.
3. T.G.Lewis and H. EI-Rewini, Introduction to parallel computing, Prentice Hall, New Jersey,2019.

PE-IT-D405A	Compiler Design						
L	**T**	**P**	Credit	**Major Test**	**MinorTest**	**Total**	**Time**
3	**-**	**-**	3	**75**	**25**	**100**	**3Hr**
Purpose	**To familiarize the students to design and implement a compiler.**						
Course Outcomes							
CO 1	To understand, design and implement a lexical analyzer.						
CO 2	To understand, design and implement a parser.						
CO 3	To understand, design code generation schemes.						
CO 4	To understand optimization of codes and runtime environment.						

UNIT I
Introduction to Compiling

Analysis of the source program, Phases of a compiler, Grouping of Phases, Compiler construction tools. Lexical Analysis –Regular Expression, Introduction to Finite Automata and Regular Expression, Conversion of Regular Expression to NFA, Role of Lexical Analyzer, Input Buffering, Specification of Tokens.

UNIT II
Syntax Analysis

Role of the Parser, Writing Grammars, Symbol Table, Context-Free Grammars, Shift-reduce Parser, Operator Precedence Parsing, Top Down Parsing ,Predictive Parsers, LR Parsers: SLR Parser, Canonical LR Parser, LALR Parser, Implementation of LR Parsing Tables.

UNIT III
Intermediate Code Generation and Code

Intermediate languages, Declarations, Assignment Statements, Boolean Expressions, Case Statements, DAG representation of Basic Blocks, A simple Code generator from DAG, Issues in the design of code generator , The target machine , Runtime Storage management, Error Handling- Type checking,

UNIT IV
Code Optimization and Run Time Environments

Principal Sources of Optimization, Optimization of Basic Blocks, Peephole Optimization, Introduction to Global Data Flow Analysis, Source Language issues, Storage Organization, Static Storage Management, Heap Storage management, Access to non-Local Names, Parameter Passing.

Text books

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, “Compilers Principles, Techniques and Tools”,Pearson Education Asia,2003.
2. Kenneth C. Louden, “Compiler Construction: Principles and Practice”, Thompson Learning,2003

Reference books

1. Allen I. Holub“Compiler Design in C”, Prentice Hall of India,2003.
2. C. N. Fischer and R. J. LeBlanc, “Crafting a compiler with C”, Benjamin Cummings,2003.
3. J.P. Bennet, “Introduction to Compiler Techniques”, Second Edition, Tata McGraw-Hill,2003.
4. HenkAlblas and Albert Nymeyer, “Practice and Principles of Compiler Building with C”,PHI, 2001.

OE-IT-401A	Cyber Law and Ethics						
L	**T**	**P**	**Credits**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3Hr**
Purpose	**This course explores technical, legal, and social issues related to cybercrimes, Laws Cyber Ethics. Cybercrime and laws is a broad term that includes offences where a computer may be the target, crimes where a computer may be a tool used in the commission of an existing offence, and crimes where a computer may play a subsidiary role such as offering evidence for the commission of an offence. It is also required to have knowledge of Cyber Ethics and its role and significance.**						
Course Outcomes							
CO 1	Understand Cyber laws.						
CO 2	Describe Information Technology act and Related Legislation.						
CO 3	Demonstrate Electronic business and legal issues.						
CO 4	To study the concept of cyber ethics.						

Unit-1: Introduction to Cyber Law

Evolution of computer technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.

Unit-2: Information Technology Act

Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

Unit-3: Cyber Law and Related Legislation

Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).

Unit-4: Electronic Business and Legal Issues

Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models- B2B, B2C, E security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.

Cyber Ethics

The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics.

Text Books:

1. Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, dominant Publisher

2. Cyber Ethics 4.0, ChristophStuckelberger, PavanDuggal, by Globethic

3. Information Security policy & Implementation Issues, NIIT, PHI

Reference Books:

1. Computers, Internet and New Technology Laws, Karnika Seth, Lexis NexisButterworthsWadhwa Nagpur. 5. Legal Dimensions of Cyber Space, Verma S, K, Mittal Raman, Indian Law Institute, New Delhi,

2. Cyber Law, JonthanRosenoer, Springer, New York, (1997).

3. The Information Technology Act, 2005: A Handbook, OUP SudhirNaib,, New York, (2011)

4. Information Technology Act, 2000, S. R. Bhansali,, University Book House Pvt. Ltd., Jaipur (2003).

5. Cyber Crimes and Law Enforcement, Vasu Deva, Commonwealth Publishers, New Delhi, (2003)

OE-IT-403A	Signal & System						
L	**T**	**P**	**Credit**	**Major Test**	**MinorTest**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3Hr**
Purpose	**To familiarize the students with the basic concepts of signals and systems, Random variables, discretisation of analog signals, fourier series, fourier transform and laplace transform.**						
Course Outcomes							
CO 1	Introduce and classify signals and systems based on their properties.						
CO 2	To understand the basic concepts of random variables and Linear time invariant systems.						
CO 3	Familiarization with the sampling process and spectral analysis of signals using fourier series.						
CO 4	Apply transform techniques to analyze continuous-time and discrete-time signals and systems						

Unit-I Introduction to Signals: Continuous and discrete time signals, deterministic and stochastic signals, periodic and a periodic signals, even and odd signals, energy and power signals, exponential and sinusoidal signals and singular functions. Signal representation in terms of singular functions, orthogonal functions and their use in signal representation Introduction to Systems: Linear and non-linear systems, time invariant and time varying systems, lumped and distributed systems, deterministic and stochastic systems, casual and non-causal systems, analog and discrete/digital memory and memory less systems.

Unit-II Random Variables: Introduction to Random Variables, pdf, cdf, moments, distributions, correlation functions. Linear Time Invariant Systems: Introduction to linear time invariant (LTI) systems, properties of LTI systems, convolution integral, convolution sum, causal LTI systems described by differential and difference equations. Concept of impulse response

Unit-III Discretisation of Analog Signals: Introduction to sampling, sampling theorem and its proof. Effect of under sampling, reconstruction of a signal from sampled signal. Fourier Series : Continuous time fourier series (CTFS), Properties of CTFS, Convergence of fourier series, Discrete time Fourier Series (DTFS), Properties of DTFS , Fourier series and LTI system, Filtering.

Unit-IV Fourier Transform: Continuous Time Fourier Transform (CTFT), Properties of CTFT, Systems characterized by linear constant- coefficient differential equations. Discrete time fourier transform (DTFT), Properties of DTFT, Duality, Systems characterized by Linear constant coefficient difference equations. Laplace Transform: Introduction to Laplace transform, Region of convergence for laplace transform, Inverse laplace transform, Properties of laplace transform, Analysis and characterization of LTI systems using laplace transform, System function algebra and block diagram representations, Unilateral laplace transform.

Text Books:

1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, Signals and Systems, Prentice Hall India, 2nd Edition, 2009 Reference Books: 1. Simon Haykins – “Signal & Systems”, Wiley Eastern

2. Tarun Kumar Rawat , Signals and Systems , Oxford University Press.

OE-IT-405A	Neural Networks and Deep Learning						
L	**T**	**P**	**Credit**	**Major Test**	**MinorTest**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To provide knowledge of various artificial neural networks, fuzzy logic techniques and Genetic Engineering approach for optimization**						
Course Outcomes							
CO 1	To learn the basics of artificial neural networks concepts.						
CO 2	Expose detailed explanation of various neural networks architecture.						
CO 3	To explore knowledge of special types of Artificial neural networks.						
CO 4	To explore fuzzy logic techniques and genetic algorithms in neural networks.						

Unit I: Fundamentals of Artificial Neural Networks

Introduction: Concepts of neural networks, Characteristics of Neural Networks, Applications of Neural Networks. Fundamentals of Neural Networks: The biological prototype, Neuron concept, Single layer Neural Networks, Multi-Layer Neural Networks, terminology, Notation and representation of Neural Networks, Training of Artificial Neural Networks. Representation of perceptron, perceptron learning and training, Classification, linear Separability

Unit II: Neural Networks

Hopfield nets: Structure, training, and applications, Back Propagation: Concept, Applications and Back Propagation Training Algorithms. Counter Propagation Networks: Kohonan Network, Grossberg Layer & Training, applications of counter propagation, Image classification. Bi-directional Associative Memories: Structure, retrieving a stored association, encoding associations.

Unit III: Special Neural Networks

ART: ART architecture, ART classification operation, ART implementation and characteristics of ART. Image Compression Using ART, Optical Neural Networks: Vector Matrix Multipliers, Hop field net using Electro optical matrix multipliers, Holographic correlator, Optical Hopfield net using Volume Holograms, Cognitrons and Neocognitrons: structure and training.

Unit IV: Deep learning and Fuzzy Logic

Deep learning neural networks : Deep learning neural networks, forward propagation in a deep network, need of deep representations, Building blocks of deep neural networks, forward and backward propagation Fuzzy Logic: Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation, Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations Genetic Algorithms: genetic algorithm implementation in problem solving and working of genetic algorithms evolving neural networks

Text Books:

1. Li Min Fu, “Neural Networks in Computer Intelligence”, McGraw-Hill, Inc. 2012.

2. S N Sivanandam, “Neural Networks using MATLAB 6.0”, TMH, 4th. Reprint 2015.

3. S N Sivanandam, “Principles of Soft Computing”, 2nd. Edition, Wiley, Reprint 2014.

Reference Books:

1. Simon Haykin, “Neural Networks: A Comprehensive Foundations”, Prentice-Hall International, New Jersey, 2013.

2. Freeman J.A. & D.M. Skapura, “Neural Networks: Algorithms, Applications and Programming Techniques”, Addison Wesley, Reading, Mass, 2014.

OE-IT-407A	Digital Signal Processing						
L	**T**	**P**	**Credit**	**Major Test**	**MinorTest**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To make students aware about the digital signal processing in FIR & IIR filter**						
Course Outcomes							
CO 1	This section provides the detail about the analysis of LTI system in Z transform						
CO 2	This section describe how we implement discrete time system in FIR & IIR systems						
CO 3	This section describe how we design FIR filters by frequency sampling method						
CO 4	This section describe how we design IIR filters using various method						

UNIT-I

Z – Transform Analysis of LTI System:- Transform its properties, System Function of a linear Time- Invariant system. Inversion of the Z Transform, the one-sided Z-transform, Solution of difference equations. Analysis of LTI system in Z- domain, transient and steady- state response.Causality and stability.Pole- Zero Cancellations.

DFT and FFT: DFT and its properties, Circular Convolution and fast linear convolution, Linear filtering using DFT. Direct Computation of DFT, FFT algorithms, Radix-2 and Radix-4 algorithms.

UNIT-II

Implementation of Discrete-Time Systems: Structure for the Realization of Discrete-Time Systems, Structure for FIR Systems: Direct-Form Structure, Cascade-Form Structures, Frequency-Sampling Structures; Structure for IIR Systems: Direct-Form Structures, Signal Flow Graphs and Transposed Structures, Cascade-Form Structures, Parallel-Form Structures, Lattice and Lattice-Ladder Structures for IIR Systems.

UNIT-III

Design of FIR Filters: Characteristics of practical frequency selective filters. Filters design specifications peak and pass band ripple, minimum stop band attenuation. Design of FIR filters using windows functions(Kaiser window, rectangular, Hamming and Blackman window) method comparison of design methods for FIR filters, Gibbs phenomenon, design of FIR filters by frequency sampling method.

UNIT-IV

Design of IIR Filters: Design of IIR filters from analog filters, Design by approximation of derivatives, Impulse invariance method, bilinear transformation method, characteristics of Butterworth, Chebyshev, and Elliptical analog filters and design of IIR filters.

Text Books:

1. Digital Signal Processing by J.G. Proakis and D.G. Manalakis-PHI
2. Digital Signal Processing by: A.V. Oppenheim and R.W. Schafer-PHI

References Books:

1. Element of Digital Signal Processing by N. SarkarKhanna Publishers.
2. Digital Signal Processing by S. K. Mitra –TMH.
3. Digital Signal Processing by Rabinar, Gold-PHI

PE-IT-D407A	Software Testing						
L	**T**	**P**	**Credit**	**Major Test**	**MinorTest**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To provide an understanding of concepts and techniques for testing software and assuring its quality.**						
Course Outcomes							
CO 1	Expose the criteria and parameters for the generation of test cases.						
CO 2	Learn the design of test cases and generating test cases.						
CO 3	Be familiar with test management and software testing activities.						
CO 4	Be exposed to the significance of software testing in web and Object orient techniques						

UNIT 1

Introduction: Overview of software evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference between Verification and Validation, What is software testing and why it is so hard? Test Cases, Test Oracles, Testing Process, Limitations of Testing.

UNIT 2

Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique. Structural Testing: Path testing, DD-Paths, Cyclomatic Complexity, Graph Metrics, Data Flow Testing, Mutation testing

UNIT 3

Reducing the number of test cases: Prioritization guidelines, Priority category, Scheme, Risk Analysis, Regression Testing, and Slice based testing Testing Activities: Unit Testing, Levels of Testing, Integration Testing, System Testing, Debugging, Domain Testing.

UNIT 4

Object oriented Testing: Definition, Issues, Class Testing, Object Oriented Integration and System Testing. Testing Web Applications: What is Web testing?, User interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing.

TEXT BOOKS:

1. NareshChauhan "Software Testing Principles and Practices" Oxford Publications,2012.
2. Louise Tamres, "Software Testing", Pearson Education Asia,2002.
3. Robert V. Binder, "Testing Object-Oriented Systems-Models, Patterns and Tools", Addison Wesley,1999.
4. William Perry, "Effective Methods for Software Testing", John Wiley & Sons, New York,1995.

REFERENCE BOOKS:

1. CemKaner, Jack Falk, Nguyen Quoc, "Testing Computer Software", Second Edition, Van Nostrand Reinhold, New York, 1993.
2. K.K. Aggarwal&Yogesh Singh, "Software Engineering", 2nd Ed., New Age International Publishers, New Delhi, 2005.
3. Boris Beizer, "Software Testing Techniques", Second Volume, Second Edition, Van Nostrand Reinhold, New York,1990.
4. Boris Beizer, "Black-Box Testing –Techniques for Functional Testing of Software and Systems", John Wiley & Sons Inc.,New York,1995.

PE-IT-D409A	Software Project Management						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**--**	**3**	**75**	**25**	**100**	**3Hr.**
Purpose	**The purpose of this course is to introduce students the basics of Software Project Management**						
CO 1	To study software economics evolution.						
CO 2	To study software management process & its framework.						
CO 3	To study software management planning, responsibilities.						
CO 4	To familiarize students about Project Management And Control						

Unit-1

Conventional Software Management: Evolution of software economics, Improving software economics: reducing product size, software processes, team effectiveness, automation through, Software environments, Principles of modem software management.

Unit-2

Software Management Process: Framework: Life cycle phases- inception, elaboration, construction and training phase. Artifacts of the process- the artifact sets, management artifacts, engineering artifacts, and pragmatics artifacts, Model based software architectures, Workflows of the process, Checkpoints of the process.

Unit-3

Software Management Disciplines: Iterative process planning, Project organizations and responsibilities, Process automation, Project control and process instrumentation core metrics, management indicators, life cycle expectations, Process discriminates.

Unit-4

Project Management And Control: framework for Management and control – Collection of data Project termination – Visualizing progress – Cost monitoring – Earned Value Analysis- Project tracking– Change control- Software Configuration Management – Managing contracts – Contract Management.

TEXT BOOKS:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition,Tata McGraw Hill, New Delhi, 2012.
2. Software Project Management, Walker Royee, Addison Wesley,1998

REFERENCE BOOKS :

1 Project management 2/e, Maylor.

2. Managing the Software Process, Humphrey.
3. Managing Global Software Projects. Ramesh, TMfH, 2001

PE-IT-D411A	Distributed Operating System						
L	**T**	**P**	**Credit**	**Major Test**	**MinorTest**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**2**	**100**	**3 Hr.**
Purpose	**Elucidate the foundations and issues of distributed systems**						
Course Outcomes							
CO 1	Understand foundations of Distributed Systems.						
CO 2	Introduce the idea of peer to peer services and file system.						
CO 3	Understand in detail the system level and support required for distributed system.						
CO 4	Understand the issues involved in studying process and resource management.						

Unit-1:

Introduction: Distributed Computing Systems, Distributed Computing System Models, Advantages of Distributed Systems, Distributed Operating Systems, Issues in Designing Distributed Operating Systems, Distributed Computing Environment.

Message Passing: Introduction, Features of Message Passing, Issues in IPC by Message Passing, Synchronization, Buffering, Process Addressing, Failure Handling, Group Communication.

Unit-2:

Remote Procedure Calls: The RPC Model, Transparency of RPC, Implementation of RPC Mechanism, STUB Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Parameter Passing, Call Semantics, Communication Protocol for RPCs, Complicated RPC, Client-Server Binding, Security.

Unit-3:

Distributed Shared Memory: Distributed Shared Memory Systems (DSM), DSM – Design and Implementation Issues, Granularity – Block Size, Structure of Shared Memory Space in a DSM System, Memory Coherence (Consistency) Models, Memory Consistency models, Implementing Sequential Consistency, Centralized – Server Algorithm, Fixed Distributed – Server Algorithm, Dynamic Distributed Server Algorithm, Implementing under RNMBs Strategy, Thrashing.

Unit-4:

Synchronization: Introduction, Clock Synchronization, Clock Synchronization Algorithms, Distributed Algorithms, Event Ordering, Mutual Exclusion, Deadlock, Election Algorithms.

Process Management: Introduction, Process Migration, Threads.

Security in Distributed Systems: Potential attacks to Computer Systems, Cryptography, Authentication, Access Control, Digital Signatures, Design Principles.

REFERENCE BOOKS :

1. Pradeep K Sinha, “Distributed Operating Systems: Concepts and Design”, Prentice Hall of India, 2007.
2. Tanenbaum A.S., Van Steen M., “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007.
3. Liu M.L., “Distributed Computing, Principles and Applications”, Pearson Education, 2004.

4. Nancy A Lynch, “Distributed Algorithms”, Morgan Kaufman Publishers, USA, 2003.

L	T	P	Credit	Major Test	MinorTest	Total	Time
3	-	-	3	75	25	100	3 Hr.
Purpose	**To provide knowledge of various NLP techniques.**						
Course Outcomes							
CO 1	Understand approaches to syntax, semantics, dialogue and summarization in NLP.						
CO 2	Understand current methods for statistical approaches to machine translation.						
CO 3	Understand machine learning techniques used in NLP, including hidden Markov models and probabilistic context-free grammars and clustering						
CO 4	Understand the mathematical and linguistic foundations in the area of NLP.						

Unit 1

Introduction and Overview: What and why of Natural language Processing, Ambiguity and Uncertainty in language, Theturing test. Regular Expressions: Chomski Hierarchy, Regular Languages and their limitations, Finite-state automata. Practical regular expressions for finding and counting language phenomena.

String Edit Distance and Alignment: Key algorithmic tool: dynamic programming, a simple example, then its use in optimal alignment of sequences. String edit operations, edit distance, and examples of use in spelling correction

Unit II

Context Free Grammers: Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down parsing, bottom-up parsing, and the problems with each. The desirability of combining evidence from both directions, Non-probabilisitc Parsing: Efficient CFG parsing with CYK, dynamic programming algorithm

Information Theory: What is information, Measuring it in bits. The "noisy channel model." The "Shannon game",Entropy, cross-entropy, information gain. Its application to some language phenomena.

Unit III

Language modelling and Naive Bayes: Probabilistic language modelling and its applications. Markov models.N-grams. Estimating the probability of a word, and smoothing. Generative models of language. Their applications to building an automatically-trained email spam filter, and automatically determining the language.

Part of Speech Tagging and Hidden Markov Models: The concept of parts-of-speech, examples, usage. The Penn Treebank and Brown Corpus. Probabilistic (weighted) finite state automata. Hidden Markov models (HMMs), definition and use. Viterbi Algorithm for Finding Most Likely HMM Path: Dynamic programming with Hidden Markov Models, and its use for part-of-speech tagging, Chinese word segmentation, prosody, information extraction

Unit IV

Probabilistic Context Free Grammars: Weighted context free grammars. Weighted CYK. Pruning and beam search. Parsing with PCFGs: treebank ,The probabilistic version of CYK. Experiments with eye-tracking. Modern parsers.

Maximum Entropy Classifiers: The maximum entropy principle, and its relation to maximum likelihood. The need in NLP to integrate many pieces of weak evidence.Maximum entropy classifiers and their application to document classification, sentence segmentation, and other language tasks.

Text and Reference Books:

1. Daniel Jurafsky and James H. Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech recognition, Second Ed., 2009.

2. Chris Manning and HinrichSchütze, Foundations of Statistical Natural Language Processing

PE-IT-D415A	Server Side Programming Lab						
L	**T**	**P**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
0	**0**	**3**	**1.5**	**60**	**40**	**100**	**3 Hr.**
Purpose	**To gain familiarity with what server-side programming is, what it can do, and how it differs from client-side programming.**						
	Course Outcomes						
CO1	To study Fundamentals of server side programming and basic programs.						
CO2	To Implement program in ASP to display day, month, date, digital clock.						
CO3	To implement string function using ASP.						
CO4	To implement the use of Forms and its validations using ASP.						

List of Experiments:

1. Create a Subroutine with arguments passing & call the subroutine for specific no. of time.
2. Write a program in ASP which define an object & then display the properties of object with method.
3. Write a program in ASP to display present day, month & date. Also display digital clock.
4. Write a program in ASP which will check that a specific file, folder & drive exist or not. Also return the extension of file. Then use the read & write properties on a file using text-stream object.
5. Send information to the user after he submit the form using GET & POST method & implement from validation.
6. Write a program in ASP that has a form taking the user's name as input. Store this name in a permanent cookie & whenever the page is opened again, then value of the name field should be attached with the cookie's content.
7. Use ad-rotator to change advertisements on client side request.
8. Create a session dictionary using object tag. In session-on start add keys for time, user agent, remote I.P. & add appropriate values. Create a simple page to display the values.
9. Implement session tracking using user authentication.
10. Write a program to delete all cookies of your web site that has created on the client's computer.
11. Write a program is ASP to check the capabilities of the browser using browser capability component.
12. Using data base to store & retrieves values input by a user showing them & make updating & add new records to existing database.
13. Create two ASP pages, a form creation web page (selectprice.asp) and a form processing script (liststockbyprice.asp). In selectprice.asp, the user should be shown a form in which he can enter the item & desired maximum price. When it is submitted liststockbyprice.asp will return all the stocks from database whose cost are less than the price entered by user.

Note: A student has to perform at least 10 experiments. At least seven experiments should be performed from the above list. Three experiments may be designed & set by the concerned institution as per the scope of the syllabus.

PE-IT-D417A	Python Programming Lab

L	T	P	Credit	Practical	Minor Test	Total	Time
0	**0**	**3**	**1.5**	**60**	**40**	**100**	**3 Hour**
Purpose	The course is designed to provide Basic knowledge of Python.						
	Course Outcomes						
CO1	To study fundamentals of python programming and implement basic programs.						
CO2	To implement the searching technique using python.						
CO3	To implement sorting techniques using python.						
CO4	To implement matrix multiplication using python.						

LIST OF PRACTICALS:

1. WAP to compute the GCD of two numbers.
2. WAP to find the square root of a number
3. WAP to find the Exponentiation (power of a number)
4. WAP to find the maximum of a list of numbers
5. WAP for Linear search and Binary search
6. WAP for Selection sort, Insertion sort
7. WAP for Merge sort
8. WAP to find first n prime numbers
9. WAP to multiply matrices
10. WAP that take command line arguments (word count)
11. WAP to find the most frequent words in a text read from a file
12. WAP to Simulate elliptical orbits in Pygame
13. WAP to Simulate bouncing ball using Pygame

Note: A student has to perform at least 10 experiments. At least seven experiments should be performed from the above list. Three experiments may be designed & set by the concerned institution as per the scope of the syllabus.

Semester VIII(w.e.f. session 2021-2022)										
S. No.	**Course Code**	**Subject**	**L:T:P**	**Hours /Week**	**Credits**	**Examination Schedule (Marks)**				**Duration of Exam (Hrs.)**
						Major Test	**Minor Test**	**Practical**	**Total**	
1	PE	Elective-VI	3:0:0	3	3	75	25	0	100	3
2	OE	Open Elective-III	2:0:0	2	2	75	25	0	100	3
3	OE	Open Elective-IV	2:0:0	2	2	75	25	0	100	3
4	PROJ-IT-402A	Project-III	0:0:12	12	6	0	40	60	100	3
5	PE-IT-A410A	Mobile Application Development Lab	0:0:4	4	2	0	40	60	100	3
		Total		**23**	**15**	**225**	**155**	**120**	**500**	

The course of both PE & OE will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.

PE Elective-VI
Introduction to Internet of Things: PE-IT-A402A
Cloud Computing: PE-IT-A404A
Machine learning: PE-IT-A406A
Mobile Apps Development: PE-IT-A408A

OE Elective-III	**OE Elective-IV**
Cyber Security: OE-IT-402A	Information Security: OE-IT-410A
Bioinformatics: OE-IT-404A	Image Processing: OE-IT-412A
Social Networks: OE-IT-406A	IPR, Bioethics and Biosafety: OE-IT-414A
Human Computer Interaction: OE-IT-408A	Sensor and Transducer: OE-IT-416A

PE-IT-A402A	Introduction to Internet of Things						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hour**
Purpose	**To make the students conversant with basics of Internet of Things.**						
	Course Outcomes						
CO1	Understand general concepts of Internet of Things (IoT) and Recognize various devices, sensors and applications						
CO2	To help students apply design concept to IoT solutions.						
CO3	To familiarize about the design issues in IoT applications						
CO4	To help students create IoT solutions using sensors, actuators and Devices						

UNIT 1

Introduction to IoT: Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs, IOT concepts ,Technologies that led to evolution of IOT , IOT and SCADA, IOT and M2M , IOT and Big Data , IOT Standards , Requirement of international standard (case study) , IOT standards in practice, Operating platforms /systems.

UNIT 2

Components of IoT: Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks, Machine-to-Machine Communications, IoT Definition, Characteristics. IoT Functional Blocks, Physical design of IoT, Logical design of IoT, Communication models & APIs. Components of IOT System, Design of IOT systems ,Development of prototypes, Relevance of IOT for the future, IOT in everyday life, Internet of Everything , IOT and Individual Privacy

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UNIT 3

Domain specific applications of IoT: Home automation, Industry applications, Surveillance applications, Other IoT application. i) Lighting as a service (case study) ii) Intelligent Traffic systems (case study) iii) Smart Parking (case study) iv) Smart water management (case study) f) IOT for smart cities (Case study Smart city), IOT in Indian Scenario, IOT and Aadhaar, IOT for health services , IOT for financial inclusion , IOT for rural empowerment

UNIT 4

Developing IoT solutions: Introduction to Python, Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi Implementation of IoT with Arduino and Raspberry, Cloud Computing, Fog Computing, Connected Vehicles, Data Aggregation for the IoT in Smart Cities, Privacy and Security Issues in IoT.

Suggested books

- Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.
- Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013
- The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World“
- Vijay Madisetti, ArshdeepBahga, “Internet of Things: A Hands-OnApproach”.

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

PE-IT-A404A	Cloud Computing						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**03 Hrs.**
Purpose	**To familiar the concepts of cloud services and storage to deploy various resources and arbitrary software.**						
Course Outcomes(CO)							
CO1	Facilitate the basic usage and applicability of computing paradigm.						
CO2	Explore various cloud service and deployment models to utilize different cloud services.						
CO3	To get enabled for various data, scalability & cloud services in order to get efficient database for cloud storage.						
CO4	To deal with various security threats and their controlling mechanism for accessing safe cloud services.						

UNIT 1

Overview of Computing Paradigm: Recent trends in Computing, Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing, evolution of cloud computing, Business driver for adopting cloud computing. Cloud Computing (NIST Model), History of Cloud Computing, Cloud service providers, Properties, Characteristics & Disadvantages, Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing, Role of Open Standards.

UNIT 2

Cloud Computing Architecture: Cloud computing stack, Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services, Service Models (XaaS) - Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), Deployment Models- Public cloud, Private cloud, Hybrid cloud, Community cloud.

UNIT 3

Service Management in Cloud Computing: Service Level Agreements (SLAs), Billing & Accounting, comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously, Managing Data- Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud, Large Scale Data Processing.

Case study: Eucalyptus, Microsoft Azure, Amazon EC2.

UNIT 4

Cloud Security: Infrastructure Security, Network level security, Host level security, Application level security, Data security and Storage, Data privacy and security Issues, Jurisdictional issues raised by Data location, Identity & Access Management, Access Control, Trust, Reputation, Risk, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations.

Text Books

1. Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2010.
2. RajkumarBuyya,JamesBroberg, Andrzej M. Goscinski,CloudComputing: Principles and Paradigms, Wiley, 2011.

Reference Books

1. Nikos Antonopoulos, Lee Gillam, Cloud Computing: Principles, Systems and Applications,

Springer, 2012.

2. Ronald L. Krutz, Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley-India, 2010

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

PE-IT-A406A	Machine Learning						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**03 Hr.**
Purpose	**To familiar the concepts of Machine Learning.**						
Course Outcomes(CO)							
CO1	Study basics of Machine learning						
CO2	To understand various types of learning						
CO3	Study types of Reinforcement learning						
CO4	Study of Artificial neural network						

Unit I

Introduction: Well posed learning problems, designing a learning system, Issues in machine learning, the concept learning task, types of learning: inductive learning, learning by analogy, Deductive learning, Reinforcement learning.

Unit II

Supervised Learning: Introduction to linear regression, estimating the coefficients, Accessing the accuracy of the coefficient estimates, Accessing the accuracy of the regression model, Multiple linear regression, Logistic regression, basic decision tree learning (ID3) algorithm, Hypothesis space search in decision tree learning algorithm, Inductive bias in decision tree learning, Issues in decision tree learning, k-nearest neighbour learning.

Unit III

Unsupervised Learning:

About clustering, type of data in clustering analysis, k-means and k-medoids, DBSCAN density-based clustering method, Performance analysis of clustering algorithms,

Unit IV

Artificial Neural networks: Neural Network representations, Appropriate problems for neural network learning, Perceptron. The perceptron training rule, Gradient descent and delta rule, Multilayer Networks and back propagation algorithm.

Text and Reference Books:

1. Tom M. Mitchell, Machine Learning, McGraw-Hill, 1997.

2. Bishop Christopher, Pattern Recognition and Machine Learning, Springer Verlag, 2006.

3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning: Data Mining, Inference and Prediction, Springer, 2nd edition, 2009..J. Han and M. Kamber, Data Mining Concepts and Techniques, 3rd Edition, Elsevier, 2012.

4. S. Rajeshkaran, G. A. VijayalakshmiPai, Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, PHI, 2003.

PE-IT-A408A	Mobile Apps Development						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hrs.**
Purpose	**To introduce the concepts of developing the mobile applications.**						
Course Outcomes (CO)							
CO1	Be exposed to technology and Mobile apps development aspects.						
CO2	Be competent with the characterization and architecture of mobile applications.						
CO3	Appreciation of nuances such as native hardware play, location awareness, graphics, and multimedia.						
CO4	Perform testing, signing, packaging and distribution of mobile apps.						

Unit I: Introduction to Mobility

Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android platform, Setting up the Mobile App Development environment along with an Emulator.

App User Interface Designing – Mobile UI resources (Layout, UI elements, Drawable, Menu).

Unit II: Building blocks of Mobile Apps

Activity- States and Life Cycle, Interaction amongst Activities.

App functionality beyond user interface - Threads, Async task, Services – States and Life Cycle, Notifications, Broadcast receivers, Content provider.

Unit III: Sprucing up Mobile Apps

Graphics and animation – Custom views, Canvas, Animation APIs, Multimedia – Audio/Video playback and record, Location awareness.

Native data handling–file I/O, Shared preferences, Mobile databases such as SQLite, and Enterprise data access (viaInternet/Intranet).

Unit IV: Testing Mobile Apps

Debugging mobile apps, White box testing, Black box testing, and test automation of Mobile apps, JUnit for Android.

Text Books:

1. Barry Burd, Android Application Development All in one for Dummies, Wiley publications, 2nd Edition2015.
2. Android Developer Fundamentals Course– Concepts (Learn to develop Android applications) Concepts Reference *Developed by Google Developer Training Team,2016.*
3. Valentino Lee, Heather Schneider, and Robbie Schell, Mobile Applications: Architecture, Design, and Development, Prentice Hall,2004.
4. Rick Boyer, Kyle Mew,Android Application Development Cookbook - SecondEdition,2016.

Reference Books:

1. Carmen Delessio, Lauren Darcey, Teach Yourself Android Application Development In 24 Hours , SAMS,2013.
2. Brian Fling, Mobile Design and Development, O'Reilly Media,2009.
3.

OE-IT-402A	Cyber Security						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**0**	**0**	**2**	**75**	**25**	**100**	**3 Hrs.**
Purpose	To gain a broad understanding in order to get predictive ways out related to cyber security.						
Course Outcomes							
CO1	To facilitate the basic knowledge of cyber security.						
CO2	To explore and sort issues related to different types of activities in cyber crime.						
CO3	To get enable to fix the various cyber attacks.						
CO4	To deal with the digital forensics and related scenarios of cyber crimes.						

Unit-I

Introduction: Introduction and Overview of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber Crime: crime against individual, Crime against property, Cyber extortion, Drug trafficking, cyber terrorism. Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.

Unit-II

Cyber Crime Issues: Unauthorized Access to Computers, Computer Intrusions, Viruses and Malicious Code, Internet Hacking and Cracking, Virus and worms, Software Piracy, Intellectual Property, Mail Bombs, Exploitation, Stalking and Obscenity in Internet, Password Cracking, Steganography, Key loggers and Spyware, Trojan and backdoors, phishing, DOS and DDOS attack, SQL injection, Buffer Overflow.

Unit-III

Introduction to cyber attacks: passive attacks, active attacks, Cyber crime prevention methods, Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control, Hardware protection mechanisms, OS Security

Unit-IV

Digital Forensics: Introduction to Digital Forensics, historical background of digital forensics, Forensic Software and Hardware, need for computer forensics science, special tools and techniques digital forensic life cycle, challenges in digital forensic.

Law Perspective: Introduction to the Legal Perspectives of Cybercrimes and Cyber security, Cybercrime and the Legal Landscape around the World, Why Do We Need Cyber laws, The Indian IT Act, Cybercrime Scenario in India, Digital Signatures and the Indian IT Act, Cybercrime and Punishment.

Text Books:

1. Nelson Phillips and EnfingerSteuart, “Computer Forensics and Investigations”, Cengage Learning, New Delhi, 2009.

Reference Books:

1. Robert M Slade,” Software Forensics”, Tata McGraw - Hill, New Delhi, 2005.

SunitBelapure and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley India Pvt. Ltd.

OE-IT-404A	Bioinformatics						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**0**	**0**	**2**	**75**	**25**	**100**	**3Hr.**
Purpose	**The objective of course is to study of information on Biological data.**						
Course Outcomes							
CO 1	Encompasses the development of databases to analyze and determine their relationships with biological data.						
CO 2	Enriches their understanding of how genes or molecular sequences of species evolve.						
CO 3	To enable them of using computational techniques to characterize protein and RNA structure.						
CO 4	Understand the assembling of sequences and analysis of structure and function of genomics.						

Unit -I

Bioinformatics and Biological Databases Bioinformatics: Introduction, Goal, Scope, Applications, Limitations, and New Themes Biological Databases: Introduction, Types of Databases, Biological Databases, Pitfalls of Biological Databases, Information Retrieval from Biological Databases Database Similarity Searching: Unique Requirements of Database Searching, Heuristic Database Searching, Basic Local Alignment Search Tool (BLAST), FASTA, Comparison of FASTA and BLAST, Practical Issues Profiles and Hidden Markov Models: Position-Specific Scoring Matrices, Profiles, Markov Model and Hidden Markov Model Protein Motifs and Domain Prediction: Identification of Motifs and Domains in Multiple Sequence Alignment, Motif and Domain Databases Using Regular Expressions, Motif and Domain Databases Using Statistical Models, Protein Family Databases, Motif Discovery in Unaligned Sequences, Sequence Logos

Unit -II

Gene and Promoter Prediction Gene Prediction: Categories of Gene Prediction Programs, Gene Prediction in Prokaryotes, Gene Prediction in Eukaryotes Promoter and Regulatory Element Prediction: Promoter and Regulatory Elements in Prokaryotes, Promoter and Regulatory Elements in Eukaryotes, Prediction Algorithms Molecular Phylogenetics Phylogenetics Basics: Molecular Evolution and Molecular Phylogenetics, Terminology, Gene Phylogeny versus Species Phylogeny, Forms of Tree Representation, Why Finding a True Tree Is Difficult, Phylogenetic Tree Evaluation, Phylogenetic Programs 16

Unit -III

Structural Bioinformatics Protein Structure Basics: Amino Acids, Peptide Formation, Dihedral Angles, Hierarchy, Secondary Structures, Tertiary Structures, Determination of Protein ThreeDimensional Structure, Protein Structure Database Protein Structure Visualization, Comparison, and Classification: Protein Structural Visualization, Protein Structure Comparison, Protein Structure Classification Protein Secondary Structure Prediction: Secondary Structure Prediction for Globular Proteins, Secondary Structure Prediction for Transmembrane Proteins, Coiled Coil Prediction Protein Tertiary Structure Prediction: Methods, Homology Modeling, Threading and Fold Recognition, Ab Initio Protein Structural Prediction, CASP RNA Structure Prediction: Introduction, Types of RNA Structures, RNA Secondary Structure Prediction Methods, Ab Initio Approach, Comparative Approach, Performance Evaluation

Unit -IV

Genomics and Proteomics Genome Mapping, Assembly, and Comparison: Genome Mapping, Genome Sequence Assembly, Genome Annotation, Comparative Genomics Functional Genomics: Sequence-Based Approaches, Microarray-Based Approaches, Comparison of SAGE and DNA Microarrays Proteomics: Technology of Protein Expression Analysis, Posttranslational Modification, Protein Sorting, Protein–Protein Interactions

Recommended Books:

1. Bioinformatics for Dummies, Jean-Michel Claverie, Cedric Notredame, 2003, John Wiley & Sons
2. Bioinformatics Computing, Bryan P. Bergeron, 2002, Prentice Hall
3. Introduction to Bioinformatics, Arthur M. Lesk, 2002, Oxford University Press
4. Instant Notes in Bioinformatics, D.R. Westhead, J. H. Parish, R.M. Twyman, 2002, Bios Scientific Pub
5. Fundamental Concepts of Bioinformatics, Dan E. Krane, Michael L. Raymer, Michaeel L. Raymer, Elaine NicponMarieb, 2002, Benjamin/Cummings
6. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, Second Edition, Andreas D. Baxevanis, B. F. Francis Ouellette, 2001, WileyInterscience
7. Introduction to Bioinformatics, Teresa Attwood, David Parry-Smith, 2001, Prentice Hall
8. Bioinformatics: A Primer, Charles Staben, 2001, Jones & Bartlett Pub
9. Bioinformatics: Sequence and Genome Analysis, David W. Mount, 2001, Cold Spring Harbor Laboratory Press
10. Bioinformatics: Sequence, Structure and Databanks: A Practical Approach (The Practical Approach Series, 236), Des Higgins (Editor), Willie Taylo

OE-IT-406A	Social Networks						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**0**	**0**	**2**	**75**	**25**	**100**	**3 Hour**
Purpose	**To make the students conversant with basic fundamentals of the Electronics**						
	Course Outcomes						
CO1	Ability to understand and knowledge representation for the semantic web						
CO2	Understand the basics of Semantic Web and Social Networks.						
CO3	Understand Electronic sources for network analysis and different Ontology languages						
CO4	Modeling and aggregating social network data.						

UNIT –I

Thinking and Intelligent Web Applications, The Information Age ,The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

UNIT -II

Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web – Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL), UML, XML/XML Schema. Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.

UNIT-III

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

UNIT-IV

What is social Networks analysis, Development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion networks, Blogs and Online Communities, Web Based Networks. Building Semantic Web Applications with social network features.

TEXT BOOKS:

1. Thinking on the Web - Berners Lee, Godel and Turing, Wiley inter science, 2008.
2. Social Networks and the Semantic Web, Peter Mika, Springer, 2007.

REFERENCE BOOKS:

1. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J.Davies, R.Studer, P.Warren, John Wiley & Sons.
2. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)
3. Information Sharing on the semantic Web – HeinerStuckenschmidt; Frank Van Harmelen, Springer Publications.

OE-IT-408A	Human Computer Interaction						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**0**	**0**	**2**	**75**	**25**	**100**	**3 Hour**
Purpose	**To Understand the structure of models and theories of human computer interaction and vision.**						
	Course Outcomes						
CO1	Learn the foundations of Human Computer Interaction						
CO2	Be familiar with the design technologies for individuals and persons with disabilities						
CO3	Be aware of mobile Human Computer interaction.						
CO4	Learn the guidelines for user interface						

Unit 1

Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

Unit 2

Interactive Design basics – process – scenarios – navigation – screen design –Iteration and prototyping. HCI in software process – software life cycle –usability engineering – Prototyping in practice – design rationale. Design rules– principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

Unit 3

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

Unit 4

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow.Case Studies.

References

- Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, 3rd Edition, Pearson Education, 2004 (UNIT I , II & III)
- Brian Fling, “Mobile Design and Development”, First Edition , O Reilly Media Inc., 2009
- Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O Reilly, 2009.

OE-IT-410A	Information Security

L	T	P	Credit	Major Test	Minor Test	Total	Time
2		-	2	75	25	100	3Hr.
Purpose	**The course will be useful for students who plan to do research/product development/analysis in areas related to secure computing in their career.**						
Course Outcomes							
CO 1	To learn basics of network security and cryptography.						
CO 2	To study network authentication mechanism, with security algorithms.						
CO 3	To explore the knowledge of key exchange protocols.						
CO 4	To realize the effect on digitized security.						

Unit-1

Attacks on Computers and Computer Security: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security.

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

Unit-2

Symmetric key Ciphers: Block Cipher principles, Differential and Linear Cryptanalysis, Block cipher modes of operation, Stream ciphers, RC4, Location and placement of encryption function, Key distribution.

Asymmetric key Ciphers: Principles of public key crypto systems, Algorithms (RSA, Diffie-Hellman, and ECC), Key Distribution.

Unit-3

Message Authentication Algorithms and Hash Functions: Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, HMAC, CMAC, Digital signatures, knapsack algorithm

Authentication Applications: Kerberos, X.509 Authentication Service, Public – Key Infrastructure, Biometric Authentication.

Unit-4

E-Mail Security: Pretty Good Privacy, S/MIME.

Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction

Intruders, virus and Firewalls: Intruders, Intrusion detection, password management, virus and related threats, Firewall design principles, types of firewalls.

TEXT BOOKS

1. William Stallings , *"Cryptography and Network Security"* :, Pearson Education,4″‘ Edition
2. Atul Kahate , "*Cryptography and Network Security*", McGraw Hill Edition

REFERENCE BOOKS

1. Cryptography and Network Security : Forouzan Mukho padhyay, MC Graw Hill, 2″" Edition
2. Mark Stamp ,*"Information Security, Principles and Practice"* Wiley India.
3. WM.Arthur Conklin, Greg White , *"Principles of Computer Security",* TMH

NOTE:

Eight questions are to be set in all by the examiner taking two questions from each unit. Students will be required to attempt five questions in all, selecting at least one question from each unit.

OE-IT-412A	**Image Processing**

L	T	P	Credit	Major Test	Minor Test	Total	Time
2	-	--	2	75	25	100	3Hr.
Purpose	**The objective of this course is to prepare students to conduct research in Image Processing.**						
	Course outcomes						
CO 1	To Understand key algorithms for point, neighborhood, and geometric operations						
CO 2	To study image transformation methods.						
CO 3	To study different techniques of image compression.						
CO 4	To study different attributes of images.						

Unit-1

Digital image fundamentals, application of digital image processing, elements of digital image processing systems, vidicon camera, Line scan CCD sensor, area sensor, flash A/D converter display – elements of visual perception, structure of the human eye, Luminance, brightness, contrast, mach band effect, image fidelity criteria, color models, - RGB, CMY, HIS mathematical preliminaries of 2D systems, convolution, Fourier transform – ZS transform – toeplitz and circulant matrices, orthogonal and unitary matrices.

Unit- 2

Image transforms, Unitary transform, 2D, DFT, DCT, DST, Discrete wavelet transform, Discrete Hadamard, Walsh, Hostelling transform, SVD transform, Slant Haar transforms. Image Enhancement and Restoration: Constrast stretching, intensity level slicing, Histogram equalization, spatial averaging, directional smoothing, Median filtering, nonlinear filters, maximum, minimum, geometric mean contra harmonic mean, LP mean filters, edge detection, Roberts, Sobel, Isofropic, Kinesh, Campass gradient, Laplacian operators.

Unit- 3

Degradation model - unconstrained and constrained restoration, inverse filtering, removal of blur caused by uniform linear motion, Wiener filtering, geometric transformations for image restoration.

Unit –4

Image compression- Huffman coding, truncated Huffman coding, Br, Binary codes, arithmetic coding, bit plane coding contrast area coding, Run length encoding, transform coding JPEG and MPEG coding schemes. Image Segmentation, pixel based approach, feature threshold, choice of feature, optimum threshold, threshold selection methods, region based approach, region growing, region splitting, region merging, spilt and merge.

Text books :

1. Gonzalez, R.C. and Woods, R.E., “Digital image processing”, AddisonWesley.
2. A.K.Jain, “Fundamentals of Digital Processing”,PHI.

Reference Books

1. Umbaugh, S.E. “Computer vision and image processing”, Prentice Hall Int.NJ
2. W. Pratt, “Digital Image Processing”, WileyInter-science

OE-IT-414A	IPR, Bioethics& Bio-safety						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**-**	**--**	**2**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To introduce basic concepts of ethics and safety that are essential for different disciplines of science and procedures involved and protection of intellectual property and related rights. To understand balanced integration of scientific and social knowledge in sustainable development.**						
	Course outcomes						
CO 1	Understand the basic issues of bio-safety, bioethics and IPR arising from the commercialization of biotech products.						
CO 2	Follow the regulatory framework in their future venture to ensure product safety and benefit the society						
CO 3	Aware students about the society's moral principles and not violate or breach laws.						
CO 4	Perform project management and choosing & processing the most appropriate form of IPR for protection of their research/ end product.						

Unit - I

Biosafety: Introduction; Historical background; Biosafety in the laboratory; Laboratory associated infections and other hazards; Biosafety management for environmentally safe use ofbiotechnology;Biosafetyguidelines;RecommendedBiosafetyLevelsforInfectiousAgents and Infected Animals; Definition of GMOs & LMOs; Good manufacturing practices (GMP) and Good lab practices(GLP); Overview of National Regulations and relevant International AgreementsincludingCartagenaProtocol;RolesofInstitutionalBiosafetyCommittee(IBSC), RCGM,GEAC,MEC,SBCC,DLCandRDAC;Guidelinesforresearchintransgenicsciences and release of GMOs to environment; Bioterrorism and convention on biological weapons

Unit- II

Bioethics: Ethical issues related to biotechnology research; Ethical issues associated with consumptions of genetically modified foods and other products, Ethical implications of human genome project, Social and ethical implications of biological weapons, Bioremediations and environmentalimpactsofusingGMOs;Ethicsofpatenting-anditsimpactonbiodiversityrich developing countries; Use of animals for research and testing and Alternatives for Animals in Research.

Unit - III

Social, economic and legal issues related to biotechnology: Public education of the processes of biotechnology involved in generating new forms of life for informed decision making; Testing of drugs on human volunteers; Human cloning and Gene therapy - ethical and social issues; Organ transplantation- ethical and legal implications; Research focus to address the need of the poor and of environment.

Industrial licensing, venture capital, Biotechnological industries in India and potential job opportunities.

Unit - IV

Intellectual Property Rights: Intellectual property rights and IPR protection; Patenting and the

procedureinvolvedintheapplicationofpatentsandgrantingofapatent;Compulsorylicenses; Legislations covering IPR's in India, Patent search; Patent Cooperation Treaty (PCT); Traditional knowledge commercial exploitation; Farmers rights; Plant breeder's rights; International and National conventions on Biotechnology and related areas- GATT, TRIPS, Biodiversity convention,etc.

Recommended Books:

1. Thomas, J. A. and Fuch, R. L. Biotechnology and Safety Assessment. Academic Press.(2002).
2. Fleming, D. A., Hunt, D. L., Biological safety Principles and practices. ASM Press. (2000).
3. Sateesh, M. K. Bioethics & Biosafety, IK Publishers.(2008).
4. Singh B. D. Biotechnology: Expanding Horizon. Kalyani; edition(2015)
5. Singh K., Intellectual Property Rights on Biotechnology BCIL, New Delhi.(2008).
6. Desai, V., Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House(2007).
7. Singh, I. and Kaur, B., Patent law and Entrepreneurship, Kalyani Publishers(2006).
8. Goel and Prashar, IPR, Biosafety and Bioethics, Pearson education, India(2013)

OE-IT-416A	Sensor and Transducer						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**0**	**0**	**2**	**75**	**25**	**100**	**3 Hour**
Purpose	**To make the students conversant with sensor and transducer based electronics system**						
	Course Outcomes						
CO1	To familiarize the students about Static characteristics of sensor and transducer base Instruments						
CO2	To introduce the students to various errors while using measurement systems						
CO3	Application of transducers for measuring non electrical quantities						
CO4	Introduction to Display devices and Data acquisition system						

UNIT 1

Introduction to Measurement and instrumentation: Measurement; Instrumentation; Significance of measurement; Why study measurement systems, Classification of types of measurement application ; Methods and Modes of measurement , Generalized measurement system and its functional elements.
Static Characteristics of Sensor and Transducer base Instruments : Define 1) True or actual value ; 2) Static error , 3) Indicated value ; 4) Correction ; 5) Range ; 6) Span ; 7) Sensitivity ; 8) Resolution ; 9)Threshold ; 10) Response ;11) Response time ; 12) Gain ; 13) Linearity ; 14)Scale sensitivity ; 15) Scale readability ; 16) Reproducibility ; 17) Accuracy ; 18) Precision ; 19) Tolerance ; 20) Dead band ; 21) Backlash ; 22) Drift ; 23) stability ; 24) Uncertainty ; 25) Hysteresis ; 26) Static calibration

UNIT 2

Dynamic Characteristics: Define **:** 1)Transient response 2) Dynamic error ; 3) Fidelity ; 4) Bandwidth ; 5) Speed of response ; 6) Time constant ; 7) Measuring Lag ; 8) Settling or response time ; 9) Dynamic range
Errors in measurement : Significant Figures ; Limiting or Guarantee Errors ; Relative Limiting Error ; Absolute Error ; Types of error – a) Gross error , b) Systematic Error c) Random or Accidental error ; Sources of error

UNIT 3

Sensors and Transducers (Electrical): What is a transducer? ; Classification of transducer, Factors influencing choice of transducer; Advantages and disadvantages of electrical transducers, Basic requirement of Transducers;
Measurement of Non electrical quantities using sensors / Transducers : Strain Gage , Types of strain gage , Thermocouple ; Measurement of thermocouple output ; Temperature measurement using Thermister ; Linear Variable Differential Transformer (LVDT) ; Advantages and disadvantages of LVDT , Measurement of linear displacement using LVDT ; Measurement of Angular displacement using RVDT ; Pressure measurement using Bourdon tube and LVDT ; Speed measurement using AC and DC tachometer ; Measurement of liquid level using a) Variable dielectric method b) Float and voltage divider method

UNIT 4

Display and Recorders : Seven segment display ; Liquid Crystal Display ; Plasma display ; Strip Chart Recorder ; X Y Recorder ; UV recorder ;
Data Acquisition System and Telemetry : Generalized Data Acquisition system (DAS) **,** Objectives of DAS ; Configuration of DAS ; Single and multiple channel DAS ; Signal Conditioning ; Necessity of Signal conditioning , Functions of signal conditioning equipment ; General Telemetry System , Types of Telemetry

Suggested books

- Doebelin and Manik , "Measurement Systems" , McGraw Hill
- Smaili and Mrad , "Mechatronics" , Oxford
- R. K. Rajput , "Electrical Electronics measurement and Instrumentation" , S Chand
- J.B Gupta , " A course in Electronic and Electrical Measurements and Instrumentation " , Katsons
- Nakra and Choudhary , " Instrument Measurement and Analysis" , Tata McGraw Hill
- A. K .Sawhney , "A course in Electrical and Electronic Electrical Measurements and Instrumentation" , DhanpatRai and Co.

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

PE-IT-A410A	Mobile Application Development Lab						
L	**T**	**P**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
0	**0**	**4**	**2**	**60**	**40**	**100**	**3 Hour**
Purpose	**In this lab, a student is expected to design, implement, document and present a mobile**						
	Course Outcomes						
CO1	Build a native application using GUI components and Mobile application development						
CO2	Develop an application using basic graphical primitives and databases						
CO3	Construct an application using multi threading and RSS feed						
CO4	Make use of location identification using GPS in an application						

LIST OF PRACTICALS:

1. Develop an application that uses GUI components, Font and Colours

2. Develop an application that uses Layout Managers and event listeners.

3. Develop a native calculator application.

4. Write an application that draws basic graphical primitives on the screen.

5. Implement an application that implements Multi threading

6. Develop a native application that uses GPS location information.

7. Implement an application that writes data to the SD card.

8. Implement an application that creates an alert upon receiving a message.

9. Write a mobile application that creates alarm clock.

10. Develop a sign-in page with appropriate validation.

11. Develop a real life application that makes use of database.

Note: A student has to perform at least 10 experiments. At least seven experiments should be performed from the above list. Three experiments may be designed & set by the concerned institution as per the scope of the syllabus.