# **ACADEMIC RULES AND REGULATIONS**

For

# B. Tech. with Honors program (C.S.E.)



# VIGNANA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Aushapur (V), Ghatkesar (M), Medchal Dist., Hyderabad, Telangana-501301

# **B.Tech (Honors)**

# **Offered** by

# Department of Computer Science & Engineering

**R19 - COURSE STRUCTURE & SYLLABUS** 

# **III YEAR I-SEMESTER**

S.No	Course Code	Course Title	Mode of Learning	Credits
	Pro	fessional Elective – I / Professional E	Elective – II	
	19HCS31T7	Digital Image Processing		
	19HCS31T6	Principles of Programming		
1		Languages		3
	19HCS31T5	Distributed Databases	Blended/	C
	19HCS31T4	Artificial Intelligence	Conventional	
2	19HCS31T3	Computer graphics		
2	19HCS31T2	Information Retrieval Systems		
	19HCS31T1	Software Testing Methodologies		

# III YEAR II-SEMESTER

S.No	Course Code	Course Title	Mode of Learning	Credits
1	19HCS32T1	Research Methodologies	Conventional	3
	19HCS32T2	Digital Forensics		
2	19HCS32T3	Cloud Computing	Conventional	3
-	19HCS32T4	Ad-Hoc & Sensor Networks	Conventional	5
	19HCS32T5	Security Analysis		

# **IV YEAR I- SEMESTER**

S.No	Course Code	Course Title	Mode of Learning	Credits
1	Professional Elective – IV			
	19HCS41T1	Software Process & Project Management		
	19HCS41T2	Scripting languages	Conventional	3
	19HCS41T3	Internet of Things		
	19HCS41T4	Human Computer Interaction		
	<b>Professional</b>	Elective – V		
2	19HCS41T5	Soft Computing		
	19HCS41T6	Advanced algorithms	Conventional	3
	19HCS41T7	Natural language Processing		
	19HCS41T8	High Performance Computing		

# **IV YEAR II-SEMESTER**

S.No	Course Code	Course Title	Mode of Learning	Credits
1	19HCS42TP	Technical Paper Writing	Under Supervisor	2
	Professional El	ective - VI		
	19HCS42T1	Big Data Analytics		
2	19HCS42T2	Neural Networks & Deep		3
		Learning	MOOCS	
	19HCS42T3	Robotic Process Automation		
	19HCS42T4	Real Time Systems		

# **B.Tech (Honors)**

**Offered** by

# Department of Computer Science & Engineering

R19-COURSE STRUCTURE & SYLLABUS III Year (Semester- I & Semester-II)

# **19CS3171: DIGITAL IMAGE PROCESSING**

#### (Professional Elective - I)

#### B.Tech. III Year I Sem.

# L T P C 3 - - 3

# Prerequisites

- Students are expected to have knowledge in linear signals and systems, Fourier Transform, basic linear algebra, basic probability theory and basic programming techniques; knowledge of Digital Signal Processing is desirable.
- A course on "Computational Mathematics"
- A course on "Computer Oriented Statistical Methods"

# **Course Objectives**

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

# **Course Outcomes**

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

# UNIT – I

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

# UNIT – II

Image Enhancement in Spatial Domain Point Processing, Histogram Processing, Spatial Filtering, Low pass filtering, High pass filtering, Enhancement in Frequency Domain, Image Smoothing, Image Sharpening.

# UNIT – III

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

# UNIT - IV

Image Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation, Morphological processing- erosion and dilation.

#### UNIT - V

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

#### **TEXT BOOKS:**

- 1. Digital Image Processing: R.C. Gonzalez & R. E. Woods, Addison Wesley/ Pearson Education, 2nd Ed, 2004.
- 2. Fundamentals of Digital Image Processing: A. K. Jain , PHI.

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

# **19CS3172: PRINCIPLES OF PROGRAMMING LANGUAGES**

(Professional Elective - I)

B.Tech. III Year I Sem.

L T P C 3 - - 3

#### Prerequisites

- A course on "Mathematical Foundations of Computer Science"
- A course on "Computer Programming and Data Structures"

#### **Course Objectives**

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

#### **Course Outcomes**

- Acquire the skills for expressing syntax and semantics in formal notation.
- Identify and apply a sub programming paradigms for a given computing application.
- Able to understand high-level language design and implementation.
- Gain knowledge on Interprocess communication.
- Gain knowledge of and able to compare the features of various programming languages.

# UNIT – I

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

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

# UNIT - II

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

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

**Expressions and Statements:** Arithmetic Expressions, Overloaded Operators, Type Conversions, Relational and Boolean Expressions, Short Circuit Evaluation, Assignment Statements, Mixed-Mode Assignment.

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

# UNIT - III

**Subprograms and Blocks:** Fundamentals of Sub-Programs, Design Issues for Subprograms, Local Referencing Environments, Parameter Passing Methods, Parameters that Are Subprograms, Calling Subprograms Indirectly,

Overloaded Subprograms, Generic Subprograms, Design Issues for Functions, User Defined Overloaded Operators, Closures, Coroutines.

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

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

#### UNIT – IV

**Object Oriented Programming:** Design issues for OOP, OOP in Smalltalk, C++, Java, Ada 95, Ruby, Implementation of Object-Oriented constructs.

**Concurrency:** Introduction, Introduction to Subprogram Level Concurrency, Semaphores, Monitors, Ada support for concurrency, Message Passing, Java Threads, Concurrency in Function Languages, Statement Level Concurrency.

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

#### UNIT-V

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

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

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

# **TEXT BOOKS:**

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

#### **REFERENCES:**

1. Programming Languages, 2nd Edition, A.B. Tucker, R. E. Noonan, TMH.

2. Programming Languages, K. C. Louden, 2nd Edition, Thomson, 2003.

# **19CS3174: DISTRIBUTED DATABASES**

(Professional Elective - I)

#### **B.Tech. III Year I Sem.**

L	Т	Р	С
3	-	-	3

# Prerequisites

• A course on "Database Management Systems"

# **Course Objectives**

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

# **Course Outcomes**

- Understand theoretical and practical aspects of distributed database systems.
- Study and identify various issues related to the development of distributed database system.
- Understand the design aspects of object-oriented database system and related development.
- Able to Practice Parallel distributed databases.
- Identify the differences between OODBMS and ORDBMS.

# UNIT - I

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

# UNIT - II

**Query processing and decomposition**: Query processing objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data.

**Distributed query Optimization**: Query optimization, centralized query optimization, distributed query optimization algorithms.

# UNIT - III

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

# UNIT - IV

Distributed DBMS Reliability: Reliability concepts and measures, fault-tolerance in distributed systems,

failures in Distributed DBMS, local & distributed reliability protocols, site failures and network partitioning. **Parallel Database Systems**: Parallel database system architectures, parallel data placement, parallel query processing, load balancing, database clusters.

#### UNIT - V

**Distributed object Database Management Systems**: Fundamental object concepts and models, object distributed design, architectural issues, object management, distributed object storage, object query Processing. **Object Oriented Data Model**: Inheritance, object identity, persistent programming languages, persistence of objects, comparison OODBMS and ORDBMS.

#### **TEXT BOOKS:**

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

- 1. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: "Database Systems: The Complete Book", Second Edition, Pearson International Edition
- 2. Chanda Ray (2012), Distributed Database Systems, 1st Edition, Pearson Education India.

# **19CS3271: ARTIFICIAL INTELLIGENCE**

#### (Professional Elective - II)

#### B.Tech. III Year II Sem.

L T P C 3 - - 3

# **Course Objectives**

- To train the students to understand different types of AI agents.
- Various AI search algorithms.
- Fundamentals of knowledge representation.
- To apply knowledge representation, reasoning.
- Study of Markov Models enable the student ready to step into applied AI.

# **Course Outcomes**

- Understand AI problems and problem solving agents and search strategies
- Apply advanced search techniques and acquire basic knowledge representation and reasoning logic.
- Apply reasoning under uncertainty.
- Understand learning strategies.
- Understand implementation of expert system.

# UNIT - I

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

#### UNIT - II

Advanced Search: Constructing Search Trees, Stochastic Search, A\* Search Implementation, Minimax Search, Alpha-Beta Pruning.

**Basic Knowledge Representation and Reasoning**: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

#### UNIT - III

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Non monotonic Reasoning, Other Knowledge Representation Schemes

**Reasoning Under Uncertainty**: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks.

#### UNIT - IV

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

#### UNIT - V

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

#### **TEXT BOOK:**

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, PrenticeHall, 2010.

- 1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
- 2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

# **19CS3272: COMPUTER GRAPHICS**

#### (Professional Elective - II)

#### B.Tech. III Year II Sem.

L	Т	Р	С
3	-	-	3

# **Course Objectives**

- The aim of this course is to provide an introduction of fundamental concepts and theory of computer graphics.
- Topics covered include graphics systems and input devices; geometric representations and2D/3D transformations; viewing and projections; illumination and colour models; animation; rendering and implementation; visible surface detection.

# **Course Outcomes**

- Acquire familiarity with the relevant mathematics of computer graphics.
- Be able to design basic graphics application programs, including animation
- Be able to design applications that display graphic images to given specifications.
- Implement 3-D geometric transformation and 3-D viewing.
- Apply Computer animation.

#### UNIT- I

**Introduction:** Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices.

**Output primitives**: Points and lines, line drawing algorithms (Bresenham's and DDA Algorithm), midpoint circle and ellipse algorithms.

Polygon Filling: Scan-line algorithm, boundary-fill and flood-fill algorithms

#### UNIT-II

**2-D geometrical transforms**: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.

**2-D viewing**: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland algorithms, Liang- Bersky line clipping algorithm, Hidden Line Elimination algorithm, Sutherland –Hodgeman polygon clipping algorithm.

# UNIT-III

**3-D object representation**: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Basic illumination models, Colour Models.

#### UNIT-IV

**3-D Geometric transformations**: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

**3-D viewing**: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping, Visible Surface Detection Methods.

#### UNIT-V

**Computer animation**: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications, morphing, tweening.

#### **TEXTBOOKS:**

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

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

# **19CS3273: INFORMATION RETRIEVAL SYSTEM**

#### (Professional Elective-II)

#### **B.Tech. III Year II Sem.**

L	Т	Р	С
3	-	-	3

# **Course Objectives**

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

# **Course Outcomes**

- Ability to understand IR principles to locate relevant information in large collections of data
- Ability to understand information extraction using indexing, and various data structure algorithms.
- Ability to design different document clustering algorithms and understand automatic indexing.
- Ability to use various search algorithms and perform information visualization.
- Ability to understand the ways to design an Information Retrieval System for web search tasks.

#### UNIT – I

**Introduction to Information Retrieval Systems:** Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses.

Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities.

#### UNIT - II

**Cataloging and Indexing:** History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction.

**Data Structure:** Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.

# UNIT - III

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages.

**Document and Term Clustering:** Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters.

# UNIT - IV

**User Search Techniques:** Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext.

**Information Visualization:** Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies.

#### UNIT - V

**Text Search Algorithms:** Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems.

**Multimedia Information Retrieval:** Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval, Web search basics. Web crawling and indexes.

#### **TEXT BOOKS:**

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

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

# **19CS3274: SOFTWARE TESTING METHODOLOGIES**

#### (Professional Elective-II)

#### B.Tech. III Year II Sem.

# L T P C 3 - - 3

# Prerequisites

• A course on "Software Engineering".

# **Course Objectives**

- To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
- To develop skills in performing manual testing.
- To develop skills in software test automation and management using latest tools.
- To provide knowledge in taking decision of when to use automation testing and manual testing based on the context to be tested.

#### **Course Outcomes**

- Acquire knowledge on STLC phases and consequences of bugs.
- Acquire skills to perform various testing techniques.
- Acquire knowledge on logic based testing and regular expressions.
- Demonstrate the test planning and management.
- Ability to develop skills in software test automation and management using latest tools.

#### UNIT- I

**Introduction:** Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs, STLC (software testing life cycle) phases.

**Flow graphs and Path testing:** -Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

# UNIT - II

**Integration Testing:** Integration Testing as a Type of Testing, Integration Testing as a Phase of Testing, Scenario Testing, Defect Bash.

**System and Acceptance Testing:** Overview, Functional Versus Non-Functional, Functional System Testing & Non-Functional, Acceptance Testing.

**Dataflow Testing:** - Basics of data flow testing, strategies in data flow testing, application of dataflow testing. **Regression Testing:** Introduction, Types, When to do Regression testing, how to do Regression Testing, Best Practices in Regression Testing.

#### UNIT- III

White Box Testing: Static Testing, Structural Testing, Challenges, Black Box Testing, and Logic Based Testing: Overview, decision tables, path expressions, kv charts, specifications.

**Paths, Path products and Regular expressions:** Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

#### UNIT-IV

**State, State Graphs and Transition testing:** State graphs, good & bad state graphs, state testing, Testability tips, Automation Testing versus Manual Flow Testing.

**Test Planning, Management, Execution and Reporting:** Introduction, Planning, Management, Process, and Reporting, Best Practices.

### UNIT - V

**Software Test Automation:** Terms used in Automation, Skills needed for Automation, What to Automate, Scope of Automation, Design and Architecture for Automation, Generic Requirements for Test Tools, Process Model for Automation, Selecting a Test Tool, Automation for Extreme Programming Model, Challenges. **Test Metrics and Measurements:** Metrics & Measurements, Types, Project, Progress, Productivity, Release

#### **TEXT BOOKS:**

- 1. Software Testing techniques BarisBeizer, Dreamtech, second edition.
- 2. Software Testing Tools Dr.K.V.K.K.Prasad, Dreamtech.
- 3. Srinivasa Desikan & Gopalaswamy Ramesh, "Software Testing Principles and Practices", Pearson Education, 2007.

- 1. The craft of software testing Brian Marick, Pearson Education.
- 2. Software Testing Techniques SPD(Oreille)
- 3. Software Testing in the Real World Edward Kit, Pearson.
- 4. Effective methods of Software Testing, Perry, John Wiley.
- 5. Art of Software Testing Meyers, John Wiley.
- 6. "Software Testing Effective Methods, Tools and Techniques", RenuRajani, Pradeep Oak, TMK.
- 7. Effective methods of Software Testing, Perry, John Wiley.
- 8. Art of Software Testing Meyers, John Wiley.

# **19CS3200: RESEARCH METHODOLOGIES**

**B.Tech. IV Year I Sem.** 

L T P C 3 - - 3

#### UNIT I

**RESEARCH DESIGN:** Motivation and objectives – Research methods vs. Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, concept of applied and basic research process, criteria of good research. Defining and formulating the research problem.

#### UNIT II

#### **RESEARCH ANALYSIS:**

Selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis.

#### UNIT III

**DATA COLLECTION**: Accepts of method validation, observation and collection of data, methods of data collection, sampling methods, data processing and analysis strategies and tools, data analysis with statically package (Sigma STAT,SPSS for student t-test, ANOVA, etc.), hypothesis testing.

#### UNIT IV

**RESEARCH ETHICS, IPR AND SCHOLARY PUBLISHING**: Ethics-ethical issues, ethical committees (human & animal); IPR- intellectual property rights and patent law, commercialization, copy right, royalty, trade related aspects of intellectual property rights (TRIPS); scholarly publishing- IMRAD concept and design of research paper, citation and acknowledgement, plagiarism, reproducibility and accountability.

#### UNIT V

**INTERPRETATION AND REPORT WRITING**: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of L T P C 45 15 0 4 Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports, Conclusions. 60

#### REFERENCES

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002.

# **B.Tech (Honors)**

**Offered** by

# Department of Computer Science & Engineering

R19-COURSE STRUCTURE & SYLLABUS III Year (Semester- I & Semester-II)

# **IV YEAR I- SEMESTER**

Sl.No	<b>Course Code</b>	Course Title	Mode of Learning	Credits
	Professional Elective – IV			
	19HCS41T1	Software Process & Project		
1		Management		2
1	19HCS41T2	Scripting languages	Conventional	C
	19HCS41T3	Internet of Things		
	19HCS41T4	Human Computer Interaction		
	<b>Professional</b>	Elective – V		
2	19HCS41T5	Soft Computing		
	19HCS41T6	Advanced algorithms	Conventional	3
	19HCS41T7	Natural language Processing		
	19HCS41T8	High Performance Computing		

# IV YEAR II-SEMESTER

Sl.N 0	Course Code	Course Title	Mode of Learning	Credits
1	19HCS42TP	Technical Paper Writing	Under Supervisor	2
	Professional El	ective - VI		
	19HCS42T1	Big Data Analytics		
2	19HCS42T2	Neural Networks & Deep		3
		Learning	MOOCS	
	19HCS42T3	Robotic Process Automation		
	19HCS42T4	Real Time Systems		

#### 19HCS41T1: SOFTWARE PROCESS & PROJECT MANAGEMENT (Professional Elective-IV)

#### B.Tech. IV Year I Sem.

L T P C 3 - - 3

#### **Course Objectives**

- A basic knowledge of software project management principles
- The ability to come up with a project schedule and assign resources
- Choose an appropriate project development methodology (e.g. waterfall, spiral ...)
- Identify project risks, monitor and track project deadlines.
- The capability to work in a team environment and be aware of different modes of communications.

#### **Course Outcomes**

- Identify and describe how different project contexts will impact upon all aspects of a software development project
- Identify and describe the key phases of project management and the key skills associated with each.
- Determine an appropriate project management approach through an evaluation of the business contextandprojectscopeandknowledgeofagileandtraditionalprojectmanagement approaches.
- Demonstrate through application, knowledge of the key project management skills, such as product and work break-down structure, schedule; governance including progress reporting, risk and quality management.
- As part of a small team research and produce a concise piece of writing suitable for presentation to senior management.

#### UNIT-I

**Conventional Software Management:** The waterfall model, conventional software Management performance. Overview of Project Planning – Stepwise Project Planning.

**Improving Software Economics:** Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

#### UNIT –II

**The old way and the new way:** The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life cycle phases: Engineering and production stages, Inception, Elaboration, Construction, Transition phases.

Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

# UNIT –III

Work Flows of the process: Software process workflows, Iteration workflows. Checkpoints of the process: Major milestones, Minor Milestones, Periodic status assessments.

**Iterative Process Planning**: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

#### UNIT-IV

Process Automation: Automation Building blocks.

**Project Control and Process instrumentation:** These Vencor Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation. **Tailoring the Process:** Process discriminants.

#### UNIT-V

#### **Project Organizations and Responsibilities:**

Line-of-Business Organizations, Understanding Behavior – Organizational Behavior **Future Software Project Management:** Modern Project Profiles, Next generation Software economics, modern process transitions.

Case Study: The command Center Processing and Display system-Replacement (CCPDS-R).

#### **TEXT BOOKS:**

1. Software Project Management, Walker Royce: Pearson Education, 2005.

- 1. Software Project Management, Bob Hughes and Mike Cotterell:Tata McGraw-HillEdition.
- 2. Software Project Management, Joel Henry, Pearson Education.
- 3. Software Project Management in practice, Pankaj Jalote, Pearson Education.2

#### 19HCS41T2: SCRIPTING LANGUAGES (Professional Elective-IV)

#### B.Tech. IV Year I Sem.

L T P C 3 - - 3

#### **Prerequisites:**

- A course on "Computer Programming and Data Structures"
- A course on "Object Oriented Programming Concepts"
- A course on "Web Technologies"

#### **Course Objectives**

- Introduces Ruby, Ruby on Rails, RubyGems and RubyTk scripting languages.
- Introduces scripting languages such as Extending Ruby and Embedding a Ruby Interpreter.
- Introduces PERL and Scripting.
- Introduces Advanced PERL to create Internet applications.
- Introduces TCL, Tk and Perl-Tk.

#### **Course Outcomes**

- Understand how to Comprehend the differences between Ruby, Ruby on Rails and RubyTk and Designing CGI scripts using Ruby and Web.
- Able to Understand and Extend the Ruby and Embedding a Ruby Interpreter.
- Ability to create and run scripts using PERL and able to translate from Perl/Tk to Ruby.
- Ability to create Internet ware applications by Advanced Perl.
- Acquire programming skills in TCL, Tk and Perl-Tk.

#### UNIT - I

**Introduction:** Ruby, Rails, Difference between Ruby and Ruby on Rails, The structure and Execution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Webservers, SOAP and web services, RubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling.

#### UNIT - II

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

#### UNIT - III

#### Introduction to PERL and Scripting :

Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, UsesforScriptingLanguages,WebScripting,andtheuniverseofScriptingLanguages.PERL-Names andValues,Variables,ScalarExpressions,ControlStructures,arrays,list,hashes,strings,patternand regular expressions, subroutines, Translating from Perl/Tk to Ruby.

# UNIT - IV

#### Advanced perl :

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

#### UNIT - V

TCL : TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface.Tk Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

#### **TEXT BOOKS:**

- 1. The World of Scripting Languages, David Barron, WileyPublications.
- 2. Ruby Progamming language by David Flanagan and Yukihiro MatsumotoO'Reilly
- 3. "Programming Ruby" The Pramatic Programmers guide by Dabve Thomas Secondedition

- 1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J. Lee and B. Ware (Addison Wesley) PearsonEducation.
- 2. Perl by Example, E. Quigley, Pearson Education.
- 3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
- 4. Tcl and the Tk Tool kit, Ousterhout, PearsonEducation.
- 5. Perl Power, J. P. Flynt, CengageLearning.

#### 19HCS41T3: INTERNET OF THINGS (Professional Elective-IV)

#### B.Tech. IV Year I Sem.

L T P C 3 - - 3

#### **Course Objectives**

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

#### **Course Outcomes**

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

#### UNIT - I

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

#### UNIT - II

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

#### UNIT - III

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

#### UNIT - IV

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

#### UNIT - V

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs

Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

#### **TEXT BOOKS:**

- 1. Internet of Things A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
- 2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

- 1. The Internet of Things in the Cloud: A Middleware Perspective Honbo Zhou CRC Press -2012
- 2. Architecting the Internet of Things Dieter Uckelmann; Mark Harrison; Florian Michahelles-(Eds.) Springer 2011
- 3. Networks, Crowds, and Markets: Reasoning About a Highly Connected World David Easley and Jon Kleinberg, Cambridge University Press 2010
- 4. The Internet of Things: Applications to the Smart Grid and Building Automation by Olivier Hersent, Omar Elloumi and David Boswarthick Wiley -2012
- 5. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things Key applications and Protocols", Wiley, 2012

#### 19HCS41T4 – HUMAN COMPUTER INTERACTION (Professional Elective-IV)

#### B.Tech. IV Year I Sem.

L T P C 3 - - 3

#### **Course Objectives**

- To gain an overview of human computer interaction(HCI).
- To become familiar with the vocabulary associated with sensory and cognitive systems as relevant to task performance by humans.

#### **Course Outcomes**

- Ability to apply HCI and principles to interaction design.
- Ability to design certain tools for blind or PHpeople.
- Ability to understand user interface design in general and alternatives to traditional "keyboard and mouse" computing.
- Able to implement HCI in software process.
- Able to apply models from cognitive psychology to predicting user performance in various HCI tasks and recognize the limits of human performance as they apply to computer operation.

#### UNIT-I

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

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

#### UNIT-II

**Design process** – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds and understanding business junctions.

ScreenDesigning:Designgoals–Screenplanningandpurpose,organizingscreenelements,orderingof screen data and content – screen navigation and flow – Visually pleasing **composition** – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web– statistical graphics– Technological consideration in interface design.

# UNIT-III

**Windows**–New and Navigation schemes selection of window, selection of devices based and screen-based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

#### UNIT-IV

**HCI in the software process**, The software lifecycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques ,Goals of evaluation, Evaluation

through expert analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction

#### UNIT-V

**Cognitive models Goal and task hierarchies Design Focus:** GOMS saves money Linguistic models The challenge of display-based systems Physical and device models Cognitive architectures Ubiquitous computing and augmented realities Ubiquitous computing applications research Design Focus: Ambient **Wood** – augmenting the physical Virtual and augmented reality Design Focus: Shared experience Design Focus: Applications of augmented reality Information and data visualization Design Focus: Getting the size right.

#### **TEXTBOOKS:**

- 1. The essential guide to user interface design, Wilbert OGalitz, WileyDreamTech.Units1,2, 3
- 2. Human-computer Interaction. AlanDix, JanetFincay, GreGoryd, Abowd, Russell Bealg, Pearson Education Units4,5

- 1. Designing the user interface.3rdEditionBenShneidermann,PearsonEducationAsia.
- 2. Interaction Design Prece, Rogers, Sharps. WileyDreamtech.
- 3. User Interface Design, SorenLauesen, PearsonEducation.
- 4. Human–Computer Interaction, D.R.Olsen, CengageLearning.
- 5. Human–Computer Interaction, Smith- Atakan, CengageLearning.

#### 19HCS41T5: SOFT COMPUTING (Professional Elective- V)

#### B.Tech. IV Year II Sem.

L T P C 3 - - 3

#### **Course Objectives**

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

#### **Course Outcomes**

On completion of this course, the students will be able to:

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

#### UNIT-I

Introduction to Soft Computing: Evolutionary Computing, "Soft" computing versus "Hard" computing,<br/>Soft Computing Methods, Recent Trends in<br/>SoftComputing,CharacteristicsofSoftcomputing,ApplicationsofSoftComputing Techniques.

#### UNIT-II

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

#### UNIT-III

Fuzzy Decision Making, Particle Swarm Optimization

#### **UNIT-IV**

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

#### UNIT-V

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

#### **TEXTBOOK:**

1. Soft Computing–Advances and Applications an 2015 by B.K.Tripathy and J.Anuradha – Cengage Learning

- 1. N.Sivanandam & S.N.Deepa, "Principles of Soft Computing", 2ndedition, Wiley India, 2008.
- 2. DavidE. Goldberg, "Genetic Algorithms-Education. In Search, optimization and Machine learning", Pearson
- 3. J.S.R.Jang, C.T.SunandE.Mizutani, "Neuro-Fuzzy and SoftComputing", Pearson Education, 2004.
- 4. G.J.Klir&B.Yuan, "FuzzySets & Fuzzy Logic", PHI, 1995.
- 5. MelanieMitchell,"An Introduction to Genetic Algorithm", PHI, 1998.
- 6. TimothyJ.Ross, "FuzzyLogic with Engineering Applications", McGraw- HillInternationaleditions, 1995.

#### 19HCS41T6: ADVANCED ALGORITHMS (Professional Elective- V)

#### B.Tech. IV Year II Sem.

L T P C 3 - - 3

#### **Pre-requisites:**

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

#### **Course Objectives:**

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

#### **Course Outcomes:**

- Ability to analyze the performance of algorithms
- $\bullet \quad Ability to choose appropriate data structures and algorithm design methods for a specified application$
- Abilitytounderstandhowthechoiceofdatastructuresandthealgorithmdesignmethodsimpactthe performance of programs.
- Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering.

#### UNIT-I

**Introduction:** Role of Algorithms in computing, Order Notation, Recurrences, Probabilistic Analysis and Randomized Algorithms. Sorting and Order Statistics: Heap sort, Quick sort and Sorting in Linear Time. **Advanced Design and Analysis Techniques:** Dynamic Programming- Matrix chain Multiplication, Longest common Subsequence and optimal binary Search trees.

#### UNIT-II

**Greedy Algorithms-** Huffman Codes, Activity Selection Problem. Amortized Analysis. **Graph Algorithms:** Topological Sorting, Minimum Spanning trees, Single Source Shortest Paths, Maximum Flow algorithms.

#### UNIT-III

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

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

#### UNIT-IV

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

#### UNIT-V

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

#### **TEXTBOOK:**

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

- 1. Fundamentals Of Computer Algorithms, EllisHorowitz, Satraj Sahniand Rajasekharam, Galgotia publications pvt.Ltd.
- 2. Design and Analysis Algorithms-ParagHimanshuDave, Himanshu Bhalchandra Dave Publisher:Pearson.
- 3. Algorithm Design: Foundations, Analysis and Internet examples, M.T.Good rich and R.Tomassia, JohnWileyand sons.
- 4. Data structures and Algorithm Analysis in C++, Allen Weiss, Second edition, Pearson education.

#### 19HCS41T7: NATURAL LANGUAGE PROCESSING (Professional Elective- V)

#### B.Tech. IV Year II Sem.

L T P C 3 - - 3

#### Prerequisites:

• Data structures, finite automata and probability theory

#### **Course Objectives**

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

#### **Course Outcomes**

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

#### UNIT – I

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models.

**Finding the Structure of Documents:** Introduction, Methods, Complexity of the Approaches, and Performances of the Approaches.

#### UNIT - II

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

#### UNIT - III

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

#### UNIT - IV

Predicate-Argument Structure, Meaning Representation Systems, Software.

UNIT - V

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

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

#### **TEXT BOOKS:**

1. Multilingual natural Language Processing Applications: From Theory toPractice– Daniel M. Bikel and Imed Zitouni, PearsonPublication.

2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S.Tiwary

#### **REFERENCES:**

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

#### 19HCS41T8: HIGH PERFORMANCE COMPUTING (Professional Elective- V)

#### B.Tech. IV Year II Sem.

L T P C 3 - - 3

#### **Prerequisites:**

• Computer networks

#### **Course Objectives**

- Knowledge on parallel programming paradigms, HPC platforms with particular reference to Cluster system.
- Understand the means by which to measure, assess and analyse the performance of HPC applications.

#### **Course Outcomes**

- Understand the role of HPC in science and engineering.
- Use HPC platforms and parallel programming models.
- Able to measure, analyze and assess the performance of HPC applications and their supporting hardware.
- Able to administration, scheduling, code portability and data management in an HPC environment, with particular reference to Grid Computing.
- Analyze the suitability of different HPC solutions to common problems found in Computational Science.

#### UNIT I

**Introduction:** Characteristics and requirements, Review of Computational Complexity, Performance: metrics and measurements, Granularity and Partitioning, Locality: temporal/spatial/stream/kernel, Basic methods for parallel programming, Real-world case studies (drawn from multi scale, multi-discipline applications).

#### UNIT -II

**High-End Computer Systems:** Memory Hierarchies, Multi-core Processors: Homogeneous and Heterogeneous, Shared-memory Symmetric Multiprocessors, Vector Computers, Distributed Memory Computers, Supercomputers and Peta scale Systems, Application Accelerators / Reconfigurable Computing, Novel computers: Stream, multithreaded, and purpose-built.

#### UNIT -III

**Parallel Algorithms:** Parallel models: ideal and real frameworks, Basic Techniques: Balanced Trees, Pointer Jumping, Divide and Conquer, Partitioning, Regular Algorithms: Matrix operations and Linear Algebra, Irregular Algorithms: Lists, Trees, Graphs, Randomi.

#### UNIT -IV

Parallel Programming: Revealing concurrency in applications, Task and Functional Parallelism, Task

Scheduling, Synchronization Methods, Parallel Primitives (collective operations), SPMD Programming (threads, OpenMP, MPI), I/O and File Systems, Parallel Matlabs (Parallel Matlab, Star-P, Matlab MPI), Partitioning Global Address Space (PGAS) languages (UPC, Titanium, Global Arrays

#### UNIT -V

**Performance:** Measuring performance, Identifying performance bottlenecks, restructuring applications for deep memory hierarchies, Partitioning applications for heterogeneous resources, using existing libraries, tools, and frameworks.

#### **TEXT BOOKS:**

1. Contemporary High Performance Computing by Jeffrey S. Vetter ,Released November 2017, Publisher(s): Chapman and Hall/CRC , ISBN: 9781466568358.

#### **REFERENCES:**

1. High Performance Computing by Charles Severance & Kevin Dowd, Copyright Year: 2010, Last Update: 2021, Publisher: OpenStax CNX.

#### **19HCS42TP: TECHNICAL PAPER WRITING**

#### B.Tech. IV Year II Sem.

#### L T P C 3 - - 3

#### **GENERAL INSTRUCTIONS**

- 1. Project must be carried out by an Individual Student only.
- 2. Problem Statement must be determined clearly before Proceeding into the project Reviews.
- 3. Implementation work must be carried out during the stages of the project.
- 4. Final Research Work must convert to article and publish the same in Scopus Journals.

#### 19HCS42T1: BIG DATA ANALYTICS (Professional Elective- VI)

#### B.Tech. IV Year II Sem.

L T P C 3 - - 3

#### **Course Objectives:**

- To introduce the concepts of Big Data Analytics.
- To introduce the concept of Big Data Architecture
- To introduce tools/algorithms that is available for a variety of analytics.
- To introduce the Database for Modern Web.

#### **Course Outcomes:**

- Know about sources of BigData and Analyzing Tools.
- Map statistical methods to analyze huge data.
- Know the other frameworks in Distributed File Systems.
- Know to create cluster in Hadoop distributed file system.
- Apply Map Reduction in HDFS.

#### NIT – I

**INTRODUCTION TO BIG DATA:** Introduction –distributed file system –Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce.

#### UNIT – II

**INTRODUCTION TO HADOOP AND HADOOP ARCHITECTURE:** Big Data – Apache Hadoop & Hadoop EcoSystem, Moving Data in and out of Hadoop –Understanding inputs and outputs of MapReduce - Data Serialization.

#### UNIT – III

**HDFS, HIVE AND HIVEQL, HBASE HDFS:** Overview, Installation and Shell, Java API; Hive Architecture and Installation, Comparison with Traditional Database, HiveQL, Querying Data, Sorting And Aggregating, Map Reduce Scripts, Joins & Sub queries, HBase concepts, Advanced Usage, Schema Design, Advance Indexing, PIG, Zookeeper, how it helps in monitoring a cluster, how to Build Applications with Zookeeper.

#### UNIT –IV

**SPARK:** Introduction to Data Analysis with Spark, Downloading Spark and Getting Started, Programming with RDDs, Machine Learning with MLlib. **NoSQL** What is it?, Where It is Used, Types of NoSQL databases, Why NoSQL?, Advantages of NoSQL, Use of NoSQL in Industry, SQL vs NoSQL, NewSQL.

#### UNIT –V

**DATA BASE FOR THE MODERN WEB:** Introduction to MongoDB key features, Core Server tools, MongoDB through the JavaScript's Shell, Creating and Querying through Indexes, Document-Oriented data, principles of schema design, Constructing queries on Databases, collections and Documents, MongoDB Query Language.

#### **TEXT BOOKS:**

- 1. Boris lublinsky, Kevin t. Smith, AlexeyYakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 19788126551071, 2015.
- 2. Chris Eaton, Dirk derooset al., "Understanding Big data", McGraw Hill, 2012.
- 3. BIG Data and Analytics, Sima Acharya, Subhashini Chhellappan, Willey
- 4. MongoDB in Action, Kyle Banker, Piter Bakkum, Shaun Verch, Dream tech Press
- 5. Tom White , "HADOOP: The definitive Guide", O Reilly 2012.
- 6. VigneshPrajapati, "Big Data Analytics with R and Hadoop", Packet Publishing 2013.http://www.bigdatauniversity.com/
- 7. Learning Spark: Lightning Fast Big Data Analysis Paperback by Holden Karau

- 1. Michael Minelli, Michele Chambers, Ambiga Dhiraj, JimStogdill, "BigData BigAnalytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", 1stEdition,Wiley Publications,2013.
- Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012 3. PeteWarden, "Big Data Glossary", O'Reilly, 2011..

#### 19HCS42T2: NEURAL NETWORKS & DEEP LEARNING (Professional Elective- VI)

#### **B.Tech. IV Year II Sem.**

L T P C 3 - - 3

#### **Course Objectives**

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

#### **Course Outcomes**

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

#### UNIT-I

**Artificial Neural Networks:** Introduction, benefits of Neural networks –,Model of Artificial Neuron, Neural Network Architectures – Learning Methods, important terminologies, applications.

Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

#### UNIT-II

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

#### UNIT - III

**Introduction to Deep Learning**: Historical Trends in Deep learning, Deep Feed - forward networks-Convolutional Neural Network- Basic structure of Convolutional Network, Case studies: Alex net, VGG-Net, GoogLeNet, Applications of CNN– Object D Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

#### UNIT - IV

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

#### UNIT - V

**Optimization for Train Deep Models:** Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second Order Methods, Optimization Strategies and Meta-Algorithms **Applications:** Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing.

# **TEXT BOOKS:**

- 1. Deep Learning: An MIT Press Book By Ian Goodfellow and Yoshua Bengio and Aaron Courville
- 2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.

#### 19HCS42T3: ROBOTIC PROCESS AUTOMATION (Professional Elective- VI)

#### B.Tech. IV Year II Sem.

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3	-	-	3

#### **Prerequisites:**

- Programming Concepts Basics ,Understanding the application,
- Basic Web Concepts, Protocols, Email Clients, Data Structures

#### **Course Objectives**

- To understand the Basics of Robotic Process Automation
- Identify the intensity of Design Robotic Process Automation
- To comprehend the installation process of RPA Tools
- To understand the control structure to design RPA Application
- To know the way of interaction of Robotic Process Automation with external Applications
- To understand the Exception Handling Mechanism in RPA

#### **Course Outcomes**

- knowledge on Robotic Process Automation
- ability to compare RPA with Non Automation process
- Skills to Design RPA with Internal interactions
- Skills to Design RPA with External Application interaction
- Knowledge on implement RPA using Exception Handling mechanism

#### UNIT - I

**Processes, Software Design, SDL C**: Programming Concepts Basics – 2 : Scripting, .Net Framework, .Net ,Fundamentals, Control structures and functions, XML, HTML, CSS, Varibles & Arguments.

**RPA Basics**: History of Automation, What is RPA,RPA vs Automation, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated, Types of Bots, Workloads, which can be automated.

#### UNIT - II

**RPA Advanced Concepts**: Standardization of processes, RPA Development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case, RPA Team. Process Design Document/Solution Design Document, Industries best suited for RPA, Risks, & Challenges with RPA, RPA and emerging ecosystem.

**Installation**: Installing Studio community edition, The User Interface, Keyboard Shortcuts, About Updating, About Automation Projects, Introduction to Automation Debugging, Managing Activation Packages, Reusing Automations Library, Installing the Chrome Extension, Installing the Firefox Extension, Connecting your project to a source control system, Activities Guide.

**Variables :** Managing Variables, Naming Best Practices, The Variables Panel, Generic Value Variables, Text Variables, True or False Variables, Number Variables, Array Variables ,Date and Time Variables, Data Table Variables, Managing Arguments, Naming Best Practices, The Arguments Panel, Using Arguments, About Imported Namespaces, Importing New Namespaces.

#### UNIT - III

**Control Flow**: Control Flow Introduction, If Else Statements, Loops, Advanced Control Flow, Sequences, Flowcharts, About Control Flow, Control Flow Activities, The Assign Activity, The Delay Activity, The Do While Activity, The If Activity, The Switch Activity, The While Activity, The For Each Activity, The Break Activity.

**Data Manipulation** :Data Manipulation Introduction, Scalar variables, collections and Tables, Text Manipulation, Data Manipulation, Gathering and Assembling Data.

**Recording and Advanced UI Interaction** :Recording Introduction, Basic and Desktop Recording, Web Recording, Input / Output Methods, Screen Scraping, Data Scraping, Scraping advanced techniques.

**Selectors** :Selectors, Defining and Assessing Selectors, Customization, Debugging, Dynamic Selectors, Partial Selectors, RPA Challenge.

#### UNIT- IV

Advanced Automation concepts and techniques: Image, Text & Advanced Citrix Automation :Introduction to Image & Text, Automation, Image based automation, Keyboard based automation, Information Retrieval, Advanced Citrix Automation challenges, Best Practices, Using tab for Images, Starting Apps.

**Excel Data Tables & PDF** : Data Tables in RPA, Excel and Data Table basics, Data Manipulation in excel, Extracting Data from PDF, Extracting a single piece of data, Anchors, Using anchors in PDF.

Email Automation: Email Automation, Incoming Email automation, Sending Email automation.

#### UNIT- V

**Exceptional Handling & Best Practice:** Debugging and Exception Handling: Debugging Tools, Strategies for solving issues, Catching errors.

**Introduction to Orchestrator** Orchestrator: Tenants, Authentication, Users, Roles, Robots, Environments, Queues & Transactions, Schedules.

**Emerging and Future Trends in IT**: Emerging and Future Trends in IT : Artificial Intelligence, Machine Learning, Agent awareness, Natural Language Processing, Computer Vision.

#### **Text Books:**

- 1. Learning Robotic Process Automation by Alok Mani Tripathi, Published by Packt Publishing Ltd.
- 2. Robotic Process Automation Succinctly By Ed Freitas Foreword by Daniel Jebara
- 3. Robotic Process Automation by Nividous
- 4. Robotic Process Automation NICE Special Edition by NICE RPA team with Steve Kaelble, Published by: John Wiley & Sons, Ltd., The Atrium, Southern Gate.

#### 19HCS42T4: REAL TIME SYSTEMS (Professional Elective- VI)

#### B.Tech. IV Year II Sem.

L T P C 3 - - 3

#### **Prerequisite:**

• Programming and Data Structures, Operating Systems, Computer Architecture and Organization Computer Communication, Database Systems.

#### **Course Objectives**

- $\bullet \ \ To provide broad understanding of the requirements of Real Time Operating Systems$
- To understand real-time operating system (RTOS) and the types of RTOS
- To learn various approaches to real-time scheduling
- To learn software development process and tools for RTOS applications

#### **Course Outcomes**

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

#### UNIT-I

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

#### UNIT-II

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

#### UNIT-III

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

#### UNIT-IV

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

#### UNIT-V

Case Studies of RTOS: RT Linux, Micro C/OS-II, VxWorks, Embedded Linux, and Tiny OS.

#### **TEXT BOOKS:**

- 1. Real Time Concepts for Embedded Systems- QingLi, Elsevier, 2011
- 2. Rajib Mall, "Real-Time Systems: Theory and Practice," Pearson, 2008.

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