NOTIFICATION

No. 113 /2023 Date : 14/08/2023

Subject: Revised Syllabi of Semester IV to VIII along with the details of the practical subjects of B.E. (Information Technology) (CBCS) as per AICTE Model Curriculum.

It is notified for general information of all concerned that the authorities of the University have accepted to implement the revised Syllabi of Semester IV to VIII along with the details of the practical subjects of B.E. (Information Technology) (CBCS) as per AICTE model Curriculum to be implemented from the academic session 2023-2024 onwards as given below:

Sd/-
(Dr.T.R.Deshmukh)
Registrar
Sant Gadge Baba Amravati University

REVISED SYLLABI PRESCRIBED FOR SEMESTER IV TO VIII OF B.E. (INFORMATION TECHNOLOGY)

Course Code : 4IT04	**Course Title: Data Structures**	LTPC:L-3, C-3
Course Prerequisite:	1. Basic C programming 2. Knowledge of Algorithms	
Course Objectives:	1. To provide knowledge about various data structure. 2. To equip the student with ability to identify and analyze the usageof various data structures. 3. To make the students aware about searching and sorting methods.	
Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to 1. Define basic terminologies related to data structures and implement pattern matching algorithms. 2. Study and implement Arrays with various operations and its applications. 3. Study and implement Linked list and its types with various operations. 4. Study and implement stacks, queues and its applications. 5. Study and implement different type of trees with various operations. 6. Study and implement graphs with various operations and different sorting methods.	
Unit I:	Unit Title: Data Structure Basics and Pattern Matching	Hours:06
Data structures basics, algorithmic notations & functions, Complexity of algorithms, Sub-algorithms.String processing: storing strings, pattern matching algorithms – Fast and slow.		
Unit II:	Unit Title: **Arrays**	Hours:06
Linear arrays and their representation in memory, traversing linear arrays, inserting & deleting operations, Bubble sort, Linear search and Binary search algorithms. Multidimensional arrays, Pointer arrays. Recordstructures and their memory representation. Matrices and sparse matrices.		
Unit III:	Unit Title: **Linked List**	Hours: 06
Linked lists and their representation in memory, traversing a linked list, searching a linked list. Memoryallocation & garbage collection. Insertion deletion operations on linked lists. Header linked lists, Two-way linked lists.		
Unit IV:	Unit Title: **Stacks & Queues**	Hours: 06
Stacks and their array representation. Arithmetic expressions: Polish notation. Quick sort, an applicationof stacks, Implementation of recursive procedures by stacks, Queues, Priority queues		
Unit V:	Unit Title: **Trees**	Hours: 06
Trees, Binary trees & and their representation in memory, Traversing binary trees. Traversal algorithms using stacks, Header nodes : threads, Binary Search Trees-Searching, insertion and deletion in BST. Heapand heapsort, Path length & Huffman's algorithm		
Unit VI:	Unit Title: **Graph Theory &Sorting Algorithms**	Hours: 06
Graph theory, sequential representations of graphs, Warshalls' algorithm, Linked representation,operations & traversing the graphs, Insertion Sort, Selection Sort. Radix sort, Merge Sort		
Text Book: Seymour Lipschutz: Data Structures , Schaum□s Outline Series, McGraw-Hill, Int. Editions.		

Reference Books:
1. Ellis Horowitz, Sartaj Sahni: Fundamentals of Data Structures, CBS Publications.
2. Data Structure Using C, Balagurusamy.
3. Standish: Data Structures in Java, Pearson Education.
4. Trembley, Sorenson: An Introduction to Data Structures with Applications, McGraw Hill.

5IT01 DATABASE MANGEMENT SYSTEMS

Course Objectives:
1. To understand the fundamental concepts of database management system and its applications.
2. To learn database query languages.
3. To Understand concept of designing database schema and its mapping to relational table.
4. To Apply the concepts of database integrity and Normalization.
5. To Understand the concept of transaction management and its properties.
6. To Understand concept of concurrency control and various types of protocol.

Course Outcomes:
1. Understand the database terminology, Design entity relationship and convert entity relationship diagrams into RDBMS.
2. Understand relational algebra, relational databases and formulate SQL queries on the database.
3. Apply constraints and normalization on databases.
4. Apply ACID properties for transaction management and concurrency control.
5. Understand the concept of Concurrency control and study of various database protocols.
6. Understand Database security.

Unit I: **Introduction to DBMS:**
Database System Applications, Purpose of database systems, View of Data, Database Languages, Database Architecture, Database Users and Administrators, Entity- Relationship Model, Constraints, Removing redundant attributes in Entity sets, E-R diagrams, Reduction to Relational Schemas, E-R design issues, Extended E-R Features.

Unit-II: **Relational Data Model:**
Relational Model: Structure of Relational Databases, Database schema, keys, schema diagram, relational query languages, relational operators, The Relational Algebra, **Normalization**: functional dependencies, Decomposition, Domain & data dependency, types of Normal forms: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF;

Unit-III: **SQL Introduction:**
SQL: Characteristic, advantages, data types, operators, wildcard operators, expressions, **Database Commands:** create, drop, select and show database, Create table, drop table, Query with Select statements, Insert statement, Update statement, Delete statement with use of where, and, or clauses, Use of like and top clause, Alter command, Distinct Command, View in SQL, Create view using one or multiple table, delete view, Index creation & Drop, Null Values, SQL sub queries rules, sub queries using select, insert, update, delete statements, **SQL clauses:** having, group by, order by, join, **SQL Aggregate functions:** Count, sum average, max, min; Date function, **SQL Join:** inner, left, right, full.

Unit-IV: **Transaction Management:**
Transaction Concept, Simple transaction model, Storage structure, Transaction Atomicity and Durability, transaction isolation, Serializability, transaction isolation and atomicity, transaction isolation levels, Implementation of Isolation levels, Transactions as SQL statements.

Unit-V: **Concurrency Control:**
Lock-Based Protocols, Deadlock Handling, Multiple Granularities, Timestamp- Based Protocols, Validation-Based Protocols, Multiversion schemes.

Unit-VI: **Database Security:**
Authentication, Authorization and access control, DAC, Mandatory Access Control and Role- Based Access Control models, Intrusion detection, SQL injection.

Text Book: Korth, Sudarshan : Database System Concept , Mc Graw Hill, 6th Edition.

Reference Books:
1. Raghu Ramkrishnan : ‘Database system’.
2. C.J.Date : ‘Database System’, 7th edn.
3. Connolly & Begg : “Database System”, Low Price Ed.

Course Code: 6IT03	**Course Title: Artificial Intelligence**	L-T-P-C: T
Course Prerequisite:	Discrete Structure and Graph Theory	
Course Objectives:	1. To acquire the basic concepts of AI 2. To Formulate Problems and Evaluation of Uniformed Search Strategies 3. To Understand the various searching techniques, constraint satisfaction problem and example problems - game playing techniques. 4. To make aware about knowledge-based systems and Predicate Logic 5. To learn Non monotonic & Statistical Reasoning 6. To understand advanced topics of AI based learning.	
Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to: This course meets the following student outcomes: 1. Explain concepts of Artificial Intelligence and different types of intelligent agents and their architecture. 2. Evaluate different uninformed search algorithms on well formulate problems along with stating valid conclusions that the evaluation supports. 3. Can design and analyze informed search algorithms on well formulated problems. 4. Formulate and solve given problem using Propositional and First order logic. 5. Apply reasoning for non-monotonic AI problems. 6. Have a basic understanding of some of the more advanced topics of AI such as learning, Understanding, Natural Language Processing.	
Unit I:	Unit Title: **Introduction to Artificial Intelligence**	Hours:06
Introduction: What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Risks and Benefits of AI, Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.		
Unit II:	Unit Title: **Basic Problem Solving & Search Strategies**	Hours: 06
Problems, Problem Space and Search: Production Systems, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs. Problem trees and graphs. **Uninformed Search Strategies**: Breadth First Search, Depth First Search, Depth Limited Search, Iterative Deepening Depth First Search, Bidirectional Search.		
Unit III:	Unit Title: **Informed Search Strategies**	Hours: 06
Generate-and-Test, Hill Climbing, Best-first Search, A* Algorithm, Problem Reduction, AND-OR Graphs, The AO* Algorithm, Minmax Algorithm. Constraint Satisfaction, Means ends Analysis.		
Unit IV:	Unit Title: **Knowledge Representation using Predicate Logic**	Hours: 06
Knowledge Representation and approaches, Representing simple facts in logic, augmenting the representation, resolution, conversion to clause form, Resolution in Propositional Logic and Predicate Logic, Unification Algorithms, Question Answering and Natural Deduction.		
Unit V:	Unit Title: **Symbolic Reason under Uncertainty**	Hours: 06
Introduction to Non-Monotonic Reasoning, Logics for Non-Monotonic Reasoning, Semantic Nets, Statistical Reasoning, **Statistical Reasoning:** Probability and Bayes' theorem, Bayesian Networks.		
Unit VI:	Unit Title: **Understanding**	Hours: 06
What is Understanding? Understanding as Constraint Satisfaction, Natural Language Processing, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing.		
Text Books: 1.Artificial Intelligence – Elaine Rich, Kevin Knight, Nair (Third Edition) [Mc Graw Hill] 2. Artificial Intelligence: A Modern Approach by Stuart Russell & Peter Norvig (Pearson -4th Ed.)		
Reference Books: 1. Introduction to Artificial Intelligence and expert system – Dan W. Patterson 2. Introduction to Artificial Intelligence – Rajendra Akerkar 3. Nils Nilson: "Principles of Artificial Intelligence". (Addison-Wesley) 4. R. J. Winston: "Artificial Intelligence". (Wiley) 5. A First Course in Artificial Intelligence by Deepak Khemani (Tata McGraw Hill 1st Ed.)3. 6. Artificial Intelligence and Expert Systems by Patterson (PHI) 7. Rolston "Principles of Artificial Intelligence and Expert Systems", McGraw Hill.		
Course Code:7IT01	**Course Title: Mobile Computing**	Theory Credit- 3
Course Prerequisite:	Basic Knowledge of Data Communication and Networking.	

Course Objectives:	1. To introduce basic concepts of Mobile Computing and Principals of cellular communication. 2. To familiarize different devices for mobile computing and understand Mobile client application. 3. To understand the concept of wireless application protocol & fundamental of wireless markup language. 4. To gain knowledge about open platform for mobile development 5. To understand the concept of database for mobile computing. 6. Analyze different security issues in mobile computing	
Course Outcomes (Expected Outcomes):	On completion of the course, the students will be able to: 1. Gain knowledge of basic concepts of Mobile Computing and Principals of cellular communication. 2. Understand different devices for mobile computing and understand Mobile client application. 3. Understand concepts of wireless application protocol & fundamental of wireless mark up language. 4. Develop ability for developing open platform mobile development. 5. Explore concepts of database for mobile computing. 6.Identify & understand different security issues in mobile computing.	
Unit I:	Unit Title: **Wireless and Mobile architecture**	Hours: 6 Hrs
Overview 1G,2G,3G,4G and 5G technology, Mobile Communication, Mobile Computing, Mobile Computing Architecture, GSM System and Architecture, Handover, Mobile OS, PalmOS, Windows CE, Symbian OS.		
Unit II:	Unit Title: **Mobile Infrastructure**	Hours: 6 Hrs
Mobile Devices and System Network, Smart Systems and Limitation of Mobile Devices, Mobile client application, Thin client, Fat client.		
Unit III:	Unit Title: **WAP and Fundamental of WML**	Hours: 6 Hrs
WAP 1.1, WAP2.0 Architecture, XHTML-MP, Bluetooth enabled Devices and Network, Layers in Bluetooth Protocol, Security in Bluetooth Protocol and Zigbee, Fundamentals of WML, WML Script.		
Unit IV:	Unit Title: **Building rich user interface**	Hours: 6 Hrs
Open platform for mobile development, Android SDK features, developing for mobile devices and development tools.		
Unit V:	Unit Title: **Database Management System for Mobile Computing**	Hours: 6 Hrs
Data Base management for Mobile computing, Database Hoarding Techniques, Data Caching, Transaction Models, Query Processing, Data Recovery Process.		
Unit VI:	Unit Title: **Security**	Hours: 6 Hrs
User to mobile Client security issues, mobile client security issues, Client server communication security issues, existing web architecture and backend system security issues and case study.		
Text Books: 1. Raj Kamal, Mobile Computing, 2/e, Oxford University Press-New Delhi. 2. Reto Meier, "Professional Andriod application development, John wiley and sons 2010.		
Reference Books: 1. Valentino Lee; Heather Schneider; Robbie Schell, Mobile applications: Architecture, Design and development, Prentice Hall April 16 2004. 2. Uwe Hansmann, "Pervasive computing Hand book. The mobile world", Springer Professional Publication 2002. 3. Yi Bing L, "Wireless and mobile network architecture", John Wiley.		

7IT02 EMBEDDED SYSTEMS

Course Objectives:
Students will be expected to demonstrate their understanding of Embedded System by being able to do each of the following:

1. To introduce the fundamental and building blocks of Embedded System.
2. To introduce hardware units, bus communication in processors and input/output interfacing.
3. To impart the knowledge of basic embedded programming in various languages as well as data structures.
4. To impart the knowledge of programming Models for an embedded system and introduction to IPC.
5. To impart knowledge of real-time operating system.
6. To introduce software development process and tools.

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

1. Describe the basic structural units of a processor as well as hardware units of embedded system.
2. Explain architecture of microcontroller, and processor-memory organization for embedded system.
3. Use knowledge of programming to do embedded programming in various languages and use of data structures for programming.
4. Discuss programming models for embedded system and need for Inter process Communication.
5. Examine the basic concepts of operating systems with real-time operating systems aspects.
6. Design embedded systems based various applications using embedded software development process and tools.

UNIT I: Introduction to Embedded Systems : Embedded systems, Processor embedded into a system, Embedded hardware units and devices in a system, Embedded software in a system, Classification of embedded systems, Examples of embedded systems. Embedded SOC and use of VLSI circuit design technology, Complex systems design and processors, Design process in embedded system, Design challenges in embedded-system design, Hardware-software Co-Design in an embedded system, Embedded system design technologies, Design process and design examples.

UNIT II: Processor and Memory Organization: Processor-Memory Organization, Introduction to advanced processor architecture, Processor Organization, Instruction-Level parallelism, Memory types and memory maps and addresses, Memory Hierarchy and Cache, Selection of Processor and Memory devices. Serial bus communication Protocols, Parallel bus device Protocols.

UNIT III: Embedded Programming: Programming in assembly language and in high level language 'C', 'C' Program Elements: Header and Source files and Processor Directives, Macros and Functions, Data Types, Data Structures, Modifiers, Statements, Loops and Pointers, Use of Loops, Infinite Loops and Conditions, Use of Function Calls, Function Pointers and Function Queues, Queuing of Functions on Interrupts and ISR Queues, Embedded programming in C++ and Java.

UNIT IV: Embedded System Modelling and Introduction to IPC
Program Models, DFG models, State machine programming models for event-controlled program flow, FSM Model, Multiprocessor systems, UML modelling, Inter process Communication and Synchronization of Process, Thread and Tasks.

Unit V: Basic Function of OS and RTOS: Operating system services, Process management, Timer functions, Event function, memory management, Device, File, and I/O Subsystems Management, Interrupt routines in RTOS Environment and Handling of Interrupt-Source Calls, Introduction to RTOS, Basic design using RTOS, RTOS task-scheduling models, OS Security Issues, OS Standards: POSIX.

Unit VI: Embedded Software Development Process and Tools: Introduction to Embedded software development process and tools, Host and Target machines, Linking and Locating software, Getting embedded software into the targeting system, Issues in Hardware-Software design and Co-Design, Program-Level performance analysis and performance modelling.

Text Book: Rajkamal, "Embedded Systems, Architecture, Programming & Design", Third Edition TMH.

Reference Books:

1. Shibu K V "Introduction to Embedded Systems" McGraw-Hill.
2. Rajkamal, "Embedded Systems, Architecture, Programming & Design", Second edition, TMH.
3. Mohammad Ali Mazidi "The 8051 Microcontroller and Embedded System using Assembly and C"Pearson.
4. Frank Vahid and Tony Givargis, "Embedded System Design, A Unified Hardware/Software Introduction", John Wiley & Sons Pvt. Ltd.

7IT06 EMBEDDED SYSTEM – LAB.

Minimum Eight (8) experiments / programming assignments must be completed based on the syllabus covering each of the units.

8IT04 HUMAN COMPUTER INTERACTION

Course Objectives:

- To learn the foundations of Human Computer Interaction.
- To become familiar with the design technologies for individuals and persons with disabilities. To be aware of mobile HCI.
- To learn the guidelines for user interface.

Course Outcomes: Upon completion of the course, the students should be able to:

- Design effective dialog for HCI
- Design effective HCI for individuals and persons with disabilities.
- Assess the importance of user feedback.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
- Develop meaningful user interface.

Unit I: Foundations if HCI:
The Human: I/O channels – Memory – Reasoning and problem solving, Emotion; The Computer: Devices, Positioning, Pointing and Drawing, Physical Controls, Sensors And Special Devices, Paper: Printing And Scanning – Memory – processing and networks;

Unit II: Design Process:
Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms: Paradigms for Interaction Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping.

Unit III: Software Process:
HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules.

Unit IV: Evaluation Techniques:
Evaluation Techniques – Universal Design, Universal Design Principles, Multi-Modal Interaction, Designing for Diversity, User Support: Requirements of User Support, Approaches to User Support, Adaptive Help Systems, Designing User Support Systems.

Unit V: Models And Theories:
Cognitive models: Goal and Task Hierarchies, Linguistic Models, The Challenge of Display-Based Systems, Physical and Device Models, Cognitive Architectures, Socio-Organizational issues and stakeholder requirements – Organizational Issues, Capturing Requirements.

Unit VI: Communication And Collaboration Models:
Face-to-Face Communication, Conversation, Text-Based Communication, Group Working, Task Analysis: Differences Between Task Analysis and other Techniques, Task Decomposition, Knowledge-Based Analysis, Entity–Relationship-Based Techniques, Sources Of Information And Data Collection.

Text Book: Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ―Human Computer Interaction□, 3rd Edition, Pearson Education.

References Books:
1. Brian Fling, ―Mobile Design and Development□, First Edition, O'Reilly Media Inc., 2009.
2. Bill Scott and Theresa Neil, ―Designing Web Interfaces□, First Edition, O'Reilly, 2009.

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3IT09 COMPUTER SKILL LAB – I

Course Pre-requisite: Basic knowledge of any Programming Language.

Course Objectives:
1. To be able to program design with functions using Python.
2. To understand data and information processing techniques.
3. To understand to Design a program to solve the problems.
4. To be able to access database using python programming.
5. To be able to design web applications using python programming.

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

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
2. Interpret different Decision Making statements, Functions, Object oriented programming in Python
3. Summarize different File handling operations
4. Explain how to design GUI Applications in Python and evaluate different database operations
5. Develop applications using Django framework or Flask.

List of Experiments:
This is a sample list of experiments, **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply):

1. Write python program to store data in list and then try to print them.
2. Write python program to print list of numbers using range and for loop
3. Write python program to store strings in list and then print them.
4. Write python program in which an function is defined and calling that function prints Hello World.
5. Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST 2017"
6. Write a program to create, append, and remove lists in python.
7. Write a program to create, concatenate and print a string and accessing sub-string from a given string.
8. Write a program to demonstrate working with tuples in python.
9. Write a program to demonstrate working with dictionaries in python.
10. Write a python program to find largest of three numbers.
11. Write python program in which an function(with single string parameter) is defined and calling that function prints the string parameters given to function.
12. Write python program in which an class is define, then create object of that class and call simple print function define in class.
13. Write a Python script that prints prime numbers less than 20.

14. Write a python program to find factorial of a number using Recursion.
15. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
16. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.
17. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
18. Write a Python class to convert an integer to a roman numeral.
19. Write a Python class to implement pow (x, n)
20. Write a Python class to reverse a string word by word.
21. Accessing and working with databases using Python.
22. Create data frame from .csv files and operations on it.
23. Plotting various graphs using Python.
24. Developing basic GUI using Python.
25. Developing web applications using Django framework or Flask.

Reference Books:

1. "Core Python Programming", R. NageswaraRao, dreamtech press.
2. "Python Programming A Modular Approach With Graphics, Database, Mobile and Web Applications", Sheetal Taneja, Naveen Kumar, Pearson.
3. Python Web Development with Django By Jeff Forcier, Paul Bissex, Wesley J Chun, Addison-Wesley Professional.
4. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning
5. Allen B. Downey , " Think Python: How to Think Like a Computer Scientist", 2nd Edition, Shroff/O'Reilly Publishers
6. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India.

4IT09 COMPUTER SKILL LAB – II

Minimum **Eight** experiments/programming assignments must be completed based HTML, CSS and JAVA SCRIPT.

5IT 09 COMPUTER SKILLS LAB – III

Pre-requisites -Before proceeding with this Angular tutorial course, students should have a basic understanding of HTML, CSS, and JavaScript, basic oops concept.

Course Outcomes:

1. Programming and Application Development using Angular and Type Script
2. Handling Project Files and Type Script Compilation, Components Templates Services Directives
3. Data Rendering, Events Handling, Building Reusable Components
4. Controlling Rendering of HTML, Creating Template Driven Forms and Model Driven Forms.
5. Using Observables and Communicating with Server using APIs
6. Building Single Page Application with Routing and Developing applications integrating CRUD with Firebase

Minimum eight (8) experiments/programming assignments covering the following aspects:

1. Introduction to Angular
2. Angular Environment Set up
3. Creating Angular Project and basic introduction about project structure / directory.
4. Understanding Components and how to create components in Angular
5. Understanding of data binding in Angular component and view files.
6. Understanding and use of different types of Angular directives
7. Understanding of modules and routing in angular.
8. Understanding of services and component 's life cycle method
9. Understanding of package. json file in Angular Project.
10. Understanding of how to fetch data from the API using services.

List of Experiments:

1. Introduction to Angular and Type Script
2. Working with Project Files and Type Script Compilation in Angular.
3. Demonstration of Components, Templates, Services, and Directives
4. Data rendering and events handling in angular
5. Building reusable components
6. Controlling and rendering of HTML
7. Designing and working with Template Driven Forms
8. Designing and working with Model Driven Forms
9. Working with Observables
10. Communicating with Server using APIs
11. Building Single Page Application with Routing
12. Performing CRUD with Firebase in Angular

6IT09 - COMPUTER SKILL LAB- IV

Minimum **Eight (8)** experiments/programming assignments must be completed based on the syllabus covering each of the units of **6IT03 Artificial Intelligence**.

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