IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)
Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering
Bachelor of Technology (B.Tech.)

Interdisciplinary foundation Course

Offered by Computer Science & Engineering branch

IFC-CS-001	**Basics of Computer Science**	**2L : 0T : 0P (2 hrs.)**	**2 credits**

Course Objective:

The objective of this course is to understand fundamental of Data Structures and Operating System

Course Contents: (22 hrs.)

Module 1: **(04 hrs.)**

Review of C programming language. Introduction to Data Structure: Concepts of Data and Information, Classification of Data structures, Abstract Data Types, Introduction to linear data structures- Arrays, String, representation & Operations, Linked List: Representation of linked list in memory.

Module 2: **(05 hrs.)**

Stacks: Stacks as ADT, Application of Stack: Conversion of infix to postfix notation using stack, evaluation of postfix expression, Queues: Queues as ADT, Application of queues.

Module 3: **(04 hrs.)**

Tree: Definitions - Height, depth, order, degree etc. Binary Search Tree - Operations, Traversal, Search, Heap, Applications and comparison of various types of tree.

Module 4: **(04 hrs.)**

Introduction to Operating Systems: Function, Different Types, Desirable Characteristics and features of an O/S, Operating Systems Services: Types of Services, Different ways of providing these Services , Operating System Structure.

Module 5: **(05 hrs.)**

CPU Scheduling : Process Concept, Scheduling Concepts, Types of Schedulers, Scheduling Criteria, Process State Diagram, Introduction to Deadlocks. Memory Management: Different Memory Management Techniques – Partitioning, Swapping,

Course Outcome:

1. Understand basic data structures such as arrays, linked lists,
2. Introduce the concept of stacks and queues.
3. Understand the basic concept of trees .
4. State the core concepts of operating system and types of operating system.
5. Describe the concept of process, deadlock and memory.

List of Text / Reference Books:

1. Ellis Horowitz, Sartaj Sahni, “Fundamentals of Data Structures” Computer Science Press.
2. Mark Allen Weiss “Algorithms, Data Structures, and Problem Solving with C++” , Pearson Education (US) 1996
3. R. G. Dromey “How to Solve it by Computer”, 2nd Impression by, PHI
4. AM Tanenbaum, Y Langsam& MJ Augustein, “Data structure using C and C++”, 2nd Ed., 2006 , Prentice Hall India.
5. Avi Silberschatz, Peter Galvin, Greg Gagne, “Operating System Concepts Essentials”, Wiley Asia Student Edition, 10th Edition, 2018.
6. William Stallings, “Operating Systems: Internals and Design Principles”, Prentice Hallof India, 5th Edition, 2005.

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IFC Offered by IOT

IFC-CIOT-001	**Foundation of Internet of Things**	**2L : 0T : 0P (2 hrs.)**	**2 credits**

Course Objective:
The course enables student to understand the basics of Internet of things and protocols. It introduces some of the application areas where Internet of Things can be applied. Students will learn about the middleware for Internet of Things. To understand the concepts of Web of Things

Module I: **(04 hrs.)**
IOT - What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues.

Module II: **(05 hrs.)**

IOT PROTOCOLS - Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BAC Net Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security

Module III: **(04 hrs.)**
IOT ARCHITECTURE - IoT Open source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity : An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction.

Module IV: **(05 hrs.)**

WEB OF THINGS - Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence.

Module V: **(04 hrs.)**
IOT APPLICATIONS - - IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc.

Course Outcome:

1. Understand the key components that make up an IoT system.
2. Student will understand the concept of protocol used in IoT.
3. Student will learn about architecture of IoT.
4. Student will understand the basics of WoT.
5. Student will understand the different application area of IoT.

List of Text / Reference Books:

- Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press,2012.
- Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
- David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a
- HighlyConnected World", Cambridge University Press, 2010.
- Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key
- Applications and Protocols", Wiley, 2012.

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IFC Offered by CSIT branch

IFC-CI-001	**Foundation of Computer Science**	**2L : 0T : 0P (2 hrs.)**	**2 credits**

Course Objective:

The main objective of this course is to provide conceptual understanding of object oriented programming and database management system.

Course Contents: (25 hrs.)

Module 1: **(05 hrs.)**

Introduction to Object Oriented Programming, Comparison with Procedural Programming, features of Object oriented paradigm, merits and demerits of OO methodology; Data Encapsulation: Concept of Classes & Objects; State, Behavior & Identity of an object.

Module 2: **(05 hrs.)**

Data Abstraction and Message Passing: Methods, Calling of constructors, Decision making constructs, Control loops, Concept of Packages, Basic idea of exception handling, Inheritance, Interfaces, Polymorphism.

Module 3: **(05 hrs.)**

Introduction to DBMS, File system vs DBMS, Advantages of database systems, Database System architecture, Data models, Schemas and instances, Data independence, Functions of DBA and designer, Design issues, ER- Modal

Module4: **(05 hrs.)**

Structure of relational databases, Domains, Relations, Relation algebra – fundamental operators and syntax, relational algebra queries, Integrity constraints, Referential integrity, Keys.

Module 5: **(05 hrs.)**

Functional Dependency –definition, trivial and nontrivial FD, closure of FD set, closure of attributes, Normalization –1NF, 2NF,3NF, BCNF, 4NF and 5NF.

Course Outcome:

1. Understand object oriented programming concepts.
2. Develop skill in data abstraction and message passing
3. Describe basic concepts of DBMS and Explain ER model.
4. Describe Relational Algebra and Keys
5. Understanding of functional dependencies and normalization theory

List of Text / Reference Books:

1. G. Booch, "Object Oriented Analysis & Design", Pearson.
2. Barbara Liskov, Program Development in Java, Addison-Wesley, 2001
3. Date C J, "An Introduction to Database System", Pearson Educations, 8th Edition,2003.
4. Korth, Silbertz,Sudarshan, "Fundamental of Database System", McGraw Hill,5th Edition,2006.
5 . Atul Kahate ," Introduction to Database Management System", Pearson Educations,2004.

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IFC Offered by AIML branch

IFC-AL-001	**Foundation of AIML**	**2L : 0T : 0P (2 hrs.)**	**2 credits**

Course Objective:

The objective of this course is to understand fundamental of AI & ML with Block Chain Technology.

Course Contents: (22 hrs.)

Module 1: **(04 hrs.)**
Introduction to Artificial Intelligence, Need of AI, Goals of AI, Applications of AI, Types of AI, Basic Problem Solving: Informed & Uninformed Search algorithms, Hill CLimbing Algorithm.

Module 2 : **(05 hrs.)**
Working of machine learning, Machine Learning Life Cycle, Datasets & Data preprocessing, Types of learning methods: Supervised Learning, Unsupervised Learning, Reinforcement Learning, Some basic supervised learning algorithms: Linear Regression & K Nearest Neighbors.

Module 3: **(05 hrs.)**
Blockchain Technology: Introduction, Need of blockchain (solving double spending), Public Key Cryptography, Hashing, Blockchain vs Database, Blockchain Data Management, Limitations of Blockchain,

Module 4: **(04 hrs.)**
Bitcoin: An application of Blockchain Technology, Basic Components of Bitcoin, Bitcoin mining & role of miners, Chaining of blocks & Distributed ledger, Privacy in Bitcoin system.

Module 5: **(04 hrs.)**
Introduction to various online tools & python libraries, Demonstration of Case studies using Kaggle online tool: Predicting House Prices using Boston Housing Dataset & Performing K-NN algorithm on Iris Dataset.

Course Outcome:

1. Identifying Needs & Uses of AI & ML in the modern world.
2. Getting Acquinted with Blockchain Technology & Understanding its working
3. Studying an application of Blockchain i.e. Bitcoin.
4. Understanding Practical implementation of Machine Learning
5. Working with a few popular case studies pertaining to Machine Learning

List of Text / Reference Books

1. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-GrawHill.
2. Introduction to AI & Expert System: Dan W.Patterson, PHI.
3. The Hundred-Page Machine Learning Book: Andriy Burkov
4. BASICS OF BITCOINS & BLOCKCHAINS: An Introduction to Cryptocurrencies and the Technology that Powers Them: Anthony Lewis
5. Blockchain Basics: A Non-Technical Introduction in 25 Steps.

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IFC Offered by "CSE (IOT and Cyber Security including Blockchain Technology)" branch

IFC-CB-001	**Block Chain Technology**	**2L : 0T : 0P (2 hrs.)**	**2 credits**

Prerequisite: NA

Course Objective:

To understand the concept of Blockchain and its platforms- Bitcoin, Ethereum, Hyperledger and Multichain. The course provides an overview of the structure and mechanism of Blockchain.

Course Contents: (25 hrs.)

Module 1: Blockchain **(05 hrs.)**

Introduction and crypto foundation: Elliptic curve Cryptography, ECDSA, encryption and decryption. Introduction to Blockchain Technology with its Applications, Blockchain Network, Hashing Algorithm, SHA-256, Immutable Ledger, Centralized and Distributed P2P Network.

Module 2: Blockchain Mining **(05 hrs.)**

Blockchain Mining, Byzantine General Problem, Consensus Protocol and its types- Proof of work (PoW) and proof-of-stake (PoS) algorithm.

Module 3: Cryptocurrency **(05 hrs.)**

Bitcoin, Bitcoin addresses, Bitcoin Ecosystem, Bitcoin's Monetary Policy, The Halving Problem, Block frequency, The Nonce, difficulty adjustment algorithm, mining pools, transactions, Ethereum, overview of differences between Ethereum and bitcoin, block format, mining algorithm, account management, contracts, Solidity language, decentralized application using Ethereum.

Module 4: Smart Contract **(05 hrs.)**

Introduction to Smart Contracts, Different Blockchains and Consensus mechanisms. Smart contacts (escrow, micropayments, and decentralized lotteries), payment channels.

Module 5: Application Areas of Blockchain **(05 hrs.)**

Blockchain and its application with IOT and Cybersecurity, Blockchain and Security R3, CORDA and Hyperledger System architecture, ledger format, chain code, transaction flow and ordering, private channels, membership service providers, case studies.

Course Outcomes:

After Completing the course student should be able to:

1. Describe the basic concepts blockchain technology.
2. Understand several types of consensus protocols.
3. Illustrate the concepts of Bitcoin along with different types of cryptocurrencies.
4. Understand the working and importance of smart contracts.
5. Analyze the block chain applications in a structured manner.

List of Text / Reference Books:

1. Mastering Bitcoin:Unblocking Digital Cryptocurrencies, by Andreas Antonopoulos.
2. Mastering Ethereum, Antonopoulos, Andreas M. and Wood, O'Reilly Media, Inc.,2018
3. An Introduction to Bitcoin, V. Saravanan, Lecture Notes.
4. Bitcoin and Cryptocurrencies Technologies: A Comprehensive Introduction, Arvind Narayanan,Princeton University Press (July 19,2016) ISBN-10:0691171696.

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IFC Offered by Data Science branch

IFC-DS-001	**Foundation of Data Science**	**2L : 0T : 0P (2 hrs.)**	**2 credits**

Course Objective: This course provides a concise introduction to the fundamental concepts of Data Science

Course Contents :(25 hrs)

Module1: **(5 hrs.)**

Introduction: What is Data Science? Big Data and Data Science – Datafication - Current landscape of perspectives - Skill sets needed; Matrices - Matrices to represent relations between data, and necessary linear algebraic operations on matrices Statistics: Descriptive Statistics: distributions and probability -

Module 2: **(05 hrs.)**

Data preprocessing: Data cleaning - data integration - Data Reduction Data Transformation and Data Discretization. Evaluation of classification methods –Exploratory Data Analysis - Basic tools (plots, graphs and summary statistics) of EDA,

Module 3: **(5 hrs.)**

Introduction to Machine Learning Concepts: Association Rule mining - Linear Regression Logistic Regression- Classifiers - k-Nearest Neighbors (k-NN), k-means -Decision tree -

Module 4: **(05 hrs.)**

Clustering: Choosing distance metrics - Different clustering approaches - hierarchical agglomerative clustering, k-means (Lloyd's algorithm), - DBSCAN - Relative merits of each method - clustering tendency and quality.

Module 5: **(05 hrs.)**

Case Studies/Projects related to data science.

Course Outcome:

1. State the overview of the Data Science.
2. Explain the process of Data preprocessing.
3. Discuss the various Machine Learning Algorithms.
4. Explain the clustering techniques.
5. Discuss the usage of Data Science technologies.

List of Text / Reference Books:

1. Cathy O'Neil and Rachel Schutt, " Doing Data Science, Straight Talk From The Frontline", O'Reilly, 2014.
2. Jiawei Han, Micheline Kamber and Jian Pei, " Data Mining: Concepts and Techniques", Third Edition. ISBN 0123814790, 2011.
3. Mohammed J. Zaki and Wagner Miera Jr, "Data Mining and Analysis: Fundamental Concepts and Algorithms", Cambridge University Press, 2014.
4. Matt Harrison, "Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization , O'Reilly, 2016.
5. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media, 2015.
6. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly Media, 2012.
7. NPTEL Course Link: https://nptel.ac.in/courses/106/106/106106212/
8. NPTEL Course Link: https://nptel.ac.in/courses/106/106/106106179/