Semester VI

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Navrachana University
Bachelor of Technology (Information Technology)

Course Code:
Course Name: Theory of Computation LTPC: 3-0-0-3

Unit - 1: Finite Automata

Introduction- Basic Mathematical Notation and techniques- Finite State systems – Basic Definitions – Finite Automaton – DFA & NDFA – Finite Automaton with €- moves – Regular Languages- Regular Expression – Equivalence of NFA and DFA – Equivalence of NDFA‟s with and without €-moves – Equivalence of finite Automaton and regular expressions –Minimization of DFA- – Pumping Lemma for Regular sets – Problems based on Pumping Lemma.

Unit - 2: Grammars

Grammar Introduction– Types of Grammar – Context Free Grammars and Languages– Derivations and Languages – Ambiguity- Relationship between derivation and derivation trees – Simplification of CFG – Elimination of Useless symbols – Unit productions – Null productions – Greiback Normal form – Chomsky normal form – Problems related to CNF and GNF.

Unit - 3: Pushdown Automata

Pushdown Automata- Definitions – Moves – Instantaneous descriptions – Deterministic pushdown automata – Equivalence of Pushdown automata and CFL – pumping lemma for CFL – problems based on pumping Lemma.

Unit - 4: Turing Machines

Definitions of Turing machines – Models – Computable languages and functions –Techniques for Turing machine construction – Multi head and Multi tape Turing Machines – The Halting problem – Partial Solvability – Problems about Turing machine- Chomskian hierarchy of languages.

Reference Books:

1. Hopcroft J.E., Motwani R. and Ullman J.D, “Introduction to Automata Theory, Languages and Computations”, Second Edition, Pearson Education, 2008.
2. John C Martin, “Introduction to Languages and the Theory of Computation”, Third Edition, Tata McGraw Hill Publishing Company, New Delhi, 2007.

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Course Code:
Course Name: Artificial Intelligence LTPC: 3-0-0-3

Unit - 1: Basics of AI

Tree and Graph data structure, What is ontology? Semantic network, Frame, Structural knowledge, Declarative knowledge, Procedural knowledge, Propositional logic: Definition of logic formula, Meaning of logic formula, Classification of logic formula, Proof based on truth table, Basic laws, Clausal form/Conjunctive canonical form, Formal proof.

Unit - 2: Prediate logic and fuzzy logic

Predicate logic: Term and logic formula, Clausal form/Conjunctive canonical form, Standardization of logic formula, Unification and resolution, Horn clause and Prolog, Fuzzy logic: Fuzzy set, Membership function, Notation of fuzzy set, Operations of fuzzy set, Fuzzy number and operations, Extension principle, Fuzzy rules, De-fuzzification, Fuzzy control

Unit - 3: Pattern Recognization and ANN

Patterns: Concept and concept learning, Pattern classification and recognition, Feature vector representation of patterns, Nearest neighbor based learning, Discriminant function and decision boundary, Multi-class pattern recognition, General formulation of machine learning, The k-means algorithm, ANN: What is a neural network? Model of one neuron, Learning rules for one neuron, Layered neural network, Learning of multilayer neuron network, ANN.

Unit - 4: GA and Decision Tree

GA: Definition, Notions, Initial population, Fitness function, Selection, Crossover, Mutation, Termination, Decision Tree: Review of useful tree structures, What is a decision tree? Make a decision using decision tree, Induction of decision trees, Neural network decision tree, Induction of neural network decision trees.

Reference Books:

1. Stuart Russell and Peter Norvig, Artificial Intelligence – A Modern Approach (3rd Edition)
2. Denis Rothman, Artificial Intelligence By Example

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Course Code:
Course Name: Mobile Application Development LTPC: 1-0-4-3

Unit - 1:
Introduction to Android: Why Android? Android Run Time, Android Studio, Introduction to Gradle, Fundamentals: Basic Building blocks – Activities, Services, Broadcast Receivers & Content providers, UI Components- Views & notifications, Components for communication -Intents & Intent Filters, Android API levels), Application Structure: AndroidManifest.xml, uses-permission, Activity/services/receiver declarations, Resources & R.java, Layouts & Drawable Resources, Activities and Activity lifecycle

Unit - 2:
Emulator: Launching emulator, Editing emulator settings, Emulator shortcuts, Logcat usage, Android Device Monitor (ADM), File explorer, Intents: Explicit Intents, Implicit intents, Basic UI design, Styles & Themes: Form widgets, Text Fields, Layouts -RelativeLayout,TableLayout, FrameLayout, LinearLayout, Nested layouts, styles.xml, drawable resources for shapes,gradients(selectors), Style attribute in layout file, Applying themes via code and manifest file,AlertDialogs& Toast, Time and Date, Images and media.

Unit - 3:
Menu: Option menu And Action Bar, Context menu and contextual action mode, Popup menu, menu from xml, menu via code, Linkify, MatchFilter&TransformFilter, Adapters:ArrayAdapters,BaseAdapters,ListView and ListActivity, Custom listview,GridView using adapters, Gallery using adapters, Android Session and Session management, Content Providers: SQL, DML & DDL Queries in brief,SQLiteDatabse,SQLiteOpenHelper, Cursor, SQLite Programming, Reading and updating Contacts, Android Debug Bridge(adb) tool, Broadcast Receivers, Services.

Unit - 4:
Notifications: Alarm, Via service, Customize, Toast, Dialogs, Tabs, Animated popup panels, Grid view,Spinner,Thread,AsynTask, XML Parsing, Android JSON parsing using Volley, How to create REST API for Android app using PHP,Mysql, Accessing Phone services, Fragments: Introduction to fragments, Fragments Life Cycle, Fragments in Activity, Google Maps V2 using Fragments, Develop Fragment based UI designs, Location based Services, GPS, Geocoding, Network connectivity services, Sensors(Accelerometer, Gyroscope), Using Wi-Fi& Bluetooth, Google Cloud Messaging for Android, App Widgets.

Reference Books

1. John Horton, Android Programming for Beginners: Learn all the Java and Android skills you need to start making powerful mobile applications (2015)
2. Dawn Griffiths, David Griffiths, Head First Android Development: A Brain-Friendly Guide 1st Edition
3. Neil Smyth, Android Studio Development Essentials - Android 6 Edition (2015)

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Course Code:
Course Name: Advanced .NET Concpets LTPC: 1-0-4-3

Unit - 1:
Intermediate Language - the native language of .NET, and dynamically generating code, How the CLR works.

Unit - 2:
Optimizing the performance of your applications and profiling their usage of system resources

Unit - 3:
Thread synchronization in .NET, Advanced Windows applications

Unit - 4:
Managing resources on a machine using WMI, Security and cryptography in .NET

Reference Book:

1. Simon Robinson, Advanced .NET Programming by (2002)

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Course Code:
Course Name: Embedded Systems (Elective Chain – 1) LTPC: 3-0-0-3

Unit - 1: Embedded Processors
Types of Processors: Microcontrollers, DSP Processors, Graphics Processors, Parallelism: Parallelism vs. Concurrency: Pipelining, Instruction-Level Parallelism, Multicore Architectures

Unit - 2: Memory Architectures
Memory Technologies: RAM, Non-Volatile Memory, Memory Hierarchy, Memory Maps, Register Files, Scratchpads and Caches, Memory Models, Memory Addresses, Stacks, Memory Protection Units, Dynamic Memory Allocation

Unit - 3: Input and Output
I/O Hardware: General-Purpose Digital I/O, Serial Interfaces, Parallel Interfaces, Buses, Sequential Software in a Concurrent World, Interrupts and Exceptions, Atomicity, Timers, Interrupt Controllers, Modeling Interrupts, The Analog/Digital Interface, Digital to Analog and Analog to Digital Converters, Signal Conditioning, Sampling and Aliasing

Unit - 4: Multitasking
Threads, Creating Threads, Implementing Threads, Mutual Exclusion, Deadlock, Memory Consistency Models, The Problem with Threads, Processes and Message Passing

Reference Books:

1. Introduction to Embedded Systems by Edward Ashford Lee, Sanjit A. Seshia UC Barkley

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Course Code:
Course Name: Introduction to Microprocessor (Elective Chain – 1) LTPC: 2-0-0-2

Unit - 1: Raspberry PI overview
PI board overview, PI's peripherals, USB power supply, microSD card with NOOBS, USB Keyboard and mouse, HDMI Cable, Connecting the microSD card, keyboard, mouse, display, network cable, power supply.

Unit - 2: Raspbian Overview
Installing Raspbian on PI board, web browser, file manager, libra office, configuration tools.

Unit - 3: Programming with python on PI
Introducing the Thonny Python IDE, first Python program, loops and code indentation, Conditionals and variables, import command, Working with images, sleep() function, Introducing the GPIO header, Electrical components: breadboard, Jumber wires, push button, LED, Resistors, Reading resistor colour codes, LED control, Reading a button in Python, controlling a buzzer

Unit - 4:
Case studies

Reference Books:

1. THE OFFICIAL Raspberry Pi Beginner's Guide by Gareth Halfacree, Raspberry PI Press

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Course Code:
Course Name: Real World ML Algorithms (Elective Chain – 2) LTPC: 3-0-0-3

Unit - 1:
What is Supervised Learning? What is Regression Problem? Linear Regression Algorithm, Gradient descentalgorithm, ANN based Algorithms

Unit - 2:
What is Classification Problem? Logisting Regression algorithms, K-nearest neighbours Algorithm, SVMAlgroithm

Unit - 3:
Wha is Unsupervised Learning? What is Clustering? Hierarchical clustering, K-means clustering, K-NN (k nearest neighbors), Principal Component Analysis. What is Association?

Unit - 4:
Other ML based systems: Recommender Systems, Online Systems.

Reference Books:

1. Machine Learning (2017) by Tom M. Mitchell
2. Understanding Machine Learning: From Theory to Algorithms (2015) by Shai Shalev-Shwartz, Shai Ben-David

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Course Code:
Course Name: ML with Matlab (Elective Chain – 2) LTPC: 2-0-0-2

Unit - 1:
Introduction of MATLAB, MATLAB basic Functions

Unit - 2:
Visualization, Conditional statements

Unit - 3:
Overview of Linear Algebra, Linear Regression Algorithm With Single Variable

Unit - 4:
Linear Regression with multiple variable

Reference Books:

1. MATLAB for Machine Learning (2017) by Giuseppe Ciaburro
2. MATLAB Machine Learning 1st ed. Edition by Michael Paluszek, Stephanie Thomas
3. MACHINE LEARNING with MATLAB: The Art and Science That Make Sense of Data by Kaushal Sharma, Kshitij Singh

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Course Code:
Course Name: Statistics for Data Science (Elective Chain – 3) LTPC: 3-0-0-3

Unit - 1:
Introduction to Statistics, Harnessing Data

Unit - 2:
Exploratory Analysis, Distributions

Unit - 3:
Hypothesis & computational Techniques

Unit - 4:
Correlation & Regression

Reference Books:

1. Statistics for Data Science (2017) by James D. Miller
2. Probability and Statistics for Engineers and Scientists: PNIE, 9e (2013) by Walpole

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Course Code:
Course Name: Data Analysis using R (Elective Chain – 3) LTPC: 3-0-0-3

Unit - 1:
Introduction to Data Analysis, The building blocks of R, Vectors and vector operations

Unit - 2:
Matrices, Fundamentals of programming with R, Data frames

Unit - 3:
Manipulating data, Visualizing data, Exploratory data analysis,

Unit - 4:
Hypothesis Testing, Linear Regression Analysis

Reference Books:

1. Data Analysis with R (2015) by Anthony Fischetti
2. Data Analysis with R: A comprehensive guide to manipulating, analyzing, and visualizing data in R, 2nd Edition (2018) by Tony Fischetti

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Course Code:
Course Name: Data Modeling and Analysis (Elective Chain – 4) LTPC: 3-0-0-3

Unit - 1:
Why use Data Model? Types of Data Models: Logical and Physical, Conceptual Model: Entity, Attribute, Relationship, Data Modeling concepts: Data type, domain, Default Value, Advantages and Disadvantages of Data Model.

Unit - 2:
Designing Logical Data Models

Unit - 3:
Designing Physical Data Models

Unit - 4:
Leveraging Data Models on Agile and DevOps Projects

Reference Books:

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Course Code:
Course Name: Manual Testing Methodologies (Elective Chain – 4) LTPC: 2-0-0-2

Unit - 1: Desktop and Web application functional Testing
Techniques of Desktop Testing, Compatibility testing/Cross browser testing, Configuration testing -Intersystem testing, Functionality testing, User Interface-Manual support testing, Techniques of Web Application Testing, Usability testing-Compatibility testing

Unit - 2: Mobile Application Functional Testing
Techniques of Desktop Testing, User Interface-Manual support testing, Functionality testing-Compatibility testing, Configuration testing-Intersystem testing, Techniques of Web application Testing, Usability testing-Compatibility testing, GUI testing-Security Testing, Performance testing-Stress testing, Load Testing, Bugzilla

Unit - 3: Manual Non-functional Testing
SEO Testing, Accessibility Testing, Security Testing

Unit - 4: Functional Automation Testing
Functional Testing Tools – Selenium, QTP, Tosca etc., Automation approach – data driven/ keyword driven/ hybrid/ BDD, Introduction to selenium, QTP vs Selenium, Selenium architecture, Selenium features, How differs from other automation tools, Scope of Selenium, Advantages of selenium, Download and Installation, Object, CSS, XPath, Elements Identificationapproach (Firepath& Self-identification), Commenting Code, Scripting and execution with Selenium WebDriver, Grid, Cross Browser Execution with Selenium, Page Object/Page Factory methodology, Usage of JavaScriptExecutor in Selenium, Window/ iframe handling in Selenium, Reporting: TestNG, Extent

Reference Books:

1. SOFTWARE TESTING AND QUALITY ASSURANCE Theory and Practice by KSHIRASAGAR NAIK and PRIYADARSHI TRIPATHY, Wiley & Sons, Inc.
2. The Art of Software Testing, Second Edition by Glenford J. Myers and Tom Badgett, Todd M. Thomas and Corey Sandler John, Wiley & Sons, Inc.

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