SEMESTER I			
CORE II	**DIGITAL IMAGE PROCESSING USING MATLAB**		
Course Code: 21PCSC12	**Hrs/Week: 5**	**Hrs/Sem: 75**	**Credits: 4**

Objectives:

- To interpret images mathematically and process them for the extraction of data using MATLAB.
- To familiarize students with image enhancement and restoration techniques.
- To introduce the concepts of image processing and basic analytical methods to be used in image processing.

Course Outcomes:

CO. No.	Upon Completion of this course, students will be able to	PSOs Addressed	CL
CO-1	Develop programming skills and techniques to solve mathematical problem.	1	Ap
CO-2	Learn graphic features of MATLAB and they are able to use this feature effectively in the various applications	1	Ap
CO-3	Distinguish the need for image transforms different types of image transforms and their properties.	2,3	An
CO-4	Learn different techniques employed for the enhancement of images.	3	Un
CO-5	Analyze images in the frequency domain using various transforms.	3	An
CO-6	Interpret Image compression, segmentation and representation standards	3	An
CO-7	Choose image filtering in various applications	2	Ap
CO-8	Analyze different causes for image degradation and overview of image restoration techniques.	3	An

SEMESTER I			
CORE II	**DIGITAL IMAGE PROCESSING USING MATLAB**		
Course Code: 21PCSC12	**Hrs/Week: 5**	**Hrs/Sem: 75**	**Credits: 4**

UNIT- I: Matlab

Introduction: MATLAB Environment - Types of files - Search - Constants , Variables and Expressions - Vectors and Matrices - Polynomials - Input / Output statements-MATLAB graphics-Control Structures - Writing Programs and functions.
(Text Book 1 - Chapter 1, 2, 3, 4, 5, 6, 7, 8)

UNIT- II: Introduction & Image Enhancement

Introduction – steps in image processing, Image acquisition, representation, sampling and quantization, relationship between pixels. – color models – basics of color image processing.

Image enhancement in spatial domain – some basic gray level transformations – histogram processing – enhancement using arithmetic, logic operations – basics of spatial filtering and smoothing.

UNIT-III: Intensity Transformations And Spatial Filtering& Frequency Domain Processing

Intensity Transformation Functions- Histogram Processing and Function Plotting- Spatial Filtering- Image Processing Toolbox Standard Spatial Filters

The 2-DDiscrete Fourier Transform- Computing andVisualizing the 2-D DFT in MATLAB-Filtering in the Frequency Domain- Obtaining Frequency Domain Filters from Spatial Filters - Generating Filters Directly in the Frequency Domain- Sharpening Frequency Domain Fillers.

UNIT -IV: Image Restoration & Color Image Processing

A Model of the Image Degradation/Restoration Process - Noise Models - Restoration in the Presence of Noise Only-Spatial Filtering- Periodic Noise Reduction by Frequency Domain Filtering-Modeling the Degradation Function **-**Direct Inverse Filtering -Wiener Filtering

Color Image Representation in MATLAB- Converting to Other Color Spaces -The Basics of Color Image Processing Color Transformations**.**

UNIT -V: Image Compression & Image Segmentation

Coding Redundancy -Huffman Codes - Huffman Encoding - Huffman Decoding -Interpixel Redundancy -Psychovisual Redundancy- JPEG Compression.

Point, Line, and Edge Detection- Thresholding- Region-Based Segmentation.
(Text Book 2 - Chapter 2, 3, 4, 5, 6, 8, 10)

Text Books:

1. Rajkumar Bansal, Ashok Kumar Goel and Manoj Kumar Sharma. *MATLAB and its Applications in Engineering*. Pearsons Publications, 2016.
2. Rafael C. Gonzalez. *Digital Image Processing using MATLAB*. 2nd Edition, 2010.

Reference Books:

1**.** R.C. Gonzalez and R.E.Woods. *Digital Image Processing*, 3rd Edition, Pearson Education.

SEMESTER –I			
CORE IV	**COMPILER DESIGN**		
Course Code:21PCSC14	**Hrs/week:4**	**Hrs/Semester:60**	**Credits:4**

Objectives:

- To learn the process of translating a modern high-level language to executable code.
- To identify the methods and strategies of parsing techniques.
- To generate intermediate code, and to design syntax directed translation scheme and apply code optimization techniques.

Course Outcomes:

CO. No	Upon Completion of this course, students will be able to	PSO addressed	CL
CO-1	Understand the basic principles of compiler in high level programming language	1,5	Un
CO-2	Represent language tokens using regular expressions, finite automata	5	An
CO-3	Apply parsing techniques and able to write Context Free Grammars for various languages	5	Ap
CO-4	Apply the knowledge of intermediate code generation to build efficient systems	5	Ap
CO-5	Develop the knowledge on Run-time Environment	5	Ap
CO-6	Understand the need of intermediate representation for the generation of target code	5	Ap
CO-7	Design code generator and apply code optimization techniques	5	Ap
CO-8	Apply optimization techniques to intermediate code and generate machine code for high level language program	5	Ap

SEMESTER –I			
CORE IV	**COMPILER DESIGN**		
Course Code:21PCSC14	**Hrs/week:4**	**Hrs/Semester:60**	**Credits:4**

UNIT – I: Lexical Analysis

Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens –Finite Automata – Regular Expressions to Automata – Minimizing the number of states of a DFA.

UNIT – II: Syntax Analysis

Introduction – Context-free Grammars – Writing a Grammar – Top-Down Parsing – Bottom-Up parsing – LR Parsing – Ambiguous Grammar – Parser Generators

UNIT – III: Intermediate Code Generation

Syntax Directed Definitions - Evaluation Orders for Syntax Directed Definitions - Variants of Syntax trees – Three-Address Code – Types and Declarations – Translation of Expressions – Type Checking

UNIT – IV: Run Time Environments and Code Generation

Storage Organization – Stack Allocation of Space - Access to Nonlocal Data on the Stack - Issues in the Design of a Code Generator – Target Language – Address in the Target Language - A Simple Code Generator

UNIT – V: Code Optimization

Basic Blocks and Flow Graphs - Optimization of Basic Blocks - Peephole Optimization - Machine-Independent Optimizations: Introduction to Data-Flow Analysis

Text Book:

1. Alfred V. Aho, Monica S. Lam, RaviSethi and Jeffery D.Ullman. *Compilers: Principles, Techniques and Tools*. Pearson, 2nd Edition, 2014.

Reference Books:

1. J.P. Tremblay and P.G. Sorrenson. *The Theory and Practice of Compiler Writing*. McGraw Hill, 1985.
2. David Galles. *Modern Compiler Design.* Pearson Education Asia, 2007.
3. Steven S. Muchnick. *Advanced Compiler Design & Implementation*. Morgan Kaufmann Pulishers, 2000.

SEMESTER- II			
CORE VIII - SINGLE BOARD COMPUTERS AND IOT			
Course Code: 21PCSC24	**Hrs / week :4**	**Hrs / Sem: 60**	**Credits :4**

Objectives:

- To deliver a deep knowledge of Internet of Things and Single Board Computers.
- To understand the architecture of Single Board Computers and ability on setup Raspberry Pi .
- To recognize the concepts of Internet of Things and its security measures.

Course Outcomes:

CO.No	Upon Completion of this course, students will be able to	PSO addressed	CL
CO-1	Code program and develop applications using single board computers	8	Ap
CO-2	Create a good working setup of Raspberry Pi	8	Cr
CO-3	Understand the concepts of Internet of Things	8	Un
CO-4	Identify andapplying different IoT technologies	8	Ap
CO-5	Inculcate knowledge on communication middleware and Information security in IoT	7,8	Un
CO-6	Analyze basic protocols in wireless sensor network	7	An
CO-7	Implement State of the Art - IoT Architecture	8	Ap
CO-8	Examine the security and privacy issues in IoT	7,8	An

UNIT - I: Introduction to Single Board Computers

Introduction - history of Single Board Computers - Classification - Comparison - Evolution - Architecture - applications - Overview on Raspberry Pi - GPIO - shields - overview on Beaglebone - features.

UNIT - II: Setting up RASPBERRY Pi

Installing and preparing Raspberry Pi - flashing SD Card - Booting up - Configuring Pi - Troubleshooting - Using Command Line interface - Linux commands - configuring network connection- Arduino and Pi- Basic Input and Output

UNIT – III: Introduction to Internet of Things

Internet of Things: Introduction-Definition & Characteristics of IoT-Physical design of IoT and logical design of IoT- IoT Enabling Technologies: WSNs, Cloud Computing, Big Data Analytics, Communication Protocols and Embedded Systems. IoT and M2M: Introduction-M2M-Difference between IoT and M2M Scenario.

UNIT – IV: Internet of Things Concepts

IoT concepts: IoT architectures-Resource management-IoT data management and analytics-Communication protocols-Applications-Programming frameworks for Internet of Things: Overview-Embedded Device Programming Languages-Message passing in Devices-Stream processing in IoT-Introduction-The foundations of stream processing in IoT- Continuous Logic Processing System-Challenges and future directions.

UNIT – V: Security and Privacy in the Internet of Things

Concepts- IoT Security Overview-Security Frameworks for IoT-Privacy in IoT Networks-Obfuscation and Diversification for Securing the Internet of Things: Introduction-Distinguishing Characteristics of IoT-Obfuscation and Diversification Techniques

Text Books:

1. Matt Richardson and Shawn Wallace.*Getting started with Raspberry Pi*. O'ReillyMedia, Inc, 1st edition, 2012.
2. ArshdeepBahga and Vijay Madisetti.*Internet of Things-A Hands-on Approach*. Universities Press Amir (India), 2015.

Reference Books:

1. RajkumarBuyya and VahidDastjerdi. *Internet of Things: Principles and Paradigms.* Cloud Computing and Distributed Systems (Clouds) Laboratory, Manja Soft Pty Ltd., Australia, 2016.
2. Fei Hu. *Security and Privacy in Internet of Things (IoTs): Models, algorithms, and Implementations.* CRC Press, 2016 .
3. Tim Cox. *Raspberry Pi Cookbook for Python Programmers*. 2014.

SEMESTER –I			
CORE PRACTICAL-I DESIGN AND ANALYSIS OF ALGORITHMS LAB			
Course Code:21PCSCR1	**Hrs/week: 4**	**Hrs/Semester:60**	**Credits:2**

Using C++ programming write programs for the following:

1. Sorting
2. Graph traversal
3. Prim's Algorithm-Greedy Method
4. N queen problem
5. Knapsack problem
6. Single Source Shortest Path
7. Sum of Subsets
8. Binary Search Tree
9. Graph Coloring
10. BiConnected Components
11. Travelling Salesman Problem

SEMESTER –I			
CORE PRACTICAL-II DIGITAL IMAGE PROCESSING USING MATLAB LAB			
Course Code:21PCSCR2	**Hrs/week:4**	**Hrs/Semester:60**	**Credits:2**

Using MATLAB write programs for the following:

1. Resizing and Rotating Images
2. To extract different attributes of an Image.
3. Image Enhancement- Contrast and Brightness
4. Image Enhancement- Calculate Histogram
5. Blurring and Smoothing
6. Edge Detection
7. Image Sharpening
8. Object Segmentation via Thresholding
9. Noise Filtering
10. Image Negation

SEMESTER- I			
ELECTIVE I B- CRYPTOGRAPHY AND NETWORK SECURITY			
Course Code: 21PCSE12	**Hrs / week :4**	**Hrs / Sem: 60**	**Credits :4**

Objectives:

- To make the students to learn the fundamental concepts of cryptography and network security and utilize these techniques in computing system.
- To understand cryptography and network security concepts
- To develop the knowledge in cryptography theories, algorithms and systems

Course Outcomes:

CO. No.	Upon Completion of this course, students will be able to	PSOs Addressed	CL
CO-1	Understand the fundamental Conceptsof various encryption techniques	1,2	Un
CO-2	Demonstrate the process to maintain the Confidentiality, Integrity and Availability of data	7	Ap
CO-3	Distnguish between various algorithms for network security to protect against the threats in the networks	7	An
CO-4	Apply the concept of Public key cryptography	1,7	Ap
CO-5	Analyze solutions for effective key management and distribution	2,7	An
CO-6	Apply and manage to secure a message over insecure channel by various means	7	Ap
CO-7	Identify and apply the functional IP network security to protect against the threats in the networks	7	Ap
CO-8	Explain the configuration of simple firewall architectures	7	Ap

UNIT - I

Introduction: Information OSI Security Architecture - Security Attacks-Passive Attacks-Active Attacks-Security Services – Authentication-Access Control-Data Confidentiality-DataIntegrity-Nonrepudiation-AvailabilityService-Security Mechanisms- Model for Network security

UNIT - II

Classical Encryption Techniques -Symmetric Cipher Model- Substitution Techniques - Transposition Techniques - Block Ciphers and the Data Encryption Standard-Block Cipher Principles - The Data Encryption Standard -Strength of DES-Advanced Encryption Standard -Evaluation Criteria for AES- The AES Cipher

UNIT- III

Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems - The RSA Algorithm- Key Management - Diffie-Hellman Key Exchange- Message Authentication and Hash Functions: Authentication Requirements-Authentication Functions -Message Authentication Codes - Hash Functions

UNIT - IV

IP Security: IP security overview, IP security architecture, Authentication header, Encapsulating security pay load, combining security association, Key management-Web security considerations, Secure socket layer, Secure electronic transaction.

UNIT - V

System Security: Intruders - Intrusion Detection - Password Management-Malicious software, Viruses and related threats, virus counter measures-Firewalls: Firewall Design Principles-Trusted Systems - Common Criteria for Information Technology Security Evaluation

Text Book:

1. William Stallings. *Cryptography and Network Security Principles and Practices*. 6th Edition, 2013.

References Books:

1. Behrouz A. Ferouzan. *Cryptography & Network Security*, Tata McGraw Hill, 2007.

2. Charlie Kaufman, Radia Perlman and Mike Speciner. *Network Security*. Prentice Hall of India, 2002.

SEMESTER- II			
ELECTIVE II	**B - SOFT COMPUTING**		
Course Code: 21PCSE22	**Hrs / week :4**	**Hrs / Sem: 60**	**Credits :4**

Objectives:

- To solve real-world problems by providing approximate results those conventional and analytical models cannot solve.
- To understand the features, advantages and applications of Artificial Intelligence.
- To realize the revolution of artificial intelligence to develop hybrid systems for the industrial problems.

Course Outcomes:

CO. No.	Upon Completion of this course, students will be able to	PSOs Addressed	CL
CO-1	Understand the concepts of Artificial Intelligence and neural networks.	1	Un
CO-2	Categorize different learning algorithms	3	An
CO-3	Analyze the classification taxonomy of NN	3	An
CO-4	Compare different network models	7	An
CO-5	Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.	2	Ap
CO-6	Implement the concepts of fuzzy sets, knowledge representation using fuzzy rules	2	An
CO-7	Identify and define approximate reasoning, fuzzy inference systems, and fuzzy logic	1	An
CO-8	Analyze the genetic algorithms and their applications	3	An

SEMESTER- II			
ELECTIVE II	**B - SOFT COMPUTING**		
Course Code: 21PCSE22	**Hrs / week :4**	**Hrs / Sem: 60**	**Credits :4**

UNIT – I: Neural Networks Fundamentals

Fundamentals of ANN: The Biological Neural Network, Artificial Neural Networks - Building Blocks of ANN and ANN terminologies: Architecture, setting of weights, activation functions-McCulloch-pitts Neuron Model - Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules – Hebbian Learning rule- Perceptron learning rule-Delta Learning Rule.

UNIT – II: Categories of Neural Networks

Models of ANN: Single layer perceptron- Architecture, Algorithm, application procedure. Associative memory Networks: Hopfield Net and BAM - Supervised Learning Networks: Back propagation Network (BPN) and Radial Basis Function Network (RBFN) - UnSupervised Learning Networks : Self Organizing Feature Maps: SOM and LVQ.

UNIT – III: Basic Concepts of Fuzzy Set

Fuzzy Sets, properties and operations - Fuzzy relations, cardinality, operations and properties of fuzzy relations, fuzzy composition

UNIT – IV: Membership Function & FIS

Fuzzy variables - Types of membership functions - fuzzy rules: Takagi and Mamdani - fuzzy inference systems: fuzzification, inference, rule base, defuzzification.

UNIT-V: Genetic Algorithms

Genetic Algorithm (GA): Biological terminology – elements of GA: encoding, types of selection, types of crossover, mutation, reinsertion – a simple genetic algorithm –General Genetic algorithm -The Schema Theorem - Classification of Genetic Algorithm - Applications of Genetic Algorithm.

Text Books:

1. S. N. Sivanandam, S. Sumathi and S.N. Deepa. *Introduction to Neural Networks using MATLAB 6.0*. Tata McGraw-Hill, New Delhi, 2006.
2. S. N. Sivanandam and S.N. Deepa. *Principles of Soft Computing.* Wiley-India, 2008.

Reference Books:

1. Simon Haykin.*Neural networks A Comprehensive Foundation*. Pearson Prentice Hall,2005
2. S.Rajasekaran and G.A.V.Pai. *Neural Networks, Fuzzy Logic and Genetic Algorithms.* PHI, 2004.
3. S.N.Sivanandam and S.N.Deepa.*Introduction to Genetic Algorithms.* Springer, 2007.
4. Timothy J.Ross.*Fuzzy Logic with Engineering Application.* McGraw Hill, 2000.
5. Davis E.Goldberg.*Genetic Algorithms: Search, Optimization and Machine Learning*. Addison Wesley, N.Y., 2003.