CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

AICTE Model Curriculum (with effect from 2021-22)
B.E. (Information Technology)

SEMESTER– VII

S.No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per Week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	18IT C27	Big Data Analytics	3	-	3	30	70	3
2	18IT C28	Embedded Systems	3	-	3	30	70	3
3	18IT C29	Internet of Things	3	-	3	30	70	3
4	18IT C30	Distributed Systems	3	-	3	30	70	3
5		Core Elective - 5	3	-	3	30	70	3
PRACTICAL								
6	18IT C31	Big Data Analytics Lab	-	2	2	15	35	1
7	18IT C32	Embedded Systems and IoT Lab	-	2	2	15	35	1
8	18IT C33	Distributed Systems Lab	-	2	2	15	35	1
9	18IT C34	Project Part - 1	-	4	-	50	-	2
		TOTAL	15	10	-	245	455	20

L: Lecture **T: Tutorial** **D: Drawing** **P: Practical**
CIE-Continuous Internal Evaluation **SEE-Semester End Examination**

Core Elective-5		
S.No.	**Subject Code**	**Subject Name**
1.	18IT E17	Cloud Computing
2.	18IT E18	Quantum Computing
3.	18IT E19	Natural Language Processing
4	18IT E20	Block Chain Technology

With effect from Academic Year 2021-22

18IT C27 **BIG DATA ANALYTICS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To introduce the importance of big data, role of Hadoop framework in analyzing large datasets.
2. To gain knowledge of writing mapper and reducer for a given problem.
3. To provide the concepts of NoSQL databases and the working mechanisms of MongoDB.
4. To familiarize writing queries in Pig and Hive to process big data.
5. To discuss the concept and writing applications using Spark.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand and analyze the processing of large datasets in Hadoop framework.
2. Apply MapReduce architecture to solve real world problems.
3. Understand NoSQL databases and create data models using MongoDB.
4. Develop scripts using Pig over large datasets and query using Hive.
5. Understand the fundamentals of the Scala programming and exercise Resilient Distributed Datasets (RDDs) for creating applications in Spark.

UNIT-I

Introduction to Big Data: Importance of Big Data, when to consider Big Data as a solution, Big Data use cases: IT for IT Log Analytics, The Fraud Detection Pattern, and Social Media Pattern.

The Hadoop Distributed Files system: The Design of HDFS, HDFS Concepts, Blocks, Name nodes and Data nodes, Block Caching, HDFS Federation, HDFS High Availability, The Command-Line Interface, Basic File system Operations, Hadoop File systems, Interfaces, The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the File System API, Writing Data, Directories, Querying the File system, Deleting Data, Data Flow, Anatomy of a File Read, Anatomy of a File Write.

UNIT-II

MapReduce: What is Map reduce, Architecture of map reduce.

How MapReduce Works: Anatomy of a MapReduce Job Run, Job Submission, Job Initialization, Task Assignment, Task Execution, Progress and Status Updates, Job Completion, Failures, Task Failure, Application Master Failure, Node Manager Failure, Resource Manager Failure, Shuffle and Sort, The Map Side, The Reduce Side, MapReduce Types and Formats: MapReduce Types, The Default MapReduce Job, Input Formats, Input Splits and Records, Text Input, Output Formats, Text Output, Developing a MapReduce Application.

UNIT-III

No SQL Databases: Review of traditional Databases, Need for NoSQL Databases, Columnar Databases, Failover and reliability principles, CAP Theorem, Differences between SQL and NoSQL databases, **Working mechanisms of Mongo DB:** Overview, Advantages, Environment, Data Modelling, Create Database, Drop Database, Create collection, Drop collection, Data types, Insert, Query, Update and Delete operations, Limiting and Sorting records, Indexing, Aggregation.

UNIT-IV

Pig: Installing and Running Pig, an Example, Generating Examples, Comparison with Databases, Pig Latin, User-Defined Functions, Data Processing Operators, Pig in Practice.

Hive: Installing Hive, The Hive Shell, An Example, Running Hive, Comparison with Traditional Databases, HiveQL, Tables, Querying Data, User-Defined Functions, Writing a User Defined Functions, Writing a User Defined Aggregate Function.

UNIT-V

Spark: Importance of Spark Framework, Components of the Spark unified stack, Batch and Real-Time Analytics with Apache Spark, Resilient Distributed Dataset (RDD), SCALA (Object Oriented and Functional

Programming) **Scala**: Scala Environment Set up, Downloading and installing Spark standalone, Functional Programming, Collections.

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Media Inc, 2015.
2. Tanmay Deshpande, "Hadoop Real-World Solutions Cookbook", 2nd Edition, Packet Publishing 2016.

Suggested Reading:

1. Thilinagunarathne Hadoop MapReduce v2 Cookbook – 2nd Edition, Packet Publishing, 2015.
2. Chuck Lam, Mark Davis, Ajit Gaddam, "Hadoop in Action", Manning Publications Company, 2016.
3. Alan Gates, "Programming Pig", O'Reilly Media Inc, 2011.

Web Resources:

1. http://www.planetcassandra.org/what-is-nosql
2. http://www.iitr.ac.in/media/facspace/patelfec/16Bit/index.html
3. https://class.coursera.org/datasci-001/lecture
4. http://bigdatauniversity.com

With effect from Academic Year 2021-22

18IT C28 **EMBEDDED SYSTEMS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To introduce the architecture, instruction set of 8085 and Assembly language programming.
2. To facilitate with the understanding of the functionality and interfacing of various peripheral devices.
3. To provide basic concepts of embedded system development using 8051.
4. To deal with theoretical aspects of the design and development of an embedded system.
5. To familiarize with different debugging techniques, hardware and software tools.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Make use of the architecture, instruction set of 8085 and write Assembly language programs.
2. Examine the interface with peripheral devices like Keyboard and Display devices.
3. Inference the embedded systems and its applications using 8051 Microcontroller.
4. Interpret the design issues of Microcontroller based embedded systems.
5. Identify and test Embedded systems using Hardware tools like Multi meter, Logic Analyzer and Software tools like Emulator, Simulator etc.

UNIT-I

8085 Microprocessor Architecture: Introduction to Microprocessors, The 8085 MPU: The 8085 Microprocessor, Microprocessor Communication and Bus Timings, De-multiplexing the Bus AD7-AD0, Generating Control Signals, A Detailed Look at the 8085 MPU and its Architecture, Decoding and Executing an Instruction**.**

Programming the 8085: Introduction to 8085 instructions: Data Transfer Operations, Arithmetic Operation, Logic Operations, Branch Operations, Writing Assembly Language Programs, Debugging a Program. Programming techniques with Additional instructions: Programming Techniques-Looping, Counting and Indexing, Additional Data Transfer and 16-Bit Arithmetic Instructions, Arithmetic Operations Related to memory, Logic Operations: Rotate and Compare.

UNIT-II

Stacks and subroutines: Stack, Subroutine, Restart, Conditional CALL and RETURN instructions, Advanced Subroutine Concepts. **Interrupts:** The 8085 Interrupt, 8085 Vectored Interrupts: TRAP, RST 7.5, 6.5, AND 5.5, **Additional I/O Concepts and Processes:** Programmable Interrupt Controller (8259A), Direct Memory Access (DMA) and 8257 DMA controller. Programmable Peripheral Interface (Intel 8255A), Programmable Communication Interface (Intel 8251).

UNIT-III

The 8051 Architecture: Introduction, 8051 Micro controller Hardware, Input/output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/Output, Interrupts, Programming using 8051, Data Transfer and Logical Instructions. Arithmetic Operations, Decimal Arithmetic, Jump and Call Instructions, **Applications:** Interfacing with Keyboards, Displays, D/A and A/D Conversions, Multiple Interrupts.

UNIT-IV

Embedded System Design Cycle: Embedded system design and co-design issues in system development process, Design cycle in the development phase for an embedded systems. **Embedded software development tools:** Host and Target machines, Linker/Locators for embedded software, Embedded software into the target system.

UNIT – V

Debugging tools and Applications: Integration and testing of embedded hardware, Testing methods, Debugging techniques, Laboratory tools and target hardware debugging: Logic Analyzer, Simulator, Emulator

and In-Circuit Emulator, IDE, RTOS services, VxWorks features. Case Studies: Embedded system design for automatic vending machines and digital camera.

Text Books:

1. Ramesh S Gaonkar, "Microprocessor Architecture, Programming and Applications with the8085", 5th Edition, Prentice Hall, 2002
2. Kenneth J.Ayala, "The 8051 Microcontroller", 3rd Edition, Thomson.
3. Raj Kamal, "Embedded Systems-Architecture, Programming and Design," 3rd Edition, Tata McGraw Hill Education, 2015.

Suggested Reading:

1. William Stallings, "Computer Organization and Architecture, Design for Performance", Pearson, 9th Edition, 2013
2. Shibu K V, "Introduction to Embedded systems", 1st Edition, McGraw Hill Education, 2009.

Web Resources:

1. https://slideplayer.com/slide/3944480/
2. https://nptel.ac.in/noc/individual_course.php?id=noc17-cs05
3. https://slideplayer.com/slide/5740917/
4. http://www.technolamp.co.in/2011/04/computer-organization-carl-hamacher.html
5. https://inspirit.net.in/viewer/Li9ib29rcy9hY2FkZW1pYy84MDg1IE1pY3JvcHJvY2Vzc29yIC0gUmFtZXNoIEdhb25rYXIucGRm
6. https://nptel.ac.in/courses/106103068/

With effect from Academic Year 2021-22

18IT C29 **INTERNET OF THINGS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To provide an overview of Internet of Things, building blocks of IoT and real-world applications.
2. To explore various IoT enabling technologies.
3. To facilitate with Python scripts.
4. To identify steps in IoT design Methodology.
5. To introduce about the Raspberry Pi device, its interfaces and Django Framework.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Outline the terminology, protocols, Communication models and Communication APIs of IoT.
2. Define the various IoT enabling technologies, Levels, Domain specific Applications and differentiation between M2M and IoT.
3. Make use the basics of Python Programming for developing IoT applications.
4. Infer the steps involved in IoT platform design methodology and interpret physical devices like Raspberry Pi3.
5. Analyze Data with Physical servers and develop web applications using Django frame work.

UNIT-I

Introduction: Internet of Things- Definitions & Characteristics of IoT, Physical Design of IoT-Physical Layer, Network Layer, Transport Layer, Application Layer, Things in IoT, IoT Protocols, Logical Design of IoT-IoT Functional Blocks, IoT Communication Models-Request-response, Publisher-Subscriber, Push-Pull, Exclusive Pair, IoT Communication APIs-REST API, Websocket API.

UNIT-II

IOT Enabling Technologies: Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IoT Levels and Deployment Templates. M2M, Differences and similarities between IoT and M2M, SDN and NFV for IoT. **Domain Specific IoT** – IoT applications for Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

UNIT-III

Introduction to Python: Motivation for using Python for designing IoT systems, Language features of Python, Data types- Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, Data Structures: Control of flow- if, for, while, range, break/continue, pass functions, modules, packaging, file handling, data/time operations, classes, Exception handling.

UNIT-IV

IoT Platforms Design Methodology: Introduction, IoT Design Methodology Steps-Purpose and Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device and Component Integration, Application Development, Case Study on IoT System for Weather Monitoring.

IoT Physical Devices and End Points: Basic building blocks of an IoT device, Raspberry Pi About the Raspberry Pi board, Raspberry Pi interfaces-Serial, SPI, I2C, Other IoT Devices pcDuino, Beagle Bone Black, Cubie board.

UNIT-V

IoT Physical Servers and cloud offerings: Introduction to cloud storage models and communication APIs, WAMP, Xively cloud for IoT, Python Web Application Framework: Django Framework Django Architecture, Designing a RESTful Web API, Amazon web services for IoT. SkyNet IoT messaging platform.

Text Books:

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

Suggested Reading:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.
3. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347- 4, Willy Publications.

Web Resources:

1. The Internet of Things - Article https://dl.acm.org/citation.cfm?id=1862541
2. Internet of Things - Tutorial. http://archive.eurescom.eu/~pub/about-eurescom/message_2009_02/Eurescom_message_02_2009.pdf
3. Publications on the Internet of Things. http://www.itu.int/osg/spu/publications/internetofthings/InternetofThings_summary.pdf

With effect from Academic Year 2021-22

18IT C30 **DISTRIBUTED SYSTEMS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To present the basic principles and architectures of distributed systems.
2. To familiarize the concepts of processes, threads and various communication methods.
3. To introduce the concepts of naming, directory services and synchronization in Distributed environment.
4. To impart knowledge on the principles of consistency and replication, fault tolerance in distributed systems.
5. To provide understanding of various distributed object based systems.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Describe the various concepts, types and architectures of distributed systems.
2. Illustrate the processes and various communication techniques for distributed systems.
3. Demonstrate various naming and synchronization mechanism in distributed systems.
4. Analyse consistency, replication and fault tolerance in distributed systems.
5. Evaluate various distributed object-based systems with applications.

UNIT–I

Introduction: Definition of A Distributed System; Goals- Making Resources Accessible, Distribution Transparency, Openness, Scalability; Types of Distributed Systems- Distributed Computing Systems, Distributed Information Systems, Distributed Pervasive Systems.

Architectures: Architectural Styles, System Architectures- Centralized Architectures, Decentralized Architectures, Hybrid Architectures; Architectures versus Middleware-Interceptors, General Approaches to Adaptive Software.

UNIT–II

Processes: Threads - Introduction to Threads, Threads in Distributed Systems; Virtualization - The Role of Virtualization In Distributed Systems, Architectures of Virtual Machines; Clients- Networked User Interfaces, Client-Side Software for Distribution Transparency; Servers- General Design Issues, Server Clusters, Managing Server Clusters; Code Migration- Approaches to Code Migration, Migration and Local Resources, Migration in Heterogeneous Systems.

Communication: Fundamentals- Layered Protocols, Types of Communication; Remote Procedure Call- Basic RPC Operation, Parameter Passing, Asynchronous RPC; Message-Oriented Communication- Message Oriented Transient Communication, Message Oriented Persistent Communication; Stream-Oriented Communication- Support for Continuous Media, Streams and Quality of Service, Stream Synchronization; Multicast Communication- Application-Level Multicasting, Gossip-Based Data Dissemination.

UNIT-III

Naming: Names, Identifiers, and Addresses; Flat Naming- Simple Solutions, Home-Based Approaches, Distributed Hash Tables, Hierarchical Approaches; Structured Naming- Name Spaces, Name Resolution, the Implementation of a Name Space; Attribute-based Naming- Directory Services, Hierarchical Implementations: LDAP, Decentralized Implementations.

Synchronization: Clock Synchronization- Physical Clocks, Global Positioning System, Clock Synchronization Algorithms; Logical Clocks- Lamport's Logical Clocks, Vector Clocks; Mutual Exclusion-Overview, A Centralized Algorithm, A Decentralized Algorithm, A Distributed Algorithm, A Token Ring Algorithm, A Comparison of the Four Algorithms; Global Positioning of Nodes; Election Algorithms- Traditional Election Algorithms, Elections in Wireless Environments, Elections in Large Scale Systems.

UNIT-IV

Consistency And Replication: Introduction- Reasons for Replication, Replication as Scaling Technique; Data-Centric Consistency Models- Continuous Consistency, Consistent Ordering of Operations; Client-Centric Consistency Models- Eventual Consistency, Monotonic Reads, Monotonic Writes, Read your Writes, Writes Follow Reads; Replica Management- Replica-Server Placement, Content Replication and Placement, Content Distribution; Consistency Protocols- Continuous Consistency, Primary-Based Protocols, Replicated-Write Protocols, A Cache-Coherence Protocols, Implementing Client-Centric Consistency.

Fault Tolerance: Introduction To Fault Tolerance-Basic Concepts, Failure Models, Failure Masking by Redundancy; Process Resilience- Design Issues, Failure Masking and Replication, Agreement in Faulty Systems, Failure Detection; Reliable Client-Server Communication- Point-To-Point Communication, RPC Semantics in The Presence Of Failures; Reliable Group Communication- Basic Reliable-Multicasting Schemes, Scalability in Reliable Multicasting, Atomic Multicast; Distributed Commit-Two-Phase Commit, Three-Phase Commit; Recovery- Introduction, Checkpointing, Message Logging, Recovery-Oriented Computing.

UNIT-V

Distributed Object-Based Systems: Architecture- Distributed Objects, Example: Enterprise Java Beans, Example- Globe Distributed Shared Objects; Processes- Object Servers, Example: The Ice Runtime System; Communication- Binding a Client to an Object, Static versus Dynamic Remote Method Invocations, Parameter Passing, Example: Java RMI, Object-Based Messaging; Naming- CORBA Object References, Globe Object References; Synchronization, Consistency and Replication- Entry Consistency, Replicated Invocations; Fault Tolerance- Example: Fault-Tolerant CORBA, Example: Fault-Tolerant Java; Security- Example: GLOBE , Security for Remote Objects.

Text Books:

1. Andrew S. Tanenbaum and Van Steen "Distributed Systems: Principles and Paradigms", PHI, 2nd Edition, 2014.
2. Colouris G., Dollimore Jean and Kindberg Tim, "Distributed Systems Concepts and Design", Pearson education, 5th Edition, 2012.

Suggested Reading:

1. Sunitha Mahajan, Seema Shah, “Distributed Computing”, Oxford University Press, 2nd Edition, 2013.
2. S.Ghosh, Chapman & Hall/CRC, “Distributed Systems”, Taylor & Francis Group, 2010.
3. Ajay D. Kshemakalyani & MukeshSinghal, “Distributed Computing, Principles, Algorithms and Systems”, Cambridge, 2010.

Web Resource:

1. https://nptel.ac.in/courses/106106168/

With effect from Academic Year 2021-22

18IT E17 **CLOUD COMPUTING**
(Core Elective-5)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To familiarize basic concepts of cloud computing and enabling technologies.
2. To introduce Auto-Scaling, capacity planning and load balancing in cloud.
3. To impart knowledge on issues related to security, privacy and compliance.
4. To introduce cloud management standards and programming models.
5. To deal with the basics of Service oriented architecture and databases in cloud.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Explain different types of cloud computing concepts and the techniques.
2. Determine the issues related to scaling, capacity planning and load balancing.
3. Estimate the security and compliance issues in clouds.
4. Analyse the Portability and Interoperability issues of cloud virtualization.
5. Evaluate the importance of SOA and database technology.

UNIT-I

Introduction: Limitations of the Traditional Computing Approaches, Three Layers of Computing, Three Layers in Traditional Computing, The End of Traditional Computing, Influences behind Cloud Service Adoption. **Benefits and challenges:** Origin of the Term 'Cloud Computing', Early Initiatives, Utility Computing, Metering and Billing in Cloud, Separation of Data Center Operation, Benefits of Cloud Computing, Challenges of Cloud Computing, How Cloud Computing Addresses Business Challenges, Ethical Issues in Cloud Computing, Cloud Computing: Network as Computer, Role of Web Service, Role of API, Ubiquitous Cloud, Confusion Between Cloud and Internet. Cloud computing services, Resource Virtualization, Resource pooling, sharing and provisioning.

UNIT-II

Scaling in cloud: Introduction to Scaling, Scaling in Traditional Computing, Scaling in Cloud Computing, Foundation of Cloud Scaling, Scalable Application , Scaling Strategies in Cloud, Auto-Scaling in Cloud, Types of Scaling , Performance and Scalability , the Resource Contention Problem , Cloud Bursting: A Scenario of Flexible Scaling, Scalability is a Business Concern, **Capacity Planning:** Capacity Planning, Capacity Planning in Computing, Capacity Planning in Cloud Computing, Approaches for Maintaining Sufficient Capacity, Steps for Capacity Planning, **Load Balancing:** Load Balancing , Importance of Load Balancing in Cloud Computing, Load Balancing in Cloud, Goals of Load Balancing, Categories of Load Balancing, Load Balancing Algorithms, Case study on Google cloud and Amazon Elastic Compute Cloud (EC2), File System and Storage.

UNIT-III

Content Delivery Network: CDN Service Operations, Evolution of CDN, Advantages of CDN, Disadvantages of CDN, CDN Service Provider, Security Reference Model, **Security Issues:** Cloud security, threats to Cloud Security, Infrastructure Security, Information Security, Identity Management and Access Control, Cloud Security Design Principles, Cloud Security Management Frameworks, Security-as-a-Service, Privacy and Compliance Issues.

UNIT-IV

Portability and Interoperability Issues: Challenges in the Cloud, The Issues in Traditional Computing, Addressing Portability and Interoperability in Cloud, Portability and Interoperability Scenarios, Machine Imaging or Virtual Machine Image, Virtual Appliance, Difference between Virtual Machine Image and Virtual Appliance, Open Virtualization Format (OVF), Cloud Management and a Programming Model Case Study, Popular Cloud Services.

UNIT-V

Service-Oriented Architecture: The Pre-SOA Era, Role of SOA in Cloud Computing, Service-Oriented Architecture, Goal of System Designing, Service Represents Business Functionality, Open Standard Implementation, Benefits of SOA, SOA and Cloud Computing. **Database Technology:** Database in Cloud, Data Models, Database-as-a-Service, Relational DBMS in Cloud, Non-relational DBMS in Cloud.

Text Book:

1. Sandeep Bhowmik, "Cloud Computing", Cambridge University Press, 2017.

Suggested Reading:

1. Kai Hwang, Geoffrey C.Fox, Jack J.Dongarra, "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Elsevier, 2012.
2. Barrie Sosinsky" Cloud Computing Bible", Wiley-India, 2010
3. Ronald L. Krutz, Russell Dean Vines "Cloud Security: A Comprehensive Guide to Secure Cloud Computing", Wiley- India,2010
4. John W. Rittenhouse, James F. Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2009.

Web Resource:

1. https://nptel.ac.in/courses/106105167/1

With effect from Academic Year 2021-22

18IT E18 **QUANTUM COMPUTING**
(Core Elective-5)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To impart basic knowledge on quantum computing.
2. To acquaint with major mathematical representations like matrix algebra, Dirac notation.
3. To learn basic building Blocks for Quantum Program, q-bit representation and its operations.
4. To familiarize with quantum computing programming model and quantum cryptography.
5. To discuss various quantum computing algorithm and toolkits for implementing them.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Explain the origin of quantum computing and basic concepts.
2. Apply Mathematical knowledge on Quantum computing applications.
3. Demonstrate the working of a Quantum Computing, its architecture, program model and quantum logic gates.
4. Build cryptographic techniques in quantum algorithms.
5. Evaluate quantum algorithm and program it on major toolkits.

UNIT-I

Introduction to Quantum Computing: Motivation for studying Quantum Computing, Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc.), Origin of Quantum Computing, Overview of major concepts in Quantum Computing, Qubits and multi-qubits states, Bra-ket notation.Bloch Sphere representation, Quantum Superposition,Quantum Entanglement.

UNIT-II

Math Foundation for Quantum Computing: Matrix Algebra: basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen vectors.

UNIT-III

Building Blocks for Quantum Program: Architecture of a Quantum Computing platform, **Details of qubit system of information representation:** Block Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from quantum algorithmic perceptive e.g. Bell State, **Operation on qubits:** Measuring and transforming using gates.**Quantum Logic gates and Circuit:** Pauli, Hadamard, phse shift, controlled gates, Deutsch, swap.

UNIT-IV

Programming model for a Quantum Computing Program: Steps performed on classical computer, Steps performed on Quantum Computer, Moving data between bits and qubits

Quantum Cryptography: Cryptography, classical cryptography, introduction to quantum cryptography. BB84, B92 protocols. Introduction to security proofs for these protocols.

UNIT-V

Introduction to Quantum Algorithms: Basic techniques exploited by quantum algorithms: Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum Walks
Major Algorithms: Shor's Algorithm, Grover's Algorithm**,** Deutsch's Algorithm**,** Deutsch-Jozsa Algorithm
OSS Toolkits for implementing Quantum program: IBM quantum experience, Microsoft Q, Rigetti PyQuil (QPU/QVM).

Text Books:

1. M.A. Nielsen and I.L.Chuang, "Quantum Computation and Quantum Information", 1st Edition, Cambridge University Press, 2000.
2. Phillip Kaye, Raymond Laflamme, and Michele Mosca, "An Introduction to Quantum Computing", 1st Edition, Oxford University Press, 2007.

Suggested Reading:

1. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II: Basic Tools and Special Topics, World Scientific.
2. Chris Bernhardt, "Quantum Computing for everyone", 1st edition, MIT Press, 2019.
3. Nason S. Yonofsky, Mirco A Monnucci "Quantum Computing for Computer Scientists" 1st Edition, Cambridge University Press, 2008.

Web Resources:

1. http://www.theory.caltech.edu/people/preskill/ph229/
2. http://honor.unc.edu/
3. http://www.cs.unc.edu/Admin/Courses/HonorCode.html
4. http://people.ccmr.cornell.edu/~mermin/qcomp/ CS483.html
5. https://www.microsoft.com/en-us/research/uploads/prod/2018/05/40655.compressed.pdf

With effect from Academic Year 2021-22

18IT E19 **NATURAL LANGUAGE PROCESSING**
(Core Elective-5)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To provide theoretical concepts of language processing that shows how to explore interesting bodies of text.
2. To familiarize with fundamental topics in language processing that include tagging, classification, and information extraction using tiny Python programs.
3. To facilitate understanding of formal grammar to describe the structure of an unlimited set of sentences.
4. To acquaint with methods to parse a sentence, recognize its syntactic structure and construct representations of meaning.
5. To familiarize with design of existing corpora, the typical workflow for creating a corpus and the life cycle of a corpus.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Comprehend the concept of natural language processing, its challenges and applications.
2. Formulate different natural language processing tasks using Python programming and Natural Language Toolkit (NLTK) open source library.
3. Articulate information from unstructured text, either to guess the topic or identify named entities.
4. Analyze linguistic structure in text, including parsing and semantic analysis.
5. Compare popular linguistic databases, including WordNet and treebank.

UNIT-I

Language Processing: Computing with Language- Texts and Words, A Closer Look at Python-: Texts as Lists of Words, Computing with Language- Simple Statistics, Automatic Natural Language Understanding, **Accessing Text Corpora and Lexical Resources:** Accessing Text Corpora, Conditional Frequency Distributions, Lexical Resources, WordNet.

UNIT-II

Processing Raw Text: Strings- Text Processing at the Lowest Level, Text Processing with Unicode, Regular Expressions for Detecting Word Patterns, Useful Applications of Regular Expressions, Normalizing Text, Regular Expressions for Tokenizing Text, Segmentation, Formatting: From Lists to Strings.
Categorizing and Tagging Words: Mapping Words to Properties Using Python Dictionaries, Automatic Tagging, N-Gram Tagging, Transformation-Based Tagging.

UNIT-III

Learning to Classify Text: Supervised Classification, Evaluation, Modeling Linguistic Patterns.
Extracting Information from Text: Information, Chunking, Developing and Evaluating Chunkers Recursion in Linguistic Structure.

UNIT-IV

Analyzing Sentence Structure: Context-Free Grammar, Parsing with Context-Free Grammar, Dependencies and Dependency Grammar, Grammar Development.
Building Feature-Based Grammars: Grammatical Features, Processing Feature Structures, Extending a Feature-Based Grammar.

UNIT-V

Analyzing the Meaning of Sentences: Natural Language Understanding, Propositional Logic, First-Order Logic, The Semantics of English Sentences.

Managing Linguistic Data: Corpus Structure: A Case Study, The Life Cycle of a Corpus, Acquiring Data.

Text Book:

1. Steven Bird, Evan Klein and Edward Loper, "Natural Language Processing with Python", O'Reilly Media, Inc., 2009.

Suggested Reading:

1. Daniel Jurafsky and James H Martin. Speech and Language Processing, 2nd Edition, Pearson Education, 2009.
2. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, 2nd Edition, Chapman and Hall/CRC Press, 2010.
3. Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval, Oxford University Press, 2008.
4. Nitin Hardaniya, Jacob Perkins, "Natural Language Processing: Python and NLTK", Packt Publishers, 2016.

Web Resources:

1. https://pythonprogramming.net/tokenizing-words-sentences-nltk-tutorial/
2. http://www.nptelvideos.in/2012/11/natural-language-processing.html
3. https://github.com/keon/awesome-nlp

With effect from Academic Year 2021-22

18IT E20 **BLOCK CHAIN TECHNOLOGY**
(Core Elective – 5)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To provide Conceptual understanding of how block chain technology can be used to improve business processes.
2. To facilitate understanding of bit coin crypto currency system.
3. To impart knowledge about building and deploying block chain applications.
4. To introduce new ways of using block chain technology for applications other than crypto currency.
5. To familiarize with platforms such as Ethereum, Hyperledger Fabric involved in building block chain applications.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the concepts of Block chain technology and describe how the Block chain systems work.
2. Explain the working of bit coin crypto currency.
3. Develop and deploy block chain application for on premise and cloud-based architecture.
4. Incorporate ideas from various domains and implement them using block chain technology in different perspectives.
5. Devise smart contract using Hyperledger Fabric and Ethereum frameworks.

UNIT-I

Introduction: Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Crypto currency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain.

Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.

UNIT-II

Bitcoin and Block chain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay.

Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) —basic introduction, Hashcash PoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

UNIT-III

Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for permissioned block chain-Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.

UNIT-IV

Enterprise application of Block chain: Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade — Trade Finance Network, Supply Chain Financing, Identity on Block chain.

UNIT-V

Hyperledger Fabric: Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda.

Text Books:

1. Melanie Swan, "Block Chain: Blueprint for a New Economy", 1st Edition O'Reilly, 2015.
2. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", 1st Edition, O'Relly, 2015.

Suggested Reading:

1. Iran Bashir "Mastering Blockchain" 2nd Edition Paperback 2018.
2. Daniel Drescher, "Block Chain Basics", 1st Edition, Apress, 2017.
3. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Block Chain", Packt Publishing.

Web Resources:

1. https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html
2. https://www.hyperledger.org/projects/fabric
3. https://www.packtpub.com/big-data-and-business-intelligence/hands-blockchain-hyperledger
4. https://www.amazon.com/Hands-Blockchain-Hyperledger-decentralized-applications/dp/1788994523
5. https://github.com/HyperledgerHandsOn/trade-finance-logistics

With effect from Academic Year 2021-22

18IT C31 **BIG DATA ANALYTICS LAB**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:

1. To provide the knowledge to setup a Hadoop Cluster and implement applications using MapReduce.
2. To introduce Pig, PigLatin and HiveQL to process big data.
3. To gain knowledge to work with NoSQL databases.
4. To get familiarize with latest big data frameworks and writing applications using Spark and Scala.
5. To learn processing large datasets in Hadoop and visualizing its results in R (RHadoop).

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand Hadoop working environment and develop applications using MapReduce framework.
2. Develop scripts using Pig to solve real world problems and query the datasets using Hive.
3. Write NoSQL queries to large datasets.
4. Develop applications in Spark environment using RDDs.
5. Analyze and visualize applications in R language by integrating Hadoop.

List of Programs

1. Understanding and using basic HDFS commands
2. Word count application using Mapper Reducer on single node cluster
3. Analysis of Weather Dataset on Multi node Cluster using Hadoop
4. Real world case studies on Map Reduce applications
5. Working with files in Hadoop file system: Reading, Writing and Copying
6. Writing User Defined Functions/Eval functions for filtering unwanted data in Pig
7. Working with HiveQL
8. Writing User Defined Functions in Hive
9. Understanding the processing of large dataset on Spark framework.
10. Integrating Hadoop with other data analytic framework like R

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Media Inc, 2015.
2. Tanmay Deshpande, “Hadoop Real-World Solutions Cookbook”, 2nd Edition, Packt Publishing 2016.

Suggested Reading:

1. Edward Capriolo, Dean Wampler, and Jason Rutherglen, "Programming Hive", O'Reilly Inc, 2012.
2. Vignesh Prajapati, "Big data Analytics with R and Hadoop", Packt Publishing, November 2013.

Web Resources:

1. https://parthgoelblog.wordpress.com/tag/hadoop-installation
2. http://www.iitr.ac.in/media/facspace/patelfec/16Bit/index.html
3. https://class.coursera.org/datasci-001/lecture
4. http://bigdatauniversity.com.

With effect from Academic Year 2021-22

18IT C32 **EMBEDDED SYSTEMS AND IOT LAB**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:

1. To familiarize with architecture, instruction set of 8085 and assembly language programming.
2. To impart knowledge about the functionality and interfacing of peripheral devices.
3. To provide an overview of basic concepts and development of embedded systems using 8051.
4. To deal with theoretical aspects of the design and development of an embedded system.
5. To facilitate understanding of different debugging techniques and hardware and software tools.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Construct the basic Assembly Language programming using instruction set of 8085 & 8051.
2. Demonstrate and Interface embedded systems applications using 8051.
3. Develop python scripts that run on Raspberry Pi3.
4. Experiment with LEDs, Sensors using Raspberry Pi3.
5. Modify and Compose IoT systems using Raspberry Pi3.

List of Experiments

A. Introduction to 8085 instruction set and microprocessor trainer kit.
   1. Assembly language programs using Arithmetic and logic instructions.
   2. Assembly language programs using branch and conditional instructions.

B. Use of 8-bit and 32-bit Microcontrollers, (such as 8051 Microcontroller, ARM2148 / ARM2378, LPC 2141/42/44/46/48) and C compiler (Keil, Ride etc.) to:
   1. Interface Input-Output and other units such as: Relays, LEDs, LCDs, Switches, Keypads, Stepper Motors, and ADCs.
   2. Develop Control Applications such as: Temperature Controller, Elevator Controller, Traffic Controller.

C. Internet of Things (IoT) Experiments

Following are some of the programs that a student should be able to write and test on Raspberry Pi3, but not limited to this only.

1. Switching LED on/off from Raspberry Pi3 Console.
2. Interfacing an LED and Switch with Raspberry Pi3.
3. Interfacing a Light Sensor with Raspberry Pi3.
4. Interfacing Rain Sensing Automatic Wiper System.
5. Interfacing to identify accident and send alert messages.
6. Interfacing smoke sensor to give alert message to fire department.
7. Implementation of Traffic Light System based on density.
8. Design and develop IoT Solar Power Monitoring System.
9. Design and develop Patient health monitoring system.
10. Implementation of Home Automation System using WiFi Module.

Text Books:

1. Ramesh S Gaonkar, "Microprocessor Architecture, Programming and Applications withthe 8085", 5th Edition, Prentice Hall, 2002.
2. Kenneth J.Ayala, "The 8051 Microcontroller", 3rd Edition, Thomson 2014.
3. ArshdeepBahga, Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press 2014.

Suggested Reading:

1. Raj Kamal, "Embedded Systems", 2nd Edition, McGraw Hill 2015.
2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

Web Resources:

1. https://www.edgefx.in/8051-microcontroller-architecture/.
2. https://nptel.ac.in/courses/108105102/11
3. http://www.circuitbasics.com/raspberry-pi-ds18b20-temperature-sensor-tutorial/.
4. https://raspberrypihq.com/making-a-led-blink-using-the-raspberry-pi-and-python/.

With effect from Academic Year 2021-22

18IT C33 **DISTRIBUTED SYSTEMS LAB**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:

1. To learn the concepts like virtual time, agreement and consensus protocols.
2. To familiarise various distributed architectures.
3. To introduce the basics of IPC, Group communication and RPC.
4. To illustrate the methods of the DFS and DSM concepts.
5. To present transaction management in distributed environment.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Design a chat server to simulate multi-client server environment.
2. Develop file transfer using FTP.
3. Develop middleware using RMI.
4. Demonstrate the functionality of a distributed environment using 2-Phase Commit Protocol.
5. Demonstrate Distributed File System using NFS.

List of Programs

1. Demonstrate the TCP and UDP Communication.
2. Develop an FTP Client with a GUI interface for the access of all services.
3. Implement Chat Server Application.
4. Implement a mini DNS protocol using RMI.
5. Implement Multicasting.
6. Implement a Two-Phase Commit for distributed transaction management.
7. Understanding of working of NFS (Includes exercises on Configuration of NFS).
8. Implement thread communication in Distributed environment.
9. Implement Database Replication.
10. Create CORBA based server-client application.

Text Book:

1. Andrew S. Tanenbaum and Van Steen, "Distributed Systems: Principles and Paradigms", PHI, 2nd Edition (2014).

Suggested Reading:

1. Colouris, Dollimore and Kindberg, "Distributed Systems Concepts and Design", 5th Edition (2012), Pearson Education, India.
2. Sunitha Mahajan, Seema Shah, "Distributed Computing", Oxford University Press, 2nd Edition, 2013

With effect from Academic Year 2021-22

18IT C34 **PROJECT PART-1**

Instruction	4 Hours per week
CIE	50 Marks
Credits	2

The objective of Project Part -1 is to enable the student take up investigative study in the broad field of Engineering / Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D. The work shall include:

1. Survey and study of published literature on the assigned /selected topic.
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis /Modeling/Simulation/Experiment/Design /Feasibility.
4. Preparing a Written Report on the Study conducted for Presentation to the Department.
5. Final Seminar, as oral Presentation before a departmental Committee.

Guidelines for the award of Marks :Max. Marks: 50

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Department Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

AICTE Model Curriculum (with effect from 2021-22)
B.E. (Information Technology)

SEMESTER– VIII

S.No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per Week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1		Open Elective - 2	3	-	3	30	70	3
2		Open Elective - 3	3	-	3	30	70	3
PRACTICAL								
3	18IT C35	Technical Seminar	-	2	-	50	-	1
4	18IT C36	Project Part - 2	-	10	-	100	100	10
		TOTAL	6	12	-	210	240	17

L: Lecture T: Tutorial D: Drawing P: Practical
CIE-Continuous Internal Evaluation SEE-Semester End Examination

Open Elective- 2		
S.No.	**Subject Code**	**Subject Name**
1.	18ME O04	Entrepreneurship
2.	18ME O05	Human Rights and Legislature Procedures
3.	18CE O02	Disaster Mitigation Management
4.	18EG O01	Technical Writing Skills

Open Elective-3		
S.No.	**Subject Code**	**Subject Name**
1.	18ME O01	Robotics
2.	18ME O07	Intellectual Property Rights
3.	18ME O10	Introduction to Operations Research
4.	18PY O01	History of Science and Technology

18ME O04

ENTREPRENEURSHIP

(Open Elective)

Instruction	3 Hours perweek
Duration of SEE	3Hours
SEE	70Marks
CIE	30Marks
Credits	3

Objectives:

1. Concept and procedure of idea generation.
2. The nature of industry and related opportunities and challenges.
3. Elements of business plan and it s procedure.
4. Project management and its techniques.
5. Behavioural issues and Time management.

Outcomes: At the end of the course, the students are able to

1. Understand the concept and essence of entrepreneurship. (BL-2)
2. Identify business opportunities and natureof enterprise. (BL-3)
3. Analyze the feasibility of new business plan. (BL-4)
4. Apply project management techniques like PERT and CPM for effective planning and execution of projects. (BL-3)
5. Use behavioral, leadership and time management aspects in entrepreneurial journey (BL-3)

UNIT-I

Entrepreneurship: Definition, functions of entrepreneurship, qualities of entrepreneurs, identification and characteristics of entrepreneurs, entrepreneur vs. intrapreneur, first generation entrepreneurs, women entrepreneurs, conception and evaluation of ideas and their sources.

UNIT-II

Indian industrial environment: Competence, opportunities and challenges, entrepreneurship and economic growth, small scale industry in India, objectives, linkage among small, medium and heavy industries, types of enterprises, corporate social responsibility.

UNIT-III

Business plan: Introduction, elements of business plan and its salient features, business model canvas, technical analysis, profitability and financial analysis, marketing analysis, feasibility studies, executive summary, selection of technology and collaborative interactions.

UNIT-IV

Project management: During construction phase, project organization, project planning and control using CPM, PERT techniques, human aspects of project management, assessment of tax burden.

UNIT-V

Behavioral aspects of entrepreneurs: Personality, determinants, attributes and models, leadership concepts and models, values and attitudes, motivation aspects, time management: approaches of time management, their strengths and weaknesses. time management matrix and the urgency addiction .

Text Books:

1. Vasant Desai, “Dynamics of Entrepreneurial Development and Management”, Himalaya Publishing House, 1997.
2. Prasanna Chandra, “Project-Planning, Analysis, Selection, Implementation and Review”, Tata Mcgraw-Hill Publishing Company Ltd.1995.
3. S.S. Khanka, “Entrepreneurial Development”, S. Chand & Co. Pvt. Ltd., New Delhi,2015.

Suggested Reading:

1.Robert D. Hisrich, Michael P. Peters, “Entrepreneurship”, 5/e, Tata Me Graw Hill Publishing Company Ltd., 2005.
2. Stephen R. Covey and A. Roger Merrill, “First Things First”, Simon and Schuster Publication,1994.

With effect from Academic Year 2021-22

18ME O05 **HUMAN RIGHTS AND LEGISLATURE PROCEDURES**

(Open Elective- 2)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Understand the value of human rights.
2. Understand the Lawful rights available to him and others.
3. Create understanding the rights of under privileged and respect them.
4. Understand role of an individual in the Civil Society.
5. Understand the safety aspects while using technology and to understand the role of NGO's in protecting human rights and environment.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Recall the human rights in the global and national context.
2. Understand the overall view on working of Indian constitution.
3. Analyze the societal problems in the context of human rights.
4. Evaluate implementation of right to development and right to information.
5. Application of human rights for human safety and clean environment.

UNIT-I

Meaning and concept of human rights: Notion and classification of rights, moral and legal rights, three generations of rights (civil, and political rights, economic social and cultural rights, collective/solidarity rights), Indian bill of rights and sarvodaya, preamble of Indian constitution, fundamental rights-directive principles-fundamental duties

UNIT-II

Human rights enforcement mechanism: Human Rights Act, 1993, judicial organs-Supreme Court (Article 32) and high court (Article 226), human rights commission, National and State commission of Women/Children/Minority/SC/ST.

UNIT-III

A right to development: Socio-economic and cultural effects of globalization, right to education, transparency in governance and right to information, consumer protection act.

UNIT-IV

Environment rights such as right to clean environment and public safety: Issues of industrial pollution, prevention, and rehabilitation, safety aspects of new technologies such as chemical and nuclear technologies, issues of waste disposal, protection of environment.

UNIT-V

Role of advocacy groups: Professional bodies, press, media role of lawyers legal Aid., educational institutions , corporate Sector and N.G.Os.

Text Books:

1. Kapoor, S.K., "Human rights under International Law and Indian Law", Prentice Hall of India, New Delhi,2002
2. P.M. Katare and B.C. Barik, "Development, Deprivation and Human Rights, Violation", New Delhi, Rawat,2002.
3. S.N. Chaudhary, "Human Rights and Poverty in India: Theoretical Issues", Delhi: Concepts, 2005.

Suggested Reading:

1. Frankena, W.K., "Ethics, Prentice Hall of India", New Delhi, 1990.
2. K.P. Saksena, (ed.), "Human Rights and the Constitution: Vision and the Reality", New Delhi: Gyan Pub., 2003.

With effect from Academic Year 2021-22

18CE O02 **DISASTER MITIGATION MANAGEMENT**
(Open Elective- 2)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Equip the students with the basic knowledge of hazards, disasters, risks and vulnerabilities.
2. Impart knowledge in students about the nature, causes, consequences and mitigation measures of the various Hydro-meteorological disasters.
3. Introduce the concepts of causes, consequences and mitigation measures of the various Geographical disasters.
4. Enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters.
5. Equip the students with the knowledge of the impacts of disaster, chronological phases in a disaster management cycle and to create awareness about the disaster management framework and legislations in the context of Central and State Level Authorities.

Course Outcomes:
Upon completion of this course, the student will be able to:

1. Identify and understand the fundamental terminologies in disaster management.
2. Distinguish between the Hydro-meteorological disasters and apply the concepts of structural and non-structural mitigation measures.
3. Categorize different Geographical Disasters and apply the knowledge in utilizing the early warning systems.
4. Analyze various mechanisms and consequences of human induced disasters.
5. Develop an awareness of disaster management phases and formulating effective disaster management plans, ability to understand various participatory roles of stakeholders- Central and State Government bodies at different levels.

UNIT-I: Introduction: Basic definitions- Hazard, Disaster, Vulnerability, Risk, Resilience, Mitigation, Management; classification of types of disaster- Natural and manmade; Introduction to Disaster management cycle; International Decade for natural disaster reduction (IDNDR); International strategy for disaster reduction (ISDR), National disaster management authority (NDMA).

UNIT-II:
Natural Disasters:
Hydro meteorological disasters:
Causes, Early warning systems- monitoring and management, structural and non-structural measures for floods, drought and Tropical cyclones; Applications. Case studies related to various hydro-meteorological disasters.

UNIT- III
Geographical based disasters: Causes, zoning, Early warning systems- monitoring and management, structural and non-structural mitigation measures for earthquakes, tsunami, landslides, avalanches and forest fires. Case studies related to various geographical based disasters.

UNIT-IV:
Human Induced Disasters: Chemical disaster- Causes, impacts and mitigation measures for chemical accidents, Risks and control measures in a chemical industry, chemical disaster management; Case studies

related to various chemical industrial hazards eg: Bhopal gas leakage; Management of chemical terrorism disasters and biological disasters; Case studies related to power break downs, fire accidents, traffic accidents, oil spills and stampedes, building failure disasters.

UNIT-V:

Concept of Disaster Impacts and Management:

Disaster impacts- environmental, physical, social, ecological, economical, political, etc.; health, psycho-social issues; demographic aspects, gender, age, special needs; hazard locations; global and national disaster trends; climate change and urban disasters.

Disaster management cycle and its phases, risk analysis, vulnerability and capacity assessment; Post-disaster environmental response water, sanitation, food safety, waste management, disease control; Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Text Books:

1. Pradeep Sahni," Disaster Risk Reduction in South Asia", Prentice Hall, 2003.
2. B. K. Singh," Handbook of Disaster Management: techniques & Guidelines", Rajat Publication, 2008.

Suggested Reading:

1. Ministry of Home Affairs". Government of India, "National disaster management plan, Part I and II",
2. K. K. Ghosh," Disaster Management", APH Publishing Corporation, 2006.
3. Hazards, Disasters and your community: A booklet for students and the community, Ministry of home affairs.
4. Disaster Medical Systems Guidelines, Emergency Medical Services Authority, State of California, EMSA no.214, June 2003.
5. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings, Geneva: IASC.

Web Resources:

1. http://www.indiaenvironmentportal.org.in/files/file/disaster_management_india1.pdf
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs)
3. http://ndma.gov.in/ (Home page of National Disaster Management Authority)

With effect from Academic Year 2021-22

18EG O01 **TECHNICAL WRITING SKILLS**

(Open Elective- 2)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Process of communication and channels of communication in general and technical writing.
2. Technical Writing and also contextual use technology specific words.
3. Business letters and technical articles.
4. Technical reports and technical proposals.
5. Transferring data from verbal to graphic and vice versa and making technical presentations.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the channels of communication and define nature and aspects of Technical communication
2. Compare and contrast technical communication to that of general communication while constructing error free sentences applying features of technical writing.
3. Analyze data, draw inferences to write Journal articles and conference papers and to compose business letters.
4. Evaluate data to draft technical reports and technical proposals.
5. Design a technical presentation by understanding the nuances of presentation skills and also transfer data from verbal to graphic and vice versa.

UNIT-I

Communication – Nature and process.

Channels of Communication – Downward, upward and horizontal and lateral communication; Barriers to communication.

Technical Communication – Definition ; oral and written communication. Importance and need for Technical communication. Nature of Technical Communication; Aspects and forms of Technical communication. Technical communication Skills – Listening, Speaking, Reading & Writing

UNIT-II

Technical Writing – Techniques of writing. Selection of words and phrases in technical writing. Differences between technical writing and general writing. Abstract and specific words. Sentence structure and requisites of sentence construction. Paragraph length and structure.

UNIT-III

Business correspondence – Sales letters, letters of Quotation; Claim and Adjustment letters.

Technical Articles: Nature, significance and types of technical articles. Writing an abstract. Journal articles and Conference papers. Elements of technical articles.

UNIT-IV

Technical Reports : Types, significance, structure, style and writing of reports. Routine reports, Project reports.

Technical Proposals : Definition, types, characteristics, structure and significance.

UNIT-V

Information Transfer – Graphic to verbal (written) and verbal to graphic.

Technical Presentations : Important aspects of oral and visual presentations.

Text Books:

1. Meenakshi Raman & Sangeeta Sharma, "Technical Communications-Principles and Practice", Oxford University Press, 2nd Edition, 2012.
2. M Ashraf Rizvi, "Effective Technical Communication", Tata McGraw Hill Education Pvt Ltd, 2012.

Suggested Reading:

1. Kavita Tyagi & Padma Misra, "Basic Technical Communication", PHI Learning Pvt Ltd, 2012.
2. R.C Sharma & Krishna Mohan, "Business Correspondence and Report Writing", Tata McGraw Hill, 2003.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc18_mg13/preview
2. https://www.technical-writing-training-and-certification.com/
3. https://academy.whatfix.com/technical-writing-skills

With effect from Academic Year 2021-22

18ME O01 **ROBOTICS**

(Open Elective- 3)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Principle of working of a robot, types and specifications, configuration, work envelop and motion controls and applications.
2. Transformations, kinematics and dynamics of robots.
3. Singularities, Jacobian and trajectory planning of a robot to prepare the robot for various tasks
4. Design of end effectors, drives, working of sensors and controllers for finding position and orientation.
5. Robot vision for image acquisition and processing and plan for various tasks and various Languages and Programming methods of robot.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Describe the basic components, specifications and applications oftheRobots.
2. Understand transformations, direct and inverse kinematicsofrobots.
3. Calculate forces in links and joints of a robot and find thesingularities, Jacobian and trajectory planning of a robot forvarioustasks.
4. Classify drives, sensors and grippers for variousapplications.
5. Program a robot to predict motions for a given task with machine visionandsensors.

UNIT-I

Introduction to robotics: History and evolution of robots, basic configuration, degree of freedom, work envelope, motion control methods, various applications in industry, material handling, loading & unloading, processing, welding & painting, assembly, and inspection, requirements and specifications of robots

UNIT-II

Rigid motions and homogeneous transformations: Rotation matrix, homogenous transformation matrix, Denavit- Hartenberg convention, Euler angles, RPY representation, direct and inverse kinematics for industrial robots for position and orientation

UNIT-III

Velocity kinematics – the manipulator Jacobian: joint, end effect or velocity, direct and inverse velocity analysis. **Trajectory planning**: Interpolation, cubic polynomial, linear segments with parabolic blending, static force and moment transformation, solvability, stiffness, singularities.

UNIT-IV

Robot dynamics: Lagrangian Formulation for link inertia tensor and manipulator inertia tensor, Newton-Euler formulation for RR & RP manipulators.

Control: Individual, joint and computed torque.

UNIT-V

End effectors: Position and velocity measurement. **Sensors:** Proximity and range, tactile, force and torque,

Drives for Robots: Electrical, Hydraulic and Pneumatic.

Robot vision: Introduction to technique, image acquisition and processing, introduction to robot programming languages.

Text Books:

1. Spong and Vidyasagar, “Robot Dynamics and Control”, John Wile and Sons, 1990.
2. R.K. Mittal, I.J. Nagrath, “Robotics and control”, Tata Mcgraw-Hill Publishing Company Ltd. 2003.
3. Groover, “Industrial Robotics”, Mcgraw-Hill Publishing Company Ltd. 2003.

Suggested Reading:

1. Asada and Slotine, “Robot analysis and Intelligence”, Wiley Interscience, 1986.
2. K.S. Fu Gon ZalezRC., lEEc.S.G., “Robotics, Control Sensing Vision and Intelligence”, McGraw Hill, Int. Ed., 1987.

With effect from Academic Year 2021-22

18ME O07 **INTELLECTUAL PROPERTY RIGHTS**

(Open Elective- 3)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Fundamental aspects of IP.
2. Salient features of IPR acts.
3. The methods of registrations of Intellectual property.
4. Awareness for innovation and its importance of protection.
5. The changes in IPR culture and techno-business aspects of IPR.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the evolution of IP, working of organization's at global level to protect and promote IP.
2. Familiarize with the patent filing process at national and international level.
3. Draw the logical conclusion of research, innovation and patent filing.
4. Compare different kinds of IP and their patenting system.
5. Understand the techno-legal-business angle of IP, infringement and enforcement mechanisms for protection.

UNIT-I

Introduction: Definition of intellectual property, the need for intellectual property rights (IPR), kinds of intellectual property rights, IPR in India – genesis and development, IPR abroad, importance of WTO, TRIPS agreement, patent cooperation treaty, Berne and universal copyright conventions.

UNIT-II

Patents: Definition of patent, commercial significance , term of patent, patentable subject- matter, rights and obligations of patentee, searching of existing patents, drafting of patent, specification of patent, filing of a patent, the different layers of the patent system (national, regional and international options), compulsory licensing and licenses of rights, revocation of patents, differences between utility model and patent.

UNIT-III

Industrial designs: Definition of designs, registration of design, rights and duties of proprietor of design, piracy of registered design.

Trademarks: Meaning of trademarks, purpose of protecting trademarks, registration of trademarks, passing off, assignment and licensing of trademarks, infringement of trademarks.

Geographical indications: Definition, differences between GI and trademarks.

UNIT-IV

Copy right: Nature and scope of copy right, term of copyright, subject matter of copyright, rights conferred by copyright ,publication, broad casting, telecasting, computer program, database protection, assignment and transmission of copyright, infringement of copy right trade secrets and know-how agreement.

UNIT-V

Enforcement of intellectual property rights: Infringement of intellectual property rights, enforcement measures, emerging issues in intellectual property protection, case studies of patents and IP Protection.

Unfair competition: What is unfair competition, relationship between unfair competition and intellectual property laws.

Text Books:

1. Ajit Parulekar and Sarita D' Souza, "Indian Patents Law – Legal & Business Implications"; Macmillan India ltd , 2006
2. B. L.Wadehra;" Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications"; Universal law Publishing Pvt. Ltd., India 2000
3. P. Narayanan; "Law of Copyright and Industrial Designs"; Eastern law House, Delhi 2010

Suggested Reading:

1. Cronish W.R1 "Intellectual Property; Patents, copyright, Trad and Allied rights", Sweet & Maxwell, 1993.
2. P. Narayanan, "Intellectual Property Law", Eastern Law Edn., 1997.

With effect from Academic Year 2021-22

18ME O10 **INTRODUCTION TO OPERATIONS RESEARCH**
(Open Elective- 3)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To know the formulation of LPP models.
2. Understand the Algorithms of Graphical and Simplex Methods.
3. Understand the Transportation and Assignment techniques.
4. To know the procedure of Project Management along with CPM and PERT techniques.
5. Understand the concepts of sequencing.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Understand the concepts of linear programming problem.
2. Solve the given transportation problem.
3. Develop optimum pair of operations and resources by using assignment technique.
4. Analyze project management techniques like CPM and PERT to plan and execute projects successfully.
5. Apply sequencing concepts for industry applications.

UNIT-I

Introduction: Definition and scope of operations research

Linear programming: Introduction, formulation of linear programming problems, graphical method of solving LP problem, simplex method, degeneracy in simplex method

UNIT-II

Transportation models: Finding an initial feasible solution - north west corner method, least cost method, vogel's approximation method, finding the optimal solution, special cases in transportation problems - unbalanced transportation problem, degeneracy in transportation

UNIT-III

Assignment techniques: Introduction, Hungarian technique of assignment techniques, unbalanced problems, problems with restrictions, maximization in assignment problems, travelling salesman problems

UNIT-IV

Project management: Definition, procedure and objectives of project management, differences between CPM and PERT , rules for drawing network diagram, scheduling the activities, Fulkerson's rule, earliest and latest times, determination of ES and EF times in forward path, LS & LF times in backward path, determination of critical path, duration of the project

UNIT-V

Sequencing models: Introduction, general assumptions in sequencing, sequencing rules processing n" jobs throughtwomachines, processing n" jobs through three machines

Text Books:

1. Hamdy, A. Taha, "Operations Research-An Introduction", Prentice Hall of India Pvt. Ltd., 6th Edition, 1997.
2. S.D. Sharma, "Operations Research", Kedarnath, Ramnath & Co., Meerut, 2009.
3. V.K. Kapoor, "Operations Research", S. Chand Publishers, New Delhi, 2004.

Suggested Reading:

1. R. Paneer Selvam, "Operations Research", 2nd Edition, PHI Learning Pvt. Ltd., New Delhi, 2008
2. Nita H. Shah, Ravi M. Gor, Hardik Soni, "Operations Research", PHI Learning Private Limited, 2013

With effect from Academic Year 2021-22

18PY O01 **HISTORY OF SCIENCE AND TECHNOLOGY**
(Open Elective- 3)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Gains the knowledge about origin of science in the Stone Age and its progress during Antiquity period.
2. Familiar with scientific views in the Medieval period and during the Industrial revolution. .
3. Aware of modern scientific developments from 19th century onwards.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Demonstrate the process of beginning of science and civilization, knowledge acquisition and philosophical approach of science and its advancements in the Stone Ages and Antiquity period.
2. Illustrate the advancements in science and technology in the medieval period across Asia and Arab countries and decline and revival of science in Europe.
3. Explain the scientific approach and its advances of the Europeans and how the role of engineer during the industrial revolution and the major advancements.
4. Make use of the advancements in the field of science and technology by adopting new philosophies of 19th and first half of 20th century in finding ethical solutions to the societal problems.
5. Interpret the changes in specializations of science and the technology and build the relation between information and society from second half of 20th century onwards.

UNIT-I

Science - The Beginning (through 599 BCE): The Stone Ages, Knowledge among hunter gatherers, Agricultural Revolution and other revolutions, Civilization, Major advances.

Science in Antiquity (600 BCE - 529 CE): Philosophy- a precursor to science, Hellenistic world and the Roman Empire, Other cultures of the period, Major advances.

UNIT-II

Medieval Science (530 CE - 1452 CE): The decline of science in Europe, Science in China, Science and mathematics in India, Arab science, Revival of science in Europe, Technology revolution of the Middle ages, Major advances.

The Renaissance and the Scientific Revolution (1453 CE – 1659 CE): Renaissance, Scientific Revolution, Technology, Major advances.

UNIT-III

Scientific Method: Measurement and Communication (1660 CE – 1734 CE): European domination, The scientific method, Major advances.

The Industrial Revolution (1735 CE – 1819 CE): Industrial Revolution, Rise of the engineer, Major Advances.

UNIT-IV

Science and Technology in the 19th Century (1820 CE – 1894 CE): Philosophical basis of 19th-century science, Science and the public, Science and technology, Major advances.

Rise of Modern Science and Technology (1895 CE – 1945 CE): The growth of 20thcentury science, New philosophies, Quantum reality, Energy sources, Electricity: a revolution in technology, Major advances.

UNIT-V

Big Science and the Post-Industrial Society (1946 CE – 1972 CE): Big science, Specialization and changing categories, Technology changes society, Major advances.

The Information Age (1973 CE – 2015 CE): Information and society, Globalization, The post-industrial society, Problems of the Information age, Major Advances.

Text Books:

1. Bryan Bunch and Alexander Hellemans, "The History of Science and Technology", Houghton Mifflin Company (New York), 2004.
2. JD Bernal, "Science in History", 4 Volumes, Eklavya Publishers, 2012.

Suggested Reading:

1. "The 100 Most Influential Scientists of All Time", Edited by Kara Rogers, Britannica Educational Publishing, 2010.
2. Alberto Hernandez, "A Visual History of Science and Technology", The Rosen Publishing Group, 2016.

With effect from Academic Year 2021-22

18IT C35 **TECHNICAL SEMINAR**

Instruction	2 Hours per week
CIE	50 Marks
Credits	1

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state of the art topics in a broad area of his/her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

Course Objectives:

1. To introduce students to critical reading, understanding, summarizing, explaining and preparing report on state-of- the-art topics in a broad area of his/her specialization.
2. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.
3. Documenting the seminar report in a prescribed format.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Collect, Organize, Analyze and Consolidate information about emerging technologies from the literature.
2. Exhibit effective communication skills, stage courage, and confidence.
3. Demonstrate intrapersonal skills.
4. Explain new innovations/inventions in the relevant field.
5. Prepare and experience in writing the Seminar Report in a prescribed format.

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state-of-the-art topics in a broad area of his/ her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include following aspects:

1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:

1. Submit a one-page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.

- Seminars are to be scheduled from 3rdweek to the last week of the semester and any change in schedule shall be discouraged.
- For the award of sessional marks, the students are judged by three (3) faculty members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall be preferably from any peer reviewed recent Journal publications.

Guidelines for awarding marks (CIE): Max. Marks: 50		
S.No	**Description**	**Max. Marks**
1	Contents and relevance	10
2	Presentation skills	10
3	Preparation of PPT slides	05
4	Questions and answers	05
5	Report in a prescribed format	20

With effect from Academic Year 2021-22

18IT C36 **PROJECT PART – 2**

Instruction	10 Hours per week
SEE	100 Marks
CIE	100 Marks
Credits	10

The object of 'Project: Part-2' is to enable the student extend further the investigative study taken up, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned.
2. Review and finalization of the Approach to the Problem relating to the assigned topic.
3. Preparing an Action Plan for conducting the investigation, including team work.
4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed.
5. Final development of product/process, testing, results, conclusions and future directions.
6. Preparing a paper for Conference presentation/ Publication in Journals, if possible.
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar presentation before Departmental Committee.

Guidelines for the award of marks in CIE: (Max. Marks: 100)

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
Department Review Committee	10	Review 1
	15	Review 2
	25	Submission
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which may lead to publications
	10	Report Preparation
	10	Analytical / Programming / Experimental Skills

Guidelines for awarding marks in SEE: (Max. Marks: 100)

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
External and Internal Examiners together	20	Power Point Presentation
	40	Thesis Evaluation
	20	Quality of the project • Innovations • Applications • Live Research Projects • Scope for future study • Application to society
	20	Viva-Voce

Open Elective Courses offered by IT to other Departments

With effect from Academic Year 2021-22

18IT O01 **OBJECT ORIENTED PROGRAMMING USING JAVA**

(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To familiarize with fundamentals of object-oriented programming paradigm.
2. To impart the knowledge of string handling, interfaces, packages and inner classes.
3. To facilitate learning Exception handling and Multithreading mechanisms.
4. To gain knowledge on collection framework, stream classes.
5. To familiarize with event driven GUI programming and Database connectivity.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the concepts of Object-Oriented Programming and class concept in Java.
2. Apply concepts of OOP such as Inheritance, Interfaces, Packages and Inner classes.
3. Handle exceptions and demonstrate the concepts of Multithreading and Generic classes.
4. Develop programs using Java Collection API and Stream classes.
5. Design and Develop GUI applications with JDBC.

UNIT-I

OOP concepts - Data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, classes and objects, Procedural and object oriented programming paradigms.

Introduction to Java: Java's Magic: The Byte code, The Java Buzzwords, Simple Java Programs, Java Primitive Types, Arrays: How to create and define arrays, Basic Operators, Control statements.

Introducing Classes: Declaring objects, methods, Constructors, this keyword, Method Overloading and Constructor Overloading, Objects as parameters, Returning objects, Use of static and final keywords.

UNIT-II

Inheritance: super and subclasses , Member access rules ,super keyword**,** Method overriding, Dynamic method dispatch , Abstract classes, using final with inheritance , Introduction to Object class.

Packages: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

Interfaces : Defining and implementing interfaces, Nested Interfaces.

Strings Handling: String & StringBuffer classes, StringTokenizer class and Wrapper classes and conversion between Objects and primitives.

Inner classes in Java: Types of inner classes, Creating static / non-static inner classes, Local and anonymous inner classes.

UNIT-III

Exception Handling in Java: what are Exceptions? Exception types**,** Usage of try, catch, throw, throws and finally clauses, writing your own exception classes.

Multithreading in Java: The java Thread Model, How to create threads, Thread class in java, Thread priorities, Thread synchronization.

Generics: What are Generics? Generic classes, bounded types, Generic methods and interfaces.

UNIT-IV

Collections Framework: Overview of Collection Framework, Commonly used Collection classes – ArrayList, LinkedList, HashSet, LinkedHashSet, TreeSet, Collection Interfaces –Collection, List, Set, SortedSet, Accessing a collection via an Iteration,Storing user-defined classes in collections, Map Interfaces and Classes, Using a comparator. Legacy classes – Vector, Hashtable, The Enumeration interface.

Input/Output : How to read user input (from keyboard) using scanner class,Stream classes, InputStream, OutputStream, FileInputStream, FileOutputStream, Reader and Writer, FileReader, FileWriter cl asses. File class.

UNIT-V

GUI Design and Event Handling: Component, Container, window, Frame classes. Working with Frame window GUI Controls, Layout Managers, Introduction to Swings, Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces, Handling button click events, Adapter classes. Writing GUI Based applications.

Database Handling in Java: Java Database Connectivity (JDBC) using MySQL.

Text Books:

1. Herbert Schildt, "Java: The Complete Reference", 8th Edition, Tata McGraw Hill Publications, 2011.
2. Cay S. Horstmann, Gary Cornell, "Core Java, Volume I, Fundamentals", 8th Edition, Prentice Hall, 2008.

Suggested Reading:

1. E Balagurusamy "Programming with JAVA", 6th Edition , Tata McGraw-Hill Publishing company Ltd,2019.
2. Sachin Malhotra & Saurabh Choudhary, "Programming in Java", 2nd Edition, Oxford University Press, 2014.
3. C. Thomas Wu, "An introduction to Object-oriented programming with Java", 4th Edition, Tata McGraw-Hill Publishing company Ltd., 2010.
4. Kathy Sierra, Bert Bates, "Head First Java: A Brain-Friendly Guide" 2nd Edition, O'Reilly,2005

Web Resources:

1. https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html.
2. http://nptel.ac.in/courses/106106147/
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-092-introduction-to-programming-in-java-january-iap-2010/lecture-notes/

With effect from Academic Year 2021-22

18IT O02 **PYTHON PROGRAMMING**
(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To facilitate learning to use lists, tuples and dictionaries in Python programs.
2. To familiarize with functions and file handling.
3. To learn data structures of Python programming,
4. To impart knpwledge on OOPs concepts and handle exceptions in Python.
5. To introduce GUI Programming and familiarize with data visualization.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the fundamental concepts and control structures of python programming.
2. Write user defined iterative & recursive functions, identify appropriate predefined functions and perform file handling Operations.
3. Use suitable data structures such as sequences, dictionaries and sets in python programming.
4. Apply concepts of OOP, exception handling and build regular expressions using Python.
5. Design and Develop GUI based applications and visualize the data.

UNIT-I

Introduction to Python Programming: Using Python, The IDLE Programming Environment, Input and Output Processing, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, More About Data Output: New line, Item Separator, Escape Characters, Formatting parameters.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables.

Repetition Structures: Introduction, while loop, for loop, Sentinels, Input Validation Loops, Nested Loops.

UNIT-II

Functions: Introduction, Defining and Calling a Function, Designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions Generating Random Numbers, Writing Our Own Value-Returning Functions, The math Module, Random Module, Time Module and Storing Functions in Modules.

Python File Input-Output: Opening and closing file, various types of file modes, reading and writing to files, manipulating directories.

UNIT-III

Lists and Tuples: Sequences, Introduction to Lists, List slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists, Tuples.

Strings: Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings.

Dictionaries and Sets: Dictionaries, Sets, Serializing Objects.

Recursion: Introduction, Problem Solving with Recursion, Examples of Recursive Algorithms.

UNIT-IV

Classes and Object-Oriented Programming: Procedural and Object-Oriented Programming, Classes, Working with Instances, Techniques for Designing Classes.

Exception Handling: What is exception, various keywords to handle exception such try, catch, except, else, finally, raise.

Regular Expressions: The match() Function, The search() Function, The sub() Function, The findall() and finditer() Functions, Flag Options.

UNIT-V

GUI Programming: Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons.

Introduction to plotting in Python – Basic Plots- Line and Scatter Plot, box plot, bar plots, Histograms and plotting data contained in files.

Text Book:

1. Tony Gaddis, "Starting Out With Python", 3rd Edition, Pearson, 2015.

Suggested Reading:

1. ReemaThareja "Python Programming", Oxford Press, 2017
2. Kenneth A. Lambert, "Fundamentals of Python", Delmar Cengage Learning, 2013.
3. Fabio Nelli, "Python Data Analytics (With Pandas, NumPy, and Matplotlib)", Apress, 2nd Edition, 2018.
4. James Payne, "Beginning Python using Python 2.6 and Python 3", wrox programmer to programmer, 2010.
5. Paul Gries, "Practical Programming: An Introduction to Computer Science using Python", 3rd Edition, 2016.

Web Resource:

1. https://www.python.org/

With effect from Academic Year 2020-21

18IT O03 **PRINCIPLES OF INTERNET OF THINGS**

(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To provide an overview of Internet of Things, building blocks of IoT and real-world applications.
2. To explore various IOT enabling technologies.
3. To facilitate students, understand Python scripts for IoT platform.
4. To identify steps in IOT design Methodology.
5. To introduce about the Raspberry Pi device, its interfaces and Django Framework.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Comprehend the terminology, protocols and communication models of IoT.
2. Define the various IoT enabling technologies and differentiate between M2M and IoT.
3. Acquire the basics of Python Scripting Language used in developing IoT applications.
4. Describe the steps involved in IoT system design methodology.
5. Design simple IoT systems using Raspberry Pi board and interfacing sensors with Raspberry Pi.

Modified Course Outcomes:

1. Outline the terminology, protocols, Communication models and Communication APIs of IoT.
2. Define the various IoT enabling technologies, Levels, Domain Specific applications and differentiation between M2M and IoT.
3. Make use the basics of Python Scripting Language for developing IoT applications.
4. Infer the steps involved in IoT system design methodology with Home Automation case study.
5. Examine IoT systems using the Raspberry Pi board and interfacing sensors.

UNIT-I

Introduction & Concepts: Introduction to Internet of Things- Definitions & Characteristics ofIoT, Physical Design of IOT-Physical Layer, Network Layer, Transport Layer, Application Layer, Things in IoT, IoT Protocols, Logical Design of IOT-IoTFunctional Blocks, IoT Communication Models-Request-reponse,Publisher-Subscriber,Push-Pull,Exclusive Pair, IoT Communication APIs-REST API, Websocket API,

UNIT-II

IOT Enabling Technologies: Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IOT Levels & Deployment Templates. Differences and similarities between IOT and M2M, Domain Specific IoT's – IoT applications for Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

UNIT-III

Introduction to Python–Motivation for using Python for designing IoT systems, Language features of Python, Data types- Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, Data Structures: Control of flow-if, for, while, range, break/continue, pass, functions, modules, packaging, file handling, data/time operations, classes, Exception handling,

UNIT-IV

IoT Platforms Design Methodology: Introduction, IoT Design Methodology Steps-Purpose and Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device and Component Integration, Application Development, Case Study on IoT System for Weather Monitoring.

UNIT-V

IoT Physical Devices and End Points: Basic building blocks of an IoT device, Raspberry Pi about the Raspberry Pi board, Raspberry Pi interfaces-Serial, SPI, I2C, Other IoT Devices pcDuino, BeagleBone Black, Cubieboard. Python Web Application Framework: Django Framework-Roles of Model, Template andView

Text Books:

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

Suggested Reading:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.
3. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", Willy Publications.

Web Resources:

1. The Internet of Things - Article https://dl.acm.org/citation.cfm?id=1862541
2. Internet of Things - Tutorial
3. http://archive.eurescom.eu/~pub/about-eurescoiem/message_2009_02/Eurescom_message_02_2009.pdf
4. Publications on The Internet of Things. http://www.itu.int/osg/spu/publications/internetofthings/InternetofThings_summary.pdf