

III- Year I- Semester	Name of the Course	L	T	P	C
PC3101	Automata and Compiler Design	2	1	0	3

UNIT-I: Finite Automata

Automata: Need for Automata Theory, Chomsky hierarchy, Acceptance of a string, Design of NFA with ϵ , NFA without ϵ , DFA, Equivalence of NFA, DFA

Finite Automata Conversions: Conversion from NFA ϵ to NFA, NFA to DFA, Minimization of DFA, Moore and Mealy Machines.

UNIT-II: Regular Expressions and Grammars

Regular Expressions: Regular Sets, Identity Rules, Equivalence of two RE, Manipulations of REs, Finite Automata and Regular Expressions, Inter Conversion, Equivalence between FA and RE, Pumping Lemma of Regular Sets, Closure Properties of Regular Sets.

Grammars: Grammars, Classification of Grammars, Right and Left Linear Regular Grammars, Equivalence between RG and FA, Inter Conversion. Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars, Normal Forms- Chomsky Normal Form, Griebach Normal Form.

UNIT-III: Push Down Automata and Turing Machines

Push Down Automata (PDA): Design of PDA, Deterministic PDA, Non-deterministic PDA, Equivalence of PDA and Context Free Grammars.

Turing Machine (TM): Design of Turing Machine, Deterministic TM, Non-deterministic TM.

UNIT-IV: Machine Independent Phases

Lexical Analysis: Logical phases of compiler, Lexical Analysis, Lexemes Tokens and patterns, Lexical Errors, Regular Expressions, Regular definitions for the language constructs, Strings, Sequences, Comments, Transition diagram for recognition of tokens, Reserved words and identifiers.

Syntax Analysis: Parsing definition, types of parsing, left recursion, left factoring, Top-down parsing, First and Follow, LL (1) Grammars, Non- Recursive predictive parsing, Bottom-up Parsers, Shift Reduce Parsing, LR parsers.

Semantic Analysis: Syntax Directed Translation, L-attributed and S-attributed definitions .

Symbol tables: use and need of symbol tables.

UNIT-V: Machine Dependent Phases

Intermediate Code Generation: Intermediate code, three address code, quadruples, triples, directed acyclic graph.

Code Optimization: Common sub expression elimination, copy propagation, dead code elimination, constant folding, strength reduction, loop optimization.

Code Generation: Basic blocks & flow graphs, Peephole optimization, Register allocation and assignment.

Text Books:

1. Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008
2. Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra And N. Chandrasekharan, 3rd Edition, PHI, 2007
3. Compilers, Principles Techniques and Tools- Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D. Ullman, 2nd ed, Pearson, 2007.

Reference Books

1. Elements of Theory of Computation, Lewis H.P. & Papadimition C.H., Pearson /PHI
2. Theory of Computation, V. Kulkarni, Oxford University Press, 2013
3. Principles of compiler design, V. Raghavan, 2nd ed, TMH, 2011.
4. Compiler construction, Principles and Practice, Kenneth C Loudon, CENGAGE

III- Year I- Semester	Name of the Course	L	T	P	C
PC3102	Machine Learning	3	0	0	3

UNIT- I: Introduction to Statistical Learning and Linear Regression

Introduction to Statistical Learning: What Is Statistical Learning? Assessing Model accuracy.

Linear Regression: Simple Linear Regression, Estimating the Coefficients, Assessing the Accuracy of the Coefficient Estimates, Assessing the Accuracy of the Model.

UNIT- II: Multiple Linear Regression and Classification

Multiple Linear Regressions: Estimating the Regression Coefficients, Other Considerations in the Regression Model, and Comparison of Linear Regression with K-Nearest Neighbours.

Classification: An Overview of Classification, Why Not Linear Regression? Logistic Regression, Generative Models for Classification, a Comparison of Classification Methods.

UNIT-III: Resampling Methods, Linear Model Selection and Regularization

Resampling methods: Cross-Validation, the Bootstrap.

Linear Model Selection and Regularization: Subset Selection, Shrinkage Methods, Dimension Reduction Methods, Considerations in High Dimensions.

UNIT – IV: Tree-Based Methods

Tree-Based Methods: The Basics of Decision Trees, Regression Trees, Classification Trees, Trees versus Linear Models, Advantages and Disadvantages of Trees, Bagging, Random Forests, Boosting and Bayesian Additive Regression Trees.

UNIT – V: Support Vector Machines and Unsupervised Learning

Support Vector Machines, Maximal Margin Classifier, Support Vector Classifiers, Support Vector Machines.

Unsupervised Learning: The Challenge of Unsupervised Learning, Principal Components Analysis, Missing Values and Matrix Completion, Clustering Methods.

Text Books:

1. Gareth James, et al. An Introduction to Statistical Learning: with Applications in R, Springer. 2nd edition (2021 edition).

Reference Books:

1. Tom Mitchell, “Machine Learning”, McGraw Hill, 1997
2. E. Alpaydin, “Introduction to Machine Learning”, PHI, 2005.
3. Andrew Ng, Machine learning yearning, <https://www.deeplearning.ai/machine-learning-yearning/>
4. Hands-on machine learning with R” by Bradley Boehmke & Brandon Greenwell
5. “Machine learning with R, the tidyverse, and mlr” by Hefin I. Rhys.

III- Year I- Semester	Name of the Course	L	T	P	C
PC3103	Computer Networks	3	0	0	3

UNIT-I: Introduction to Computer Networks and Physical Layer

Introduction: Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, Example Networks, Physical Layer – Fourier analysis – Bandwidth Limited Signals – The Maximum Data Rate of a Channel Guided Transmission Media, Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, and Code Division Multiplexing

UNIT-II: Data Link Layer

Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Control Protocols, Sliding Window Protocols, HDLC, PPP, Channel Allocation problem, Multiple Access Protocols, IEEE standards for Local Area Networks, WLAN, Bluetooth

UNIT– III: Network Layer

Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Internet Protocol Header, IP Addresses, subnetting and super netting.

UNIT-IV: Transport Layer

Transport Layer Design Issues, Connection Establishment, Connection Termination, Transport and User Datagram Protocols

UNIT – V: Application Layer

Design Issues, DNS, WWW, HTTP/HTTPS, E-mail, FTP

Text Books:

1. Computer Networks, Andrew S Tanenbaum, Pearson, 5th Edition
2. Data Communications and Networking, Behrouz A Forouzan, Tata McGraw Hill, 4th Edition

Reference Book:

1. TCP/IP Protocol Suite, Behrouz A Forouzan, Tata McGraw Hill Edition, 3rd Edition

III- Year I- Semester	Name of the Course	L	T	P	C
OE3101	Image Processing Using Python	3	0	0	3

UNIT - I: Fundamentals of Image Processing and Image Transforms

Introduction, Image sampling, Quantization, Resolution, Elements of image processing system, Applications of Digital image processing. Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform, Discrete cosine transform, Walsh transform, Hadamard transform, Haar transform, slant transform and KL transform.

UNIT - II: Image Enhancement

Spatial domain methods: Point & Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters.

Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.

UNIT- III: Image Restoration and Reconstruction

A model of the image degradation and Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering, geometric mean filter, image reconstruction from projections.

UNIT- IV: Image Segmentation

Fundamentals, point, line, edge detection, thresholding, and region –based segmentation.

Morphological Image Processing

Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning.

UNIT - V: Image Compression

Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of image compression schemes, Fundamentals of information theory, Run length coding, Shannon – Fano coding, Huffman coding, Arithmetic coding, Predictive coding, Transformed based compression.

Text books:

1. Digital Image Processing – Gonzalez and Woods, 2nd Ed., Pearson.
2. S. Jayaraman, S. Esakkirajan and T. VeeraKumar, “Digital Image processing, Tata McGraw Hill publishers, 2009

Reference books:

1. Anil K. Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. J. T. Tou, R. C. Gonzalez, “Pattern Recognition Principles”, Addison-Wesley, 1974.
3. B. Chanda, D. Dutta Majumder, “Digital Image Processing and Analysis”, PHI, 2009.

III- Year I- Semester	Name of the Course	L	T	P	C
PE3101	Artificial Neural Networks (Professional Elective - 1.1)	2	0	2	3

UNIT - I: Foundations

Linear Algebra- Creating matrices add vectors using NumPy, implementation of operations on matrices-addition, subtraction, multiplication, transpose, inverse, determinant, Vectors- addition, subtraction, dot product, various norms. Linear transformations, pre-processing data using pandas. Scikit Learn - data processing, creating model using Scikit-learn.

UNIT - II: Introduction to Artificial Neural Network

Biological Model of Neuron, ANN model, McCulloch and Pitts model, Adaline, Perceptron, Activation functions, realizing logic gates using perceptron, implementing perceptron using Python, implementing functionality of logic gates using perceptron in python.

UNIT - III: Single Layer Perceptron

Architectural Models for ANN, Single Layer Perceptron as a classifier, implementing classification using perceptron, learning and training ANN, optimization- Gradient descent algorithm, stochastic gradient descent algorithm, implementation of gradient descent using python.

UNIT – IV: Multilayer Perceptron

Multilayer Perceptron- architecture, functionality of neurons in different layers, implementing multilayer perceptron using Scikit-learn, Back propagation algorithm-training and convergence, design issues, example, implementation using python.

UNIT – V: Linear, Logistic regression and Classification

Linear and logistic regression using MLP, multivariate regression, implementation of linear and logistic regression using Scikit-learn, Function Approximation using MLP, RBF networks, RBF Training. Implementation of classification using ANN with Scikit-learn on IRIS dataset.

. Text Books:

1. Simon Haykin, "Neural Networks: A comprehensive foundation", Second Edition, Pearson Education Asia.
2. Satish Kumar, "Neural Networks: A classroom approach", Tata McGraw Hill, 2004.
3. Pradhan Manaranjan, U Dinesh Kumar, "Machine Learning Using Python", wiley.

References:

1. Yegna narayana B, "Artificial Neural Networks", PHI Learning Pvt. Ltd, 2009.
2. Martin T. Hagan, Howard B. Demuth, Mark Hudson Beale, Orlando De Jesús, Neural Network Design, 2nd Edition (Free Online version available at url 4)
3. Aurélien Géron, Neural networks and deep learning, O'Reilly Media, 2018.

III- Year I- Semester	Name of the Course	L	T	P	C
PE3101	Software project Management (Professional Elective - 1.2)	2	0	2	3

UNIT –I: Conventional Software Management

The waterfall model, conventional software Management performance. Evolution of Software Economics: Software Economics, pragmatic software cost estimation. Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections

UNIT –II: The Old Way and the New

The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process. Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases. Artifacts of The Process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT –III:

Model Based Software Architectures: A Management perspective and technical perspective. Work Flows of the Process: Software process workflows, Iteration workflows. Checkpoints of the Process: Major mile stones, Minor Milestones, Periodic status assessments.

UNIT -IV:

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning. Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT -V:

Process Automation: Automation Building blocks, The Project Environment. Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation. Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach.

Text Books:

- 1) Software Project Management, Walker Royce, Pearson Education, 2005.
- 2) Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

Reference Books:

- 1) Software Project Management, Joel Henry, Pearson Education.
- 2) Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.
- 3) Effective Software Project Management, Robert K. Wysocki, Wiley, 2006

III- Year I- Semester	Name of the Course	L	T	P	C
PE3101	COMPUTER GRAPHICS (Professional Elective - 1.3)	2	0	2	3

UNIT – I: Introduction to Computer Graphics: Applications of Computer Graphics,

2D Primitives:-Output Primitives

Points, Lines, Planes, Frame-Buffers, Video-display devices, Line Drawing Algorithms: DDA Line drawing, Bresenham's Line Drawing, Parallel Line Drawing, Circle and Ellipse Generation, Polygon Generation, Polygon Filling Algorithms, Attributes of Output Primitives.

UNIT – II: 2D Transformations & Viewing

Basic Transformations: Translation, Rotation, Scaling, Other Transformations: Reflection, Shear, Composite Transformations, Coordinate Transformation

Viewing Pipeline: Viewing reference frame, window, Viewport, Window-to-view port transformation, multiple window transformation.

Clipping: Line clipping, Cohen-Sutherland line clipping algorithm, Polygon clipping: Sutherland Hodgeman polygon clipping algorithm, Text clipping.

UNIT – III: 3D Concepts: 3D Object Representation

Polygons, Curved Lines, Splines, Quadric Surfaces, **3D Transformations** : Basic translation, Coordinate-axis-Rotation, Arbitrary-axis Rotation, Scaling, Other: Reflection, Shear, Composition of 3D transformations, Projections: Parallel, Perspective, 3D Viewing, Visible-Surface Detection Algorithms: Back face removal, Z-Buffer, A-Buffer, Area-sub-division, Depth-Sorting (painter's), BSP-Tree, Octree, 3D Clipping.

UNIT – IV: Graphics Programming Color Models

RGB, YIQ, CMY, HSV, Animations – General Computer Animation, Raster, Key frame Graphics programming using OpenGL. Basic graphics primitives, drawing three dimensional objects drawing three dimensional scenes. Rendering Introduction to Shading models, Flat and Smooth shading, Adding texture to faces, Adding shadows of objects, Building a camera in a program – Creating shaded objects– Rendering texture, Drawing Shadows.

UNIT – V: Fractals Fractals and Self similarity

Peano curves – Creating image by iterated functions – Mandelbrot sets – Julia Sets – Random Fractals.

Overview of Ray Tracing Intersecting rays with other primitives – Adding Surface texture – Reflections and Transparency – Boolean operations on Objects.

Text Books:

1. Donald Hearn, Pauline Baker, Computer Graphics – C Version, second edition Pearson Education, 2004.
2. F.S. Hill, Computer Graphics using OpenGL, Second edition, Pearson Education, 2003.

Reference Books:

1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- principles and practice, Second Edition in C, Pearson Education, 2007.

III- Year I- Semester	Name of the Course	L	T	P	C
SAC3101	.NET Programming (Skill Advanced Course-1)	1	0	2	2

UNIT-I: Introduction to .NET Technology

Introduction: Introduction to .NET Framework, Visual Studio, Features of .NET, .NET Framework Architecture.

UNIT-II: Introduction to C#.NET

Introduction to C#.NET, OOPS in C#.NET, IDE OF Forms, Assemblies, and Namespaces, Streams, Multithreading.

UNIT– III: Introduction to ASP.NET and Programming

Introduction to ASP.NET and Programming, Web Form Fundamentals, Web Controls, State Management, Tracing, Session tracking, Fundamentals of ASP.net core.

UNIT-IV: Introduction to ADO.NET Fundamentals

ADO.NET Fundamentals, Data Binding-Single valued, Multi valued, The Data Controls-Form View, Grid View.

UNIT – V: Introduction to LINQ and Entity Framework.

LINQ and the Entity Framework, working with Services, Putting ASP.NET MVC in Context, Your First MVC Application.

Text Books:

1. Andrew Stellman, Jennifer Greene, "Head First C#", 4th Edition, 2020, O'Reilly Media.

III- Year I- Semester	Name of the Course	L	T	P	C
MC3101	Indian Constitution	2	0	0	0

UNIT-I

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions.

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions.

UNIT-IV

Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Panchayats: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy.

UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissioner at State Election Commission: Functions of Commissions for the welfare of SC/ST/OBC and women.

REFERENCES:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd. New Delhi
2. Subash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

III- Year I- Semester	Name of the Course	L	T	P	C
PC3101L	Unix & Shell Programming Lab	0	0	3	1.5

1. Create a script that, given a user name, finds the home directory of the user using the /etc/passwd file.
2. Write a script that creates a file out of the /etc/passwd file.
3. Write a script to change every single-line comment in a C++ source file that uses C program start and end comment tokens to a single-line comment starting with a C++ single-line token.
4. Write a script to backup and archive a list of files.
5. Write a script that finds all soft links to a specific file.
6. Create a script that simulates the ls -l command but prints only three columns of our choice.
7. Create a script that sends contents of a message file to everybody who logged in.
8. Create a script that can be executed only from a specific terminal. This is done for security purposes. For example, a super user may write scripts that can only be executed from his or her office and nowhere else.
9. Create a script that finds each line in a file that contains a specified string.
10. Create a script that compiles all C source files in your home directory and create executable files.
11. Create a script that finds all files in subdirectories that have the same filename.
12. Create a script that search for multiple occurrences of the specified string in each line.

Text Books:

1. UNIX and Shell Programming, Behrouz A, Forouzan and Richard F.Gilberg, Cengage Learning, 2003.
2. Advanced Programming in UNIX Environment, W.Richard Stevens, Stephen A Rago, 3rd Edition, Addison-Wesley Professional, 2013.

Reference Books:

1. UNIX and shell programming by B.M. Harwani, OXFORD university press.
2. Unix essentials by Sumitabha Das
3. Unix Shell Programming, Stephen G.Kochan, Patrick Wood, 3/e, Pearson

III- Year I- Semester	Name of the Course	L	T	P	C
PC3102L	Machine Learning Lab	0	0	3	1.5

Exercise 1: Introduction to R, Basic Commands, Graphics, Indexing Data, Loading Data, Additional Graphical and Numerical Summaries.

Exercise 2:

Using simple linear regression perform the following tasks on the Auto data set.

- Use the `lm()` function to perform a simple linear regression with mpg as the response and Horse power as the predictor.
- Use the `summary()` function to print the results. Comment on the output.
 - Is there a relationship between the predictor and the response?
 - How strong is the relationship between the predictor and the response?
 - Is the relationship between the predictor and the response positive or negative?
 - What is the predicted mpg associated with a horsepower of 98? What are the associated 95% confidence and prediction intervals?
- Plot the response and the predictor. Use the `abline()` function to display the least squares regression line.
- Use the `plot()` function to produce diagnostic plots of the least squares regression fit. Comment on any problems you see with the fit.

Exercise 3:

Using multiple linear regression perform the following tasks on the Auto data set.

- Produce a scatter plot matrix which includes all of the variable in the data set.
- Compute the matrix of correlations between the variables using the function `cor()`. You will need to exclude the name variable, `cor()` which is qualitative.
- Use the `lm()` function to perform a multiple linear regression with mpg as the response and all other variables except name as the predictors. Use the `summary()` function to print the results. Comment on the output, That is
 - Is there a relationship between the predictors and the response?
 - Which predictors appear to have a statistically significant relationship to the response?
 - What does the coefficient for the year variable suggest?
- Use the `plot()` function to produce diagnostic plots of the linear regression fit. Comment on any problems you see with the fit. Do the residual plots suggest any unusually large outliers? Does the leverage plot identify any observations with unusually high leverage?
- Use the `*` and `:` symbols to fit linear regression models with interaction effects. Do any interactions appear to be statistically significant?
- Try a few different transformations of the variables, such as $\log(X)$, \sqrt{X} , X^2 . Comment on your findings.

Exercise 4:

Implementation of KNN on the Breast Cancer Data set.

Exercise 5:

Implement LDA, QDA, and NAÏVE BAYES on the Stock market data and produce the empirical comparison.

Exercise 6:

Analyse the CAR SEATS dataset using Decision Trees.

Exercise 7:

Application of SVM for Gene Expression Data.

Exercise 8:

Perform PCA on the USArrests data set.

Exercise 9:

Perform K-Means Clustering on NC160 Dataset.

Exercise 10:

Perform Hierarchical clustering on NC160 Dataset.

Text Books:

1. Gareth James, et al. An Introduction to Statistical Learning: with Applications in R, Springer. 2nd edition (2021 edition).

Reference Books:

1. Tom Mitchell, “Machine Learning”, McGraw Hill, 1997
2. E. Alpaydin, “Introduction to Machine Learning”, PHI, 2005.
3. Andrew Ng, Machine learning yearning, <https://www.deeplearning.ai/machine-learning-yearning/>
4. Hands-on machine learning with R” by Bradley Boehmke & Brandon Greenwell
5. “Machine learning with R, the tidyverse, and mlr” by Hefin I. Rhys

III- Year II - Semester	Name of the Course	L	T	P	C
PC3201	Deep Learning	3	0	0	3

UNIT – I: Deep learning basics

Introduction, the perceptron, Over fitting and generalization, linear perceptron, learning XOR function with non-linear functions, feed forward neural networks, types of activation functions, types of loss functions, Back-Propagation.

UNIT – II: Optimization

Challenges in neural network optimization, Regularization, Gradient Descent, Stochastic Gradient Descent, Momentum Optimizer, AdaGrad, RMSProp, Adam, Batch normalization.

UNIT – III: Deep Learning for Computer Vision

Building blocks of CNN, Local receptive fields, Shared weights and bias, stride, Pooling layers, Max-pooling, Average pooling, CNN for image classification - Alex Net, VGG, GoogleNet, ResNet architectures. CNN for segmentation – Unet.

UNIT –IV: Effective training of Deep Neural Networks

Early stopping, Dropout, Instance Normalization, Group Normalization, Transfer Learning, Data Augmentation.

UNIT – V: Deep Learning for Natural Language Processing

Computational representation of language, one-hot representation of words, word vectors – the skip-gram word2vec model, The CBOW word2vec model, word vector arithmetic, RNN, LSTM.

Text Books:

1. Deep Learning- Ian Goodfellow, Yoshua Benjio, Aaron Courville, The MIT Press
2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition - Aurélien Géron, O'Reilly Media, Inc. ISBN: 9781492032649
3. Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.

Reference Books:

1. Theodoridis, S. and Koutroumbas, K. Pattern Recognition. Edition 4. Academic Press, 2008.
2. Russell, S. and Norvig, N. Artificial Intelligence: A Modern Approach. Prentice Hall Series in Artificial Intelligence. 2003.
3. Bishop, C. M. Neural Networks for Pattern Recognition. Oxford University Press. 1995.
4. Hastie, T., Tibshirani, R. and Friedman, J. The Elements of Statistical Learning. Springer. 2001.
5. Koller, D. and Friedman, N. Probabilistic Graphical Models. MIT Press. 2009.

III- Year II - Semester	Name of the Course	L	T	P	C
PC3202	Natural Language Processing	3	0	0	3

UNIT -I: Introduction and Overview

Welcome, motivations, what is Natural Language Processing? The problem of ambiguity and uncertainty in language. The Turing test; NLP representations in syntax, semantics, and pragmatics. The Applications of NLP; The role of Deep Learning in Natural Language Processing; Deep learning for NL Computing. Backpropagations, recurrent neural networks, Transformers.

UNIT-II: Syntactic Parsing

Grammar formalisms and tree banks, Efficient parsing for Context Free grammars (CFG). Statistical Context Free Grammars and Probabilistic Context Free Grammars (PCFG), Lexicalized PCFGs. Semantic Analysis: Lexical semantics and word-sense disambiguation. Computational semantics, semantic Role, labelling and semantic Parsing.

UNIT-III: N-gram Language Models

The role of language models; Simple N-gram models. Estimating parameters and smoothing evaluating language models.

Parts of Speech Tagging and Sequence Labeling: Lexical syntax, Hidden Markov Models (Forward and Viterbi Algol's and EM Trainings)

UNIT-IV: Deep learning for Named Entity Recognition (NER)

Dependency Parsing, Gradient Checks, Overfitting, Regularization, Activation functions, Multi-task and Semi-supervised Learning.

UNIT-V: Information Extraction:

Named Entity recognition and relation extraction. IE using sequencing labeling.

Machine Translation: Basic issues in MT. Statistical translation, word alignment, phase-based translation, and synchronous grammars.

Text Books:

1. Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

Reference books:

2. Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cumming, 1995.
3. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993
4. Jurafsky, Dan and Martin, James, Speech and Language Processing, Speech and Language Processing (3rd ed. draft), Draft chapters in progress, October 16, 2019.
5. Jacob Eisenstein, Introduction to Natural Language Processing, MIT Press, 2019.
6. Deep Learning, Ian Goodfellow, Yoshua Bengio, and Aaron Courville, MIT Press, 2016.
7. Radford, Andrew et. al., Linguistics, an Introduction, Cambridge University Press, 1999.
8. Pushpak Bhattacharyya, Machine Translation, CRC Press, 2017.

III- Year II - Semester	Name of the Course	L	T	P	C
HS3101	Engineering Economics and Management	3	0	0	3

UNIT-I: Introduction to Economics and Theory of Production

Introduction to Economics; Definitions, Nature, Scope, Difference between Microeconomics & Macroeconomics –Concept of Demand, Types of Demand, Determinants of Demand-Law of Demand -Elasticity of Demand, Types of Elasticity of Demand.

Theory of production; production function, Law of variable proportions & law of returns to scale, Cost; meaning, short run & long run cost, fixed cost, variable cost, total cost, average cost, marginal cost, opportunity cost. Break even analysis; meaning, explanation, simple problems.

UNIT-II: Introduction to Markets and Money

Markets: meaning, types of markets & their characteristics (Perfect Competition, Monopoly, Monopolistic Completion, Oligopoly).National Income, GNP, GDP, NNP, NDP, Personal income and GST (Goods & Service Tax).

Money: meaning, functions, types, Monetary policy- meaning, objectives, tools, fiscal policy- meaning, objectives, tools, Banking; meaning, types, functions, Central Bank- RBI; its functions, concepts; CRR, bank rate, repo rate, reverse repo rate, SLR.

UNIT-III: Introduction to Management

Concept –nature and importance of Management Functions of Management, Principles of Management.

Human Resource Management: Meaning and difference between Personnel Management and Human Resource Management, Functions of Human Resource Management.

Marketing Management: Functions of Marketing - Marketing strategies based on product Life Cycle, Channels of distributions.

UNIT-IV: Introduction to Accounting & Project Management

Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements.

Project Management: (PERT/CPM): Development of Network – Difference between PERT and CPM Identifying Critical Path (Simple Problems).

UNIT-V: Capital and Capital Budgeting

Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods (payback period, accounting rate of return) and modern methods (Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index).

Text books:

1. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2018, 2e.
2. Dr. N. Appa Rao, Dr. P. Vijay Kumar: ‘Managerial Economics and Financial Analysis’, Cengage Publications, New Delhi – 2012.
3. Management Science, Aryasri, Tata McGraw Hill, 2014.

Reference books:

1. R. L Varshney, K.L. Maheshwari: Managerial Economics, Sultan Chand & Sons 2014, 22e.
2. Suma Damodaran: Managerial Economics, Oxford 2010, 2e.
3. Ambrish Gupta: ‘Financial Accounting for Management’, Pearson 2015, 5e.

III- Year II - Semester	Name of the Course	L	T	P	C
PE3201	Design and Analysis of Algorithms	2	0	2	3

UNIT – I: Introduction, Divide and Conquer

Introduction: Algorithm Definition, Algorithm Specification, Performance Analysis, Performance Measurement, Asymptotic notations.

Divide and Conquer: General Method, Binary Search, Finding the Maximum and Minimum, Quick Sort.

UNIT - II: The Greedy Method

The Greedy Method: The General Method, Knapsack Problem, Single Source Shortest Path Problem, Optimal Storage on Tapes Problem, Optimal Merge Patterns Problem.

UNIT – III: Dynamic Programming

Dynamic Programming: The General Method, 0/1 Knapsack Problem, Single Source Shortest Path – General Weights, All Pairs-Shortest Paths Problem, Travelling Salesperson Problem, String Editing Problem.

UNIT – IV: Backtracking

Backtracking: The General Method, The N-Queens Problem, Sum of Subsets Problem, Graph Coloring Problem, Hamiltonian Cycles Problem.

UNIT – V: Branch and Bound, NP-Hard and NP-Complete

Branch and Bound: The General Method, FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack Problem, Travelling Salesperson Problem.

NP-Hard and NP-Complete problems: Basic concepts, Cook's Theorem.

Text Books:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.

Reference Books:

1. Harsh Bhasin, "Algorithms Design & Analysis", Oxford University Press.
2. S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.

III- Year II - Semester	Name of the Course	L	T	P	C
OE3201	Testing & Automation	3	0	0	3

UNIT – I

Software Development Methodologies: High-level overview, Waterfall, Agile, Scrum, Kanban, Extreme Programming. **Version Control with GIT:** Version Control concept, centralized vs. distributed version control systems, Download, install and configure GIT, GitHub, SSH-KEY, GIT internals, undoing changes (Git Revert & Git Reset), Branching and merge, Tags, Stash, Remotes, Branching strategies, Practical tasks.

UNIT – II

Introduction to Software Functional Test: Software testing and Software development processes, checklist, Test cases, Test Suites, Defect Reports, Test plan and Test Result Report

UNIT – III

Introduction to SQL: Introduction to Database Testing, DML statements - Select, insert, update, delete, truncate, DDL Statements - Create, Alter, Drop, DCL & TCL statements-Grant, Revoke & commit, Rollback, Save point.

UNIT – IV

Unit Testing Framework & Selenium API: Introduction to Selenium, Selenium Locators, Finding Elements, working with elements, Synchronizing Tests, Testng and list of annotations used in Testng.

UNIT – V

API Functional Testing & Automation: REST Architecture-Understanding of REST Architecture and Richardson Maturity Model, API Testing, Usage of Postman, Automated testing Web Services (Amazon, Flip kart, GitHub etc.).

TEXT BOOKS:

1. Software Testing - Base Course (Svyatoslav Kulikov) - 3rd edition – EN
2. Software Development a Practical Approach! Hans-Petter Halvorsen
3. Pro Git by Scott Chacon & Ben Straub – 2nd edition.
4. Database Concepts, 8th edition. David M. Kroenke, David J. Auer, Scott L. Vandenberg, Robert C. Yoder.
5. Selenium Testing Tools Cookbook (Second Edition)
6. Rest API Automation Testing from Scratch – REST Assured Java
7. Automating and Testing a REST API: A Case Study in API testing using: Java, REST Assured, Postman, Tracks, curl and HTTP Proxies

-

REFERENCE BOOKS:

I would prefer [Selenium official](#) documentation than another textbook especially for Selenium.

1. Mastering Selenium Web Driver

ONLINE REFERENCES:

1. <https://www.selenium.dev/documentation/>
2. <https://dev.mysql.com/doc/>
3. <https://www.postgresql.org/docs/>
4. <https://git-scm.com/docs>
5. <https://learngitbranching.js.org/>

III- Year II - Semester	Name of the Course	L	T	P	C
MC3201	Entrepreneurial Skill Development	2	0	0	0

UNIT I: Entrepreneurial Perspectives

Introduction to Entrepreneurship–Evolution–Concept of Entrepreneurship–Types of Entrepreneurs - Entrepreneurial Competencies, Capacity Building for Entrepreneurs. Entrepreneurial Training Methods - Entrepreneurial Motivations - Models for Entrepreneurial Development - The process of Entrepreneurial Development.

UNIT – II: New Venture Creation

Introduction, Mobility of Entrepreneurs, Models for Opportunity Evaluation; Types of loans for entrepreneurship and startups. Business plans – Purpose, Contents, Presenting Business Plan, Procedure for setting up Enterprises, Central level - Startup and State level - T Hub, Other Institutions initiatives.

UNIT – III: Small Scale Ventures, MSME in India and their challenges

Concept of micro, small and medium enterprises and startups. Scope and trends of small entrepreneurship and startup in India. Role of government in promoting small scale industries. Management of MSMEs and Sick Enterprises Challenges of MSMEs, Preventing Sickness in Enterprises – Specific Management Problems; Industrial Sickness; Industrial Sickness in India – Symptoms, process and Rehabilitation of Sick Units.

UNIT – IV: Market growth for generating entrepreneurship opportunities

Entrepreneur’s legal and regulatory systems, Intellectual property rights, patents, Copy rights and trademark and their protection. Managing Marketing and Growth of Enterprises Essential Marketing Mix of Services, Key Success Factors in Service Marketing, Cost and Pricing, Branding, New Techniques in Marketing, International Trade.

UNIT – V: Institutional Support to Entrepreneurship and Woman Entrepreneurship

Strategic perspectives in Entrepreneurship, Technology and Entrepreneurship, Training institutions “District Industry Centre (DIC), Entrepreneurship Development Institute of India (EDII)” Innovation council – Ministry of Human Resource Development (MHRD), Small Industries Development Bank of India (SIDBI), Industrial Development Bank of India (IDBI).

Women Entrepreneurs – Strategies to develop Women Entrepreneurs, Institutions supporting Women Entrepreneurship in India, Association of Lady Entrepreneurs of India (ALEAP)

Text Books:

1. Entrepreneurship Development and Small Business Enterprises, Poornima M. Charantimath, 2e, Pearson, 2014.
2. P.Narayana Reddy, Entrepreneurship, Cengage Learning, New Delhi, 2010.
3. Steven Fisher, Ja-nae Duane, The startup equation – A visual guide book for building your startup, Indian edition, Mc Graw Hill Education India Pvt. Ltd. 2016

Reference Books:

1. Entrepreneurship, Arya Kumar, 4 e, Pearson 2015.

III- Year II - Semester	Name of the Course	L	T	P	C
PC3201L	Deep Learning Lab	0	0	2	1.5

1. Installation and working on python, Jupyter, and its different libraries for deep learning (Tensor Flow, NumPy, Kera, Pandas, Matplotlib, etc.)
2. To implement a Multilayer Perceptron (MLP) using Keras with TensorFlow, and fine-tune neural network hyper parameters for regression problem (house price prediction).
3. To implement a MLP using keras with TensorFlow for classification problem (heart disease predication).
4. To implement a Convolution Neural Network (CNN) for dog/cat classification problem using keras.
5. To Implement a CNN for object detection in the given image.
6. To implement a Recurrent Neural Network (RNN) for predicating time series data.
7. To implement a Long Short-Term Memory (LSTM) for predicating time series data.
8. To implement a Seq2Seq Model for Neural Machine Translation in Keras.
9. To implement an Encoder-Decoder Recurrent neural network model for Neural Machine Translation.
10. To implement a Gated Recurrent Unit (GRU) for time series data predication.

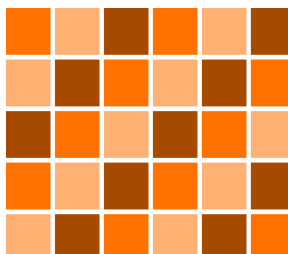
III- Year II - Semester	Name of the Course	L	T	P	C
PC3202L	Cloud Computing Lab	0	0	3	1.5

1. Basics of Virtualization: VMM, Example of VMM (virtual box), Creation of a VM, Networking and communication between VMs.
2. Introduction to Cloud Sim: Installation and Execution, Cloud Data centre, Network Topology.
3. Simulation of a Cloud Framework: Creating a DC, Creation of Tasks, Creation of VMs, Defining task and VM characteristics, execution of tasks on VMs.
4. Scalable and dynamic Cloud systems: Creation of scalable cloud entities, creation of dynamic entities.
5. Resource Allocation in Cloud Data centre: Experimenting and understanding various resource allocation policies, changing the resource allocation policy, effects of resource allocation policies.
6. Power Management in Cloud Data centres: Creation of a power data centre, understanding various power saving techniques.
7. Understanding Commercial Cloud Frameworks: Amazon AWS, Elastic Cloud, Amazon Load Balancer, creating VMs, Allocation of Resources.

III- Year II - Semester	Name of the Course	L	T	P	C
PC3203L	Full Stack Lab	0	0	3	1.5

List of experiments:

1. Try to recreate the following patterns using HTML and CSS only.3333



2. Implement Drag n Drop feature in HTML 5
3. Demonstrate Event bubbling with necessary examples.
4. Design a Calculator using Java script and relevant CSS.

(CE)	C
1	2	3	+
4	5	6	-
7	8	9	x
.	0	=	÷

5. Demonstrate Higher order functions with necessary examples – filter(), reduce() and map()
6. Create a Class Component for Counter in React JS
7. Create a Class component for Changing the color of the text given in React JS
8. Class a Class Component for viewing an array of objects in a tabular form.
9. Display a digital clock in React JS.
10. Demonstrate use State Hook with the help sample text.
11. Demonstrate use Context Hook with necessary example.
12. Demonstrate use Effect Hook with necessary example.
13. Demonstrate consuming web API using fetch & axios (AXIOS API). Demonstrate with the help of fake URL.
14. Design a BMI calculator using React JS based on the description given below:

BMI is a measurement of a person's leanness or corpulence based on their height and weight, and is intended to quantify tissue mass. It is widely used as a general indicator of whether a person has a healthy body weight for their height.

Formula: $\text{weight (kg)} / [\text{height (m)}]^2$ (or) $[\text{weight (kg)} / \text{height (cm)} / \text{height (cm)}] \times 10,000$

BMI table for adults: This is the World Health Organization's (WHO) recommended body weight based on BMI values for adults. It is used for both men and women, age 18 or older.

Category	BMI range - kg/m ²
Severe Thinness	< 16
Moderate Thinness	16 - 17
Mild Thinness	17 - 18.5

Normal	18.5 - 25
Overweight	25 - 30
Obese Class I	30 - 35
Obese Class II	35 - 40
Obese Class III	> 40

15. Display a selected set of images in tabular format using React JS.
16. Implement Upload & down load options on a given file.
17. Create a React application to view EMI calculator. A specific view is given below:

$$E = P \times r \times \frac{(1 + r)^n}{(1 + r)^n - 1}$$

Where,

E is the EMI

P is the principal amount

r is the monthly rate of interest

n is the number of months

18. Design the following Hotel bill screen. User can select as many items as possible from the dropdown box and is allowed to enter in the text field provided. Each transaction must be added in the table given below along with the bill amount.

GREEN STAR HOTEL

Customer Bill

Date:

Items: Biryani No of Items:

1.	Biryani	2	Rs. 140 Each	Rs.280
2.	Fried Rice	1	Rs. 110 Each	Rs.110
3.	Chicken Curry	2	Rs. 230 Each	Rs.460

Total	Rs. 850
GST @5%	Rs. 42.50
Bill to be paid	Rs. 892.50

19. Demonstrate the procedure to create a schema in MongoDB.
20. Demonstrate CRUD operations using MongoDB.

III- Year II - Semester	Name of the Course	L	T	P	C
SAC3201	Skill Advanced Course- 2: Soft Skills	1	0	2	2

Module1 Effective communication skills

- ✓ Start with self and connect with others.
- ✓ The art of narrating and storytelling.
- ✓ Enhance team work and influence change.

Module2 Advanced verbal ability concepts–practice and Professional writing skills

- ✓ Nurture and enhance the verbal ability strength through practice.
- ✓ Conducting mock verbal (ability) tests and their timely review.
- ✓ List the steps of writing an email effectively & comprehend the importance of structuring an email.
- ✓ Overview of various elements related to accuracy, brevity and correctness in our everyday writing at the workplace (Project proposals / covering letters / blogs / short essays).

Module3 Industry sneak and résumé/CV building strategies

- ✓ Industry & aspirant career expectations and tailoring action learning plan aptly.
- ✓ Crafting winning résumé(s) suiting to different profiles.
- ✓ Framing responses to résumé-based interview questions.

Module4 Behavioral competency building– Part II and psychometric test (HR Round Preparation)

- ✓ Listing personal characteristics and preparing blueprint to inculcate them.
- ✓ Assess the students' ability to fit into a specific work environment or with specific personality types.
- ✓ Determine basic characteristics of an individual.

Module5 Presentation skills & Mock interviews

- ✓ Illustration of presentation structure via impromptu / free speech – and essential criteria for an effective presentation
- ✓ Importance of non-verbal communication (signposting)
- ✓ Inciting the interview process by practicing a gamut of behavioral mock interviews.

Module1–Tasks

- ✓ Listening & comprehension skills–lessons from the corporate training videos/scenes in films.
- ✓ Role play– story telling & anchoring
- ✓ Extempore–student's experience with college / program.
- ✓ Listening & comprehension skills lessons from the corporate training videos / scenes in films

Module2-Tasks

- ✓ Story paraphrasing, peer introduction and monologue.
- ✓ Assignment on short essay and blog building/digital profile creation.

Module3-Tasks

- ✓ Overview & analysis of a Job Description (JD) and its reflection in resume/self-introduction

- ✓ Crafting of resumes by mapping skills & competences to different profiles offered for engineering graduates.
- ✓ An action –one day in the life of an HR manager / Project leader etc.

Module4-Tasks

- ✓ Case scenarios–to identify behavioural competencies and personality traits
- ✓ Increase self-awareness and improve interactions with others

Module5-Tasks

- ✓ Pair & Group work–debating / demonstration of product promotion, etc.
- ✓ Peer mock interview practice on selected profiles.

Reference Books

1. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success, Pearson Education; 1 edition, 2013.
2. Barun K.Mitra, “Personality Development & Soft Skills”, Oxford Publishers, Third impression, 2017.
3. ICT Academy of Kerala, "Life Skills for Engineers", Mc Graw Hill Education (India) Private Ltd., 2016.

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IV- Year I Semester	Name of the Course	L	T	P	C
HSE4101	UNIVERSAL HUMAN VALUES – 2: Understanding Harmony	3	0	0	3

UNIT-1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Purpose and motivation for the course, recapitulation from Universal Human Values-I. Self-Exploration—what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation— as the process for self-exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT-II: Understanding Harmony in the Human Being - Harmony in Myself!

Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’. Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer). Understanding the characteristics and activities of ‘I’ and harmony in ‘I’. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Health.

UNIT-III: Understanding Harmony in the Family and Society- Harmony in Human Relationship

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goal. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

UNIT-IV: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

Understanding the harmony in the Nature. Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all pervasive space. Holistic perception of harmony at all levels of existence.

UNIT-V: Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

TEXTBOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

REFERENCEBOOKS:

1. JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

IV- Year I Semester	Name of the Course	L	T	P	C
PE4101	Insights of Big Data	3	0	0	3

Syllabus:

UNIT– I

INTRODUCTION TO BIG DATA: Data, Characteristics of data and types of digital data, Sources of data, working with unstructured data, Evolution and definition of big data, Characteristics and need of big data, Challenges of big data.

BIG DATA ANALYTICS: Overview of business intelligence, Data science and analytics, Meaning and characteristics of big data analytics, Need of big data analytics, Classification of analytics, Challenges to big data analytics, Importance of big data analytics, Basic terminologies in big data environment.

UNIT – II

INTRODUCTION TO HADOOP : Introducing hadoop, Need of hadoop, Limitations of RDBMS, RDBMS versus hadoop, Distributed computing challenges, History of hadoop , Hadoop overview, Use case of hadoop, Hadoop distributors, HDFS (Hadoop distributed file system), Processing data with hadoop, Managing resources and applications with hadoop YARN (yet another resource negotiator), Interacting with hadoop ecosystem.

UNIT – III

INTRODUCTION TO MAPREDUCE PROGRAMMING: Introduction-mapper, reducer, combiner, partitioner, searching, sorting, compression, real time applications using mapreduce, combiner, partitioner, matrix multiplication using mapreduce and page rank algorithm using mapreduce.

UNIT – IV

INTRODUCTION TO PIG: The anatomy of pig, Pig on hadoop, Pig philosophy, Use case for pig, ETL processing, Pig latin overview, Data types in pig, Running pig, Execution modes of pig, HDFS commands, Relational operators, Piggy bank, Word count example using pig, Pig at Yahoo.

UNIT - V

INTRODUCTION TO HIVE: Introduction to hive, Hive architecture, Hive data types, Hive file format, Hive query language (HQL), HIVE: Partitions and bucketing, RCFile Implementation, working with XML files, User-defined Function (UDF) in Hive, Pig versus Hive.

TEXT BOOKS:

1. Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, 1st edition, Wiley, Publishers, 2015.

REFERENCE BOOKS:

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, 1st edition, Wiley, 2015.
2. Chris Eaton, Dirkderoosetal, “Understanding Big data “, 1st edition, McGraw Hill, 2012.
3. Tom White, “HADOOP: The definitive Guide”, 1st edition, O Reilly 2012.
4. Vignesh Prajapati, “Big Data Analytics with R and Hadoop”, 1st edition, Packet Publishing 2013.

Software Links:

1. Hadoop: <http://hadoop.apache.org/>
2. Hive: <https://cwiki.apache.org/confluence/display/Hive/Home>
Pig: <http://pig.apache.org/docs/r0.7.0/tutorial.html>

IV-Year I Semester	Name of the Course	L	T	P	C
PE4102	Cyber Security	4	0	0	3

SYLLABUS:

UNIT-I:

Introduction of Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes: Email Spoofing, Spamming, Internet Time Theft, Salami Attack/Salami Technique, Data Diddling, Forgery, Web Jacking, New group Spam, Industrial Espionage, Hacking, Online Frauds, Pornographic offenses, Software Piracy, Computer Sabotage, E-Mail bombing, computer network intrusions, password sniffing, credit card frauds, identity theft.

UNIT-II:

Cyber offenses: Criminals Plan: Categories of Cybercrime Cyber Attacks: Reconnaissance, Passive Attack, Active Attacks, Scanning/Scrutinizing gathered Information, Attack, Social Engineering: Classification of Social Engineering. Cyber stalking: Types of Stalkers, Working of Stalking, Real-Life Incident of Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Botnet, Attack Vector, Attacks on mobile/cell phones – Theft, viruses, mishing, vishing, smishing, hacking Bluetooth.

UNIT-III:

Cybercrime Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trend in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attack on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT-IV:

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attack on Wireless Networks.

UNIT-V: Cybercrimes and Cyber security: Organizational Implications –Introduction –Insider threats, Privacy, Key challenges to organizations, Cost of Cybercrimes and IPR issues, Incident Handling: Definitions, Why Organizations need Incident Response systems, Examples of incidents, what organizations can do to protect, best practices for organizations.

TEXTBOOKS:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, Sunit Belapure, Wiley India Publications, April, 2015.

REFERENCES:

1. James Graham, R Howard, R Olson, "Cyber Security Essentials" CRC Press, 2018
2. Michael E Whitman, Herbert J Mattord, "Principles of Information Security", 4th Edition, Cengage Learning, 2012
3. William Stallings, "Cryptography and Network Security- Principles and Practice", 7th Edition, Pearson Education, 2017

IV- Year I Semester	Name of the Course	L	T	P	C
PE4103	Digital Interaction Design	3	0	0	3

Syllabus:

UNIT-I

Introduction: Usability of Interactive Systems- introduction, usability goals and measures, usability motivations, universal usability, goals for our profession Managing. .

Guidelines, Principles, and Theories: Introduction – Guidelines – Principles – Theories.

UNIT-II

Design Processes: Introduction - Organizational Support for design – The Design Process- Design Framework – Design Methods – Design Tools, Practices and patterns – Social Impact Analysis – Legal Issues.

Direct Manipulation and Immersive Environments: Introduction – Direct Manipulation - Examples of Direct Manipulation - 2-D and 3-D Interfaces - Teleportation and Presence - Augmented and Virtual Reality.

UNIT-III

Fluid Navigation: Introduction - Navigation by Selection - Small Displays - Content Organization - Audio Menus - Form Fill-in and Dialog Boxes.

Expressive Human and Command Languages: Introduction - Speech Recognition - Speech Production - Human Language Technology - Traditional Command Languages.

UNIT-IV

Devices: Introduction - Keyboards and Keypads - Pointing Devices – Displays. (

Advancing the User Experience: Introduction - Display Design - View (Window)-Management - Animation - Webpage Design - Color - Nonanthropomorphic Design - Error Messages.

UNIT-V

User Documentation and Online Help: Introduction, Online Vs Paper Documentation, Reading from paper Vs from Displays, Shaping the content of the Documentation, Accessing the Documentation, Online tutorials and animated documentation, Online communities for User Assistance, The Development Process. (Ch-14)

Text Books:

1. Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, Niklas Elmqvist Designing the User Interface: Strategies for Effective Human-Computer Interaction, Sixth Edition, Pearson Education, 2017.

Reference Books:

1. Preece, Rogers and Sharps, “Interaction Design”, 3rd edition, Wiley Dreamtech, 2011.
2. The Essential guide to user interface design, 2/e, Wilbert O Galitz, Wiley DreamaTech.
3. Human Computer, Interaction Dan R.Olsan, Cengage, 2010.
4. Jenny Preece, Helen Sharp, Yvonne Rogers, Interaction Design: Beyond Human Computer Interaction, Wiley, 5th Edition, 2019. (Experiments)

IV- Year I Semester	Name of the Course	L	T	P	C
OE4101	Operations Research	3	0	0	3

SYLLABUS:

UNIT 1:

INTRODUCTION TO OPERATIONS RESEARCH: History, definition, operations research Models, phases of implementing operations research in practice, applications.

LINEAR PROGRAMMING: Introduction, formulation, graphical solution, simplex method, Big M and two-phase methods, duality principle.

UNIT II:

TRANSPORTATION: Introduction to the problem, LP formulation of a transportation problem. Basic feasible solution by north-west corner method, Vogel's approximation method, least cost method.

ASSIGNMENT: One to one assignment problem, optimal solutions, unbalanced assignment matrix, travelling sales man problem, maximization in A.P.

UNIT III:

QUEUING THEORY: Introduction, Kendall's notation, classification of queuing models, single server and multi-server models, Poisson arrival, exponential service, infinite population.

SEQUENCING: Introduction, assumptions, processing n-jobs through two machines, n-jobs through three machines, and graphic solution for processing 2 jobs through n machines with different order of sequence.

UNIT IV:

GAME THEORY: Introduction, game with pure strategies, game with mixed strategies, dominance principle, graphical method for $2 \times n$ and $m \times 2$ games.

REPLACEMENT THEORY: Introduction, replacement of items that deteriorate with time - value of money unchanging and changing, simple probabilistic model for replacement of items that fail completely

UNIT V:

NETWORK ANALYSIS: Project planning, scheduling and controlling – tools for project management – critical path method – Programme evaluation and review technique (PERT) – cost analysis and crashing – resource leveling – updating.

Text books:

1. Operations Research, by S.D.Sharma, Kedarnath & Ramnath publications (15th edition), 2013.
2. Introduction to Operations Research, by Taha, Pearson Education, New Delhi, (8th edition), 2008.

Reference books:

1. Operations Research, (4th edition) by A.M. Natarajan, P. Balasubramani, A. Tamilarasi, Pearson Education, New Delhi, 2009.
2. Operations Research, (2nd edition) by R.PannerSelvam, 2009, PHI Publications, Noida.
3. Operations Research, (2nd edition) by Wagner, 2007, PHI Publications, Noida
4. Operation Research, (4th edition) by J.K.Sharma, 2009, Macmillan publishers, India Ltd. New Delhi.

IV- Year I Semester	Name of the Course	L	T	P	C
OE4102	GREEN BUILDINGS	3	0	0	3

SYLLABUS:

UNIT I:

Green Buildings within the Indian Context, Types of Energy, Energy Efficiency and Pollution, Better Buildings, Reducing energy consumption, Low energy design.

UNIT II:

Renewable Energy sources that can be used in Green Buildings – Conventional and Non Conventional Energy, Solar energy, Passive Solar Heating, Passive Solar collection, Wind and other renewable. A passive solar strategy, Photovoltaics, Rainwater Harvesting Climate and Energy, Macro and Microclimate. Indian Examples.

UNIT III:

Building Form – Surface area and Fabric Heat Loss, utilizing natural energy, Internal Planning, grouping of buildings. Building Fabrics- Windows and doors, Floors, Walls, Masonry, Ecological walling systems, Thermal Properties of construction material.

UNIT IV:

Infiltration and ventilation, Natural ventilation in commercial buildings, passive cooling, modelling air flow and ventilation, Concepts of daylight factors and day lighting, daylight assessment, artificial lighting, New light sources. Cooling buildings, passive cooling, mechanical cooling. Water conservation- taps, toilets and urinals, novel systems, collection and utilization of rain water.

UNIT V:

Energy awareness, monitoring energy consumption, Building Environmental Assessment - environmental criteria - assessment methods - assessment tools (e.g. LEED, GRIHA & IGBC Certification for buildings. Ecohomes, Sustainable architecture and urban design – principles of environmental architecture, Benefits of green buildings – Energy Conservation Building code - NBC -Case Studies – Green Buildings in Auroville and Dakshina Chitra, Tamil Nadu, India

TEXT BOOKS:

1. William T. Meyer., Energy Economics and Building Design., New York: McGraw- Hill, Inc
Indian Green Building Council

REFERENCE BOOKS:

1. Public Technology, Inc. (1996). Sustainable Building Technical Manual: Green Building Design, Construction, and Operations. Public Technology, Inc., Washington, DC.
2. Sim Van Der Ryn, Stuart Cowan, “Ecological Design”, Island Press (1996).
3. Dianna Lopez Barnett, William D. Browning,” A Primer on Sustainable Building”, Rocky Mountain Green Development Services.

IV- Year I Semester	Name of the Course	L	T	P	C
SAC4101	SYSTEM DESIGN USING UML LAB	0	0	3	1.5

❖ **Week 1:**

Familiarization with Rational Rose/ Star UML/ Umbrella/ Visual Paradigm/ Microsoft Visio environment

❖ **Week 2:**

Understanding different views that the UML aims to visualize through different modelling diagrams.

User's View: Use case Diagram

Structural View: Class Diagram, Object Diagram

Behavioural View: Sequence Diagram, Collaboration Diagram, State chart Diagram, Activity Diagram

Environmental View: Deployment diagram

Implementation View: Component Diagram

❖ **Week 3:**

Create a complete UML model for E-Mail Client system.

❖ **Week 4:**

Create a complete UML model for Stock maintenance system.

❖ **Week 5:**

Consider the User's view of your respective system:

Identify the use cases, actors involved in the system and develop the Use case and sub-use case diagrams.

❖ **Week 6:**

Consider the Structural view of your respective system:

○ Identify the classes, their attributes, methods, relationships and develop the Class diagram.

○ Identify the objects and their links between and develop the Object diagram.

❖ **Week 7:**

Consider the Behavioural view of your respective system:

Visualize and ratify runtime framework of the system and develop the Sequence diagram by using life-lines, messages, execution occurrence, interaction fragments.

Develop the Communication diagram/ Collaboration diagram to portray the object's architecture in the system.

❖ **Week 8:**

Consider the Behavioural view of your respective system:

Develop the dynamic view of the system that portrays the behavior of the system using State-chart/ State-Machine diagram.

Develop the Activity diagram to demonstrate the flow of control within the system by considering concurrent and sequential activities.

❖ **Week 9:**

Consider the Implementation view of your respective system:

Develop the Component diagram that visualizes the relationships as well as the organization between the components present in the system

❖ **Week 10:**

Consider the Environmental view of your respective system:

Develop the Deployment diagram to depict how the software interacts with hardware to perform its execution by identifying nodes and their relationships in the system.

❖ **Week 11:**

Create a system to design Student Mark Analysis System and generate code by using MS-Access as back end and VB as front end.

❖ **Week 12:**

Consider your respective System UML model and generate code by using MS-Access as back end and VB as front end.

IV Year II Semester (Semester-8)

S.No	Subject code	Course Name	L	T	P	C
1	PROJ4201	Major Project-Viva Voce	0	0	0	8
2		Community Service Project	0	0	0	4
Internship(6months)						
