SYLLABUS

For

Master of Engineering Programmes

(M.TECH-AI & ML)

(For admission in 2022-23 and onwards)
# M.Tech Evaluation Scheme

## Computer Science and Engineering

**(Artificial Intelligence & Machine Learning)**

### Semester I

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**Program Elective-I**

1. **AIT-303**  Computer Vision: Foundation and Applications
2. **AIT-304**  Artificial Intelligence in Cyber Security
3. **AIT-305**  Introduction to Intelligent System
4. **AIT-306**  Pattern Recognition

**Program Elective-II**

1. **AIT-307**  Data Science
2. **AIT-308**  Health Care Data Analytics
3. **AIT-309**  GPU Computing
4. **AIT-310**  Natural Language Processing
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**Program Elective-III**
1. AIT-313 Robotics and Automation
2. AIT-314 Reinforcement Learning
3. AIT-315 Data Driven Optimization
4. AIT-316 Knowledge Based System

**Program Elective-IV**
1. AIT-317 Bioinformatics
2. AIT-318 Web Intelligence
3. AIT-319 Human Machine Interaction
4. AIT-320 Data Acquisition and Productization

**Open Elective-I**
1. AIT-321 Human Computer Interaction
2. AIT-322 Software Engineering
3. AIT-323 Python Programming
## Semester III

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**Open Elective-II**

1. AIT-324  Fuzzy Logic
2. AIT-325  Software Testing
3. AIT-326  Neural Networks
4. AIT-327  Web Technologies
5. AIT-328  Cyber Laws and Ethics
6. AIT-329  Mobile Application and Services

## Semester IV

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Syllabus
Advanced Mathematics (AHT-301)

Course objectives:

From this course, students will be able to:
1. Learn distinct methods of solving simultaneous equations.
2. Well-versed with partial differential equations and their solutions and applications.
3. Acquire the knowledge of transformation to ease the complex problems.
4. Acquaintance with basics of random variables and their distribution for dealing with events by chance.
5. Study different mathematical domains to deal with real-time engineering problems.

Learning outcomes:

1. Comprehend with engineering problems in different mathematical realm.
2. Learn analytical and numerical methods to deal with mathematical problems.
3. Understand how to model the engineering problems and their solutions.
4. Implement the solutions to real-time complex engineering problems.
5. Apprehend with mathematical methodology.

Course content:

Unit I: Solution of linear simultaneous equations: (8 hours)

Consistency, Iterative method, Convergence, Cholesky’s (Crout’s) method, Gauss-Jordan method, Gauss-Seidel iteration and relaxation methods, Solution of Eigenvalue problems, Smallest, largest, and intermediate Eigen values

Computer based algorithm and programme for these methods (non-evaluative)

Unit II: Partial differential equation and its applications: (10 hours)

Introduction and classification of partial differential equation, Four standard forms of non-linear partial differential equations and their solutions, linear equations with constant coefficients. Applications of partial differential equations one and two-dimensional wave equation, one and two-dimensional heat equation, Two-dimensional Laplace’s equation.
Unit III: Transform calculus-I: (8 hours)
Laplace transform, Properties of Laplace transform, Inverse Laplace transform, Applications of Laplace transform, Fourier integral theorem, Fourier transforms, Application of Fourier transform

Unit IV: Transform calculus-II: (8 hours)
Z-transform, Properties of Z-transform, Shifting theorems, Initial and final value theorem, Convolution theorems, Inverse Z-transform, Application of Z-transform

Unit V: Basic probability theory: (8 hours)
Concept and laws of probability, Discrete and continuous random variable and their distributions; Some special distributions such as Binomial, Poisson, Negative Binomial, Geometric, Continuous uniform, Normal, Exponential, Weibull, Moments, Moment generating functions, Expectation and variance

Practical demo with statistical software like R, SPSS, SAS, etc. (non-evaluative)

Text Books / References:
Syllabus

Deep Learning and Artificial Neural Networks (AIT – 311)

L: T: P: C: 3:1:0:4

Course Objective: 40-Hours
- The main objective of this course is to provide the student with the basic understanding of neural networks fundamentals,
- Program the related algorithms and Design the required and related systems

Course Outcomes:
- Demonstrate ANN structure and activation Functions
- Define foundations and learning mechanisms and state-space concepts
- Identify structure and learning of perceptions
- Explain Feedforward, multi-layer feedforward networks and Backpropagation algorithms
- Analyze Radial Basis Function Networks, Theor Regularization and RBF networks

UNIT-I: 8Hrs.
Introduction and ANN Structure, Biological neurons and artificial neurons. Model of an ANN. Activation functions used in ANNs. Typical classes of network architectures.

UNIT-II: 8Hrs.

UNIT-III: 8Hrs.
Single layer perceptrons, Structure and learning of perceptrons, Pattern classifier, introduction and Bayes' classifiers, Perceptron as a pattern classifier, Perceptron convergence. Limitations of a perceptron.

UNIT-IV: 8Hrs.

UNIT-V: 8Hrs.
Radial Basis Function Networks, Pattern separability and interpolation, Regularization Theor Regularization and RBF networks. RBF network design and training. Approximation properties of RBF.

Textbooks:
Syllabus

Deep Learning and Artificial Neural Networks (AIT – 311)

L: T: P: C: 3:1:0:4

Credits-4

RsonEducationAsia.

Reference Books:
Syllabus

Optimization Techniques (AIT – 312)

Course Objective:
The students will try to learn:

- Operation research models using optimization techniques based upon the fundamentals of engineering mathematics (minimization and Maximization of objective function).

COURSE OUTCOMES (COs):
- Recall the theoretical foundations of various issues related to linear programming modeling to formulate real-world problems as a LP model
- Explain the theoretical workings of the graphical, simplex and analytical methods for making effective decision on variables so as to optimize the objective function.
- Identify appropriate optimization method to solve complex problems involved in various industries.
- Demonstrate the optimized material distribution schedule using transportation model to minimize total distribution cost.
- Find the appropriate algorithm for allocation of resources to optimize the process of assignment.

Unit I: 8Hrs.
Introduction to Optimization: Historical Development, Engineering applications of Optimization, Design of vector and constraints, Constraint surface, Objective function, Classification of Optimization Problems

Unit II: 8Hrs.
Classical Optimization Techniques Single variable optimization, Constrained and unconstrained multi-variable optimization, Direct substitution method, Lagrange’s method of multipliers, Karush-Kuhn-Tucker conditions

Unit III: 8Hrs.
Linear Programming Statement of an LP problem, Graphical Solution of an LP problem, Simplex 05 method, Dual simplex method

Unit IV: 8Hrs.
Non-linear Programming: One-dimensional minimization method Unimodal function, Unrestricted search, Exhaustive search, Dichotomous search, 06 Interval halving method, Fibonacci method, Golden section method, Direct root methods

Unit V: 8Hrs.
Evolutionary Algorithms An overview of evolutionary algorithms, simulated annealing algorithm, Genetic 06 algorithm, Particle swarm optimization
Optimization Techniques (AIT – 312)

L: T: P: C: 3:1:0:4

Credits-4

Reference Books:

2. Kalyanmoy Deb Multi-objective optimization using evolutionary algorithms John Wiley Publications

Text Books:

Optimization Techniques Lab (AIT – 304)

L: T: P: C: 0:0:2:2

Credits-1

List of Experiments:

Computer programmer (using Mat lab/ Scilab) for optimization techniques mentioned in syllabus like...

1. Unrestricted Search methods
2. Golden Section Method
3. Fibonacci Method
4. Bacteria Foraging Optimization
5. Particle Swarm Optimization
6. Univariate methods
7. Ant colony optimization

Major Equipment:

1. Computational facility and Matlab/ Scilab/ Casnode

List of Open Source Software/learning website:

Scilab Software, Python
Course Objectives:
- This course will serve as a comprehensive introduction to various topics in machine learning. At the end of the course, the students should be able to design and implement machine learning solutions to classification, regression, and clustering problems; and be able to evaluate and interpret the results of the algorithms.

Course Outcomes:
- Create a custom feed-forward network.
- Design Constructing Layers
- Setting Transfer Functions, Each layer has its own transfer function
- Define which is set through the net. Layers{i}.transferFcn property
- Discriminative Learning models: Logistic Regression, Perceptron’s, Artificial Neural Networks, Support Vector Machines.

Note: The experiments need to be implemented using MATLAB.

List of Experiments

Sample Problem Statement: Create a custom feed-forward network. It consists of the following sections:

1. Network Layers
   - Constructing Layers
   - Connecting Layers
   - Setting Transfer Functions
2. Weights and Biases
3. Training Functions & Parameters
   - The difference between train and adapt
   - Performance Functions
   - Train Parameters
4. Conclusion
Syllabus

Principles of Artificial Intelligence and Machine Learning Lab (AIP-301)

L: T: P: C: 0:0:2:1

Course Objectives:

1. To provide a strong foundation of fundamental concepts in Artificial Intelligence.
2. To provide a basic exposition of the goals and methods of Artificial Intelligence.
3. To apply the techniques in applications that involve perception, reasoning, and learning.

Course Outcomes:

1. Apply the basic principles of AI in problem-solving using LISP/PROLOG
2. Implement different algorithms using LISP/PROLOG
3. Develop an Expert System using JESS/PROLOG.
4. Demonstrate the various machine learning algorithm for searching problems.
5. Demonstrate the working of the decision tree classifier, Random Forest classifier, and Logistic Regression classifier.

List of Programs:

List of Experiments (Artificial Intelligence)

1. Implementation of DFS for water jug problem using LISP/PROLOG.
3. Implementation of TSP using a heuristic approach using Java/LISP/ROLOG.
4. Implementation of Simulated Annealing Algorithm using LISP/PROLOG.
5. Implementation of Hill-climbing to solve 8- Puzzle Problem.
6. Implementation of Monkey Banana Problem using LISP/PROLOG

List of Experiments (Machine Learning)

Python Libraries required: Sklearn

Note: Standard datasets can be downloaded from UCI Machine Learning Repository

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .csv file.
Syllabus

AIP-301: Principles of Artificial Intelligence and Machine Learning Lab

M. Tech. I Year I Sem.

L: T: P: C: 0:0:2:1

Credits-1

2. For a given set of training data examples stored in a .csv file, implement and demonstrate the candidate elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

3. Write a program to demonstrate the working of the decision tree classifier. Use the appropriate dataset for building the decision tree and apply this knowledge to classify a new sample.

4. Write a program to demonstrate the working of a Decision tree regressor. Use appropriate dataset for decision tree regressor.

5. Write a program to demonstrate the working of the Random Forest classifier. Use appropriate dataset for Random Forest Classifier.

6. Write a program to demonstrate the working of the Logistic Regression classifier. Use appropriate dataset for Logistic Regression.
Syllabus

Machine Learning for Big Data Lab (AIP-302)

L: T: P: C: 0:0:2:1 Credits-1

Course Objectives:

1. To implement Map-Reduce programs for processing big data
2. To realize storage of big data using H base, Mongo DB
3. To analyze big data using linear models
4. To analyze big data using machine learning techniques such as SVM / Decision tree classification and clustering.

Course Outcomes

1. Analyze the unstructured data and apply R programming concepts on it.
2. Uncover key insights and create data-driven solute analyzed business challenges.
3. Implement Machine Learning concepts and data visualization techniques on data.
5. Perform data analysis with machine learning methods. And perform graphical data analysis.

List of Programs: (Based on Hadoop, YARN, R Package, Hbase, MongoDB)

1. Setting Up the Required Environment for Apache Hadoop Installation.
2. Installing the Single-Node Hadoop Configuration on the System.
3. Install, configure, and run Hadoop and HDFS
4. Implement word coconut/frequency grams using MapReduce
5. Implement an MR program that processes a weather dataset
6. Implement Linear and logistic Regression
7. Implement SVM / Decision tree classification techniques
8. Implement clustering techniques
9. Visualize data using any plotting framework
10. Implement an application that stores big data in HBase / MongoDB / Pig using Hadoop / R.
11. Implementing Clara Algorithm in R.
12. Implementing K-Means Algorithm in R.
13. Implementing KNN Algorithm in R Language.

(Based on Spark SQL)

15. Program involving Resilient Distributed Datasets.
16. Program involving Transformations and Actions.
17. Program involving Key-Value Resilient Distributed Datasets.
18. Program involving Local Variables, Broadcast Variables and Accumulators.
Syllabus

Machine Learning for Big Data Lab (AIP-302)

L: T: P: C: 0:0:2:1 Credits-1

19. Program involving Filter, Join, GroupBy, Agg operations.
20. Viewing and Querying Temporary Tables.
21. Transferring, Summarizing and Analysing Twitter data.
22. Program involving Flume, Kafka and Kinesis.
23. Program involving DStreams and Dstream RDDs.
24. Linear Regression.
25. Decision Tree Classification.
26. Principal Component Analysis.
27. Random Forest Classification.
28. Text Pre-processing with TF-IDF.
29. Naïve Bayes Classification.
30. K-Means Clustering

References:

2. Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani, —An Introduction to Statistical Learning with Applications in R, Springer Publications, 2015(Corrected 6th Printing).
Syllabus

Computer Vision: Foundation and Applications (AIT-303)

L: T: P: C: 3:0:0:3

Course Objectives:

1. To review image processing techniques for computer vision.
2. To understand shape and region analysis.
3. To understand Hough, Transform and its applications to detect lines, circles, ellipses.
4. To understand three-dimensional image analysis techniques.
5. To understand motion analysis.
6. To implement computer vision algorithms for real-world problems.

Course Outcomes:

1. Understand and apply fundamental image processing techniques required for computer vision.
2. Analyze shapes and regions.
3. Apply Hough Transform for line, circle, and ellipse detections.
4. Understand and analyze 3D vision techniques.
5. Understand motion analysis and develop applications using computer vision techniques.

UNIT - I

Image Processing Foundations: Review of image processing techniques; classical filtering operations; thresholding techniques; edge detection techniques; corner and interest point detection; mathematical morphology; texture.

UNIT - II

Shapes And Regions: Binary shape analysis; connectedness; object labelling and counting; size filtering; distance functions; skeletons and thinning; deformable shape analysis; boundary tracking procedures; active contours; shape models and shape recognition; centroidal profiles; handling occlusion; boundary length measures; boundary descriptors; chain codes; Fourier descriptors; region descriptors; moments.

UNIT - III

Hough Transform: Line detection; Hough Transform (HT) for line detection; foot-of-normal method; line localization; line fitting; RANSAC for straight line detection; HT based circular object detection; accurate center location; speed problem; ellipse detection; Case study: Human Iris location; hole detection; generalized Hough Transform (GHT); spatial matched filtering; GHT for ellipse detection; object location; GHT for feature collation.
Syllabus

Computer Vision: Foundation and Applications (AIT-303)

L: T: P: C: 3:0:0:3

Credits-3

UNIT - IV

3D Vision: Methods for 3D vision; projection schemes; shape from shading; photometric stereo; shape from texture; shape from focus; active range finding; surface representations; point-based representation; volumetric representations; 3D object recognition; 3D reconstruction.

Introduction To Motion: Triangulation; bundle adjustment; translational alignment; parametric motion; spline-based motion; optical flow; layered motion.

UNIT - V

Applications and Case Studies: Implementation of application like face detection, face recognition, eigen faces, surveillance, foreground-background separation, particle filters, Chamfer matching, tracking, and occlusion; combining views from multiple cameras; human gait analysis; locating roadway; road markings; identifying road signs; locating pedestrians, etc.; Case Studies and recent research in Computer Vision.

TEXTBOOKS:


REFERENCE BOOKS:

Artificial Intelligence in Cyber Security AIT-304

Course Objectives: 40-Hours

1. To learn the need of AI for Cyber Security.
2. To learn the detection of DDOS using AI techniques.
3. To learn the intrusion detection using Neural Networks.
4. To learn the various applications of AI to detect cyber-attacks.

Course Outcomes

1. Understand the cyber threats, attacks and vulnerabilities and its defensive mechanism.
2. Understand and implement various AI techniques to detect cyber-attacks.
3. Identify recent challenges in AI related to cyber security.
4. Ability to apply AI and machine learning models in cyber security issues.
5. Able to develop new security solutions to the real time applications.

UNIT - I 8 Hour


UNIT - II 8 Hour


Syllabus

Artificial Intelligence in Cyber Security (AIT-304)

UNIT - III  8 Hour


UNIT - IV  8 Hour


UNIT - V  8 Hour

**AI and Mail Server**: Types of Mail Server – Data Collection from mail server – Naive Bayes theorem to detect spam – Laplace smoothing – Featurization Techniques to covert text based emails to numeric values, Logistic regression to spam filters - Anomaly detection techniques for SMTP and HTTP, Contemporary issues.

TEXTBOOKS:


REFERENCE BOOKS:

Syllabus

Introduction to Intelligent System (AIT-305)

Course Objectives: 40-Hours

1. Different issues involved in trying to define and simulate intelligence.
2. Specific, well known Artificial Intelligence methods, algorithms, and knowledge representation schemes.
3. Different techniques which will help them build simple intelligent systems based on AI/IA concepts.

Course Outcomes

1. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents.
2. Choose an appropriate problem-solving method and knowledge-representation scheme.
3. Analyze and formalize the problem (as a state space, graph, etc.) and select the appropriate search method.
4. Build simple intelligent systems or classical toy problems using different AI techniques.
5. Demonstrate, in the form of a major project work, the ability to design and develop an intelligent system for a selected application.

UNIT - I 8 Hour

Evolution of Modern Computational Intelligence: Introduction, Roots of Artificial Intelligence, Modern Artificial Intelligence, Meta-modern AI

Problem Solving by Search: Tree Based Search, Terminology, Graph Search, Search Methods Classification, Uninformed Search Methods, Breadth First Search, Depth First Search, Backtracking Search, Depth Bounded, Depth First Search, Iterative Deepening Depth FirstSearch, Branch and Bound, Bidirectional Search.

UNIT - II 8 Hour


Iterative Search: Introduction, Hill Climbing, Simulated Annealing


UNIT - III 8 Hour

Knowledge Representation and Reasoning: Propositional Logic, First Order Predicate Logic (FOPL), Predicate Calculus, FOPL Alphabet, Resolution in Propositional Logic and FOPL, Resolution in Propositional Logic, Resolution in FOPL.
Syllabus

Introduction to Intelligent System (AIT-305)

L: T: P: C: 3:0:0:3


UNIT - IV


Artificial Neural Networks: Neural Network Types, the Perceptron, Multi-layer Perceptron Advanced Artificial Neural Networks: Jordan Network, Elman Network, Hopfield Network, Self-Organizing Networks.

UNIT - V


Swarm Intelligence: Particle Swarm Optimization, Parameters of PSO, Ant Colonies Optimization, Ant System.

Hybrid Intelligent Systems: Models of Hybrid Computational Intelligence Architectures, Neuro-fuzzy Systems, Evolutionary Neural Networks (EANN), Hybrid Evolutionary Algorithms.

TEXTBOOKS:


REFERENCE BOOKS:


Web References

1. https://dblp.org/db/series/isrl/index
Syllabus

Pattern Recognition (AIT-306)

L: T: P: C: 3:0:0:3 Credits-3

Course Objectives: 40-Hours

1. To understand the concept of a pattern and the basic approach to the development of pattern recognition and machine intelligence algorithms.
2. To apply the knowledge of feature extraction methods, feature evaluation, and data mining on real life.
3. To apply both supervised and unsupervised classification methods to detect and characterize patterns in real-world data.

Course Outcomes

1. Understand the need and significance of mathematical fundamentals in pattern recognition to solve real-time problems.
2. Explore on supervised learning algorithms and to apply them for solving problems.
3. Apply unsupervised techniques for clustering data without prior knowledge.
4. Design pattern recognition models to extract interesting patterns from structured data like graph, syntactic description etc.
5. Understand the impact of dimensionality reduction on the design of intelligent models and to apply the dimensionality reduction techniques on data.
6. Apply various machine learning techniques like artificial neural networks, Support Vector machines, Fuzzy inference engines etc. to solve real-world problems.
7. Develop prototype pattern recognition algorithms that can be used to study algorithm behavior and performance against real-world multivariate data.

UNIT - I 8 Hour


Syllabus

Pattern Recognition (AIT-306)

L: T: P: C: 3:0:0:3

Credits-3

UNIT - II  8 Hour

Unsupervised Classification: Clustering for unsupervised learning and classification-Clustering concept-C-means algorithm-Hierarchical clustering procedures-Graph theoretic approach to pattern clustering- Validity of clustering solutions.

UNIT - III  8 Hour

Structural Pattern Recognition: Elements of formal grammars-String generation as pattern Syntactic Description-Parsing-Stochastic grammars structural representation.

Feature Extraction and Selection: Entropy minimization-Karhunen-Loeve transformation-Feature selection through Functions Approximation-Binary feature selection.

UNIT - IV  8 Hour

Neural Networks and Kernel Machines: Neural network structures for pattern recognition-Neural network based pattern associators- Self organizing networks-Support vector machines (SVM)-Kernel machines, Maximum margin classification, and generalizability and VC(Vapnik-Chervonenkis) dimension.

UNIT - V  8 Hour


TEXTBOOKS:


REFERENCE BOOKS:

Syllabus

Pattern Recognition (AIT-306)

L: T: P: C: 3:0:0:3

Credits-3

Syllabus

Bioinformatics (AIT-317)

L: T: P: C: 3:0:0:3

Credits-3

Course Objectives: 40Hrs

1. To understand Bioinformatics from computing perspective.
2. To apply data mining techniques to provide better health care services.
3. To explore and extract hidden information from bioinformatics databases.
4. To understand the applications of Bioinformatics.

Course Outcomes:

After the completion of course the students will able to:

1. Understand the concepts of molecular biology, DNA analysis with respect to data processing.
2. Analyze biological sequences and score matrices with respect to data processing.
3. Implement data mining algorithms on microarray, gene expression, feature selection for proteomic and genomic data.
4. Apply AI in medical field for development of contributive solutions.
5. Investigate state-of-the-art research and developments in bioinformatics.

UNIT – I 8hrs

Introduction: Introduction to Bioinformatics and Data Mining; Molecular Biology background: Analyzing DNA; Bioinformatics perspective of how individuals of a species differ and how different species differ; Bioinformatics challenges and opportunities.

UNIT – II 8hrs

Biological Sequence Analysis: DNA sequence analysis; DNA databases; Protein structure and function; Protein sequence databases; Sequence alignment; Sequence comparison, Sequence similarity search; Longest common subsequence problem; Scoring matrices for similarity search PAM, BLOSUM, etc.

UNIT – III 8hrs

Mining Biological Data: Protein structural classification; Protein structural prediction; Modeling text retrieval in biomedicine; Mining from microarray and gene expressions; Feature selection for proteomic and genomic data mining.
Syllabus

Bioinformatics (AIT-317)

L: T: P: C: 3:0:0:3

Credits-3

UNIT – IV

**Ethics in Bioinformatics:** Ethical and social challenges of electronic health information; Public access to anatomic images; Evidence based medicine; Outcome measures and practice guidelines for using data mining in medicine; Computer assisted medical and patient education.

UNIT – V

**AI in Medical Informatics:** Infectious disease informatics and outbreak detection; Identification of biological Relationships from text documents; Medical expert systems; Telemedicine and tele surgery; Internet grateful med (IGM).

**Case Studies:** Case Studies and recent research in application of artificial intelligence in bioinformatics.

**TEXTBOOKS:**

1. S. Rastogi, N. Mendiratta and P. Rastogi, Bioinformatics: Methods and Applications: Genomics, Proteomics and Drug Discovery, PHI.

**REFERENCE BOOKS:**

1. J. Chen and S. Lonardi, Biological Data Mining, Chapman and Hall/CRC.
2. V. Buffalo, Bioinformatics Data Skills, O’Reilly Publishing.
Syllabus

Web Intelligence (AIT-318)

L: T: P: C: 3:0:0:3 Credits-3

Course Objectives: 40hrs

1. To know the importance of qualitative data, get insights and techniques.
2. To develop customer-centric approach in dealing with data.
3. To know the principles, tools, and methods of web intelligence.
4. To apply analytics for business situations.

Course Outcomes:

After the completion of course the students will able to:

1. Know the concepts and terminologies related to web analytics.
2. Explore various parameters used for web analytics and their impact.
3. Explore the use of tools and techniques of web analytics.
4. Get experience on websites, web data insights and conversions.
5. Develop efficient web analytical support systems for business.

UNIT – I 8hrs

Web Analytics: Basics, Traditional Ways, Expectations, Data Collection, Clickstream Data, Weblogs, Beacons, JavaScript Tags, Packet Sniffing, Outcomes data, Competitive data, Search Engine Data.

UNIT – II 8hrs

Qualitative Analysis: Customer Centricity, Site Visits, Surveys, Questionnaires, Website Surveys, Post visits, Creating and Running, Benefits of surveys, Critical components of successful strategy.

UNIT – III 8hrs

Web Analytic concepts: URLs, Cookies, Time on site, Page views, Understand standard reports, Website content quality, Navigation reports (top pages, top destinations, site overlay).

Search Analytics: Internal search, SEO and PPC, Measuring Email and Multichannel Marketing, Competitive intelligence and Web 2.0 Analytics, Segmentation, Connectable reports.
Syllabus

Web Intelligence (AIT-318)

L: T: P: C: 3:0:0:3

Credits-3

UNIT – IV

Google Analytics: Analytics, Cookies, Accounts vs Property, Tracking Code, Tracking Unique Visitors, Demographics, Page Views & Bounce Rate Acquisitions, Custom Reporting.

UNIT – V

Goals & Funnels: Filters, Ecommerce Tracking, Real Time Reports, Customer Data Alert, AdWords Linking, AdSense Linking, Attribution Modeling, Segmentation, Campaign Tracking, Multi-Channel Attribution.

TEXTBOOKS:


REFERENCE BOOKS:

Human Machine Interaction (AIT-319)

L: T: P: C: 3:0:0:3

Course Objectives:

1. Learn the foundation of human machine interaction.
2. Understand the importance of human psychology in designing good interfaces.
3. Be aware of mobile interaction design and its usage in day – to – day activities.
4. Understand various design technologies to meet user requirements.
5. Encourage to indulge into research in Machine Interaction Design.

Course Outcomes:

After the completion of course the students will able to:

1. Identify User Interface (UI) design principles.
2. Analysis of effective user friendly interfaces.
3. Apply Interactive Design process in real world applications.
4. Evaluate UI design and justify.
5. Create application for social and technical task.

UNIT - I


UNIT – II

Human Machine Interaction (AIT-319)

L: T: P: C: 3:0:0:3

Credits-3

UNIT – III 8hrs


UNIT – IV 8hrs

SCREEN DESIGNING: Design goals, Screen planning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, visually pleasing composition, amount of information, focus and emphasis, presentation information simply and meaningfully, information retrieval on web, statistical graphics, Technological consideration in interface design.

UNIT – V 8hrs


TEXTBOOKS:

3. Alan Cooper, Robert Reimann, David Cronin, —About Face3: Essentials of Interaction design, Wiley publication.
4. Jeff Johnson, —Designing with the mind in mind, Morgan Kaufmann Publication.

AIT-319 Human Machine Interaction

L: T: P: C: 3:0:0:3 Credits-3

REFERENCE BOOKS:

2. Guy A. Boy —The Handbook of Human Machine Interaction, Ashgate publishing Ltd.
AIT-320: Data Acquisition and Productization

L: T: P: C: 3:0:0:3                          Credits-3

Course Objectives: 40hrs

1. To explore the fundamental concepts of data pre-processing, extraction, cleaning, annotation, integration.
2. To understand the various information visualization techniques.
3. To understand data productization using Internet of things.

Course Outcomes:

After the completion of course the students will able to:

1. Identity a data acquisition system and their processes.
2. Apply of data pre-processing, extraction, cleaning, annotation, integration on data.
3. Apply the suitable visualization techniques to output analytical results.
4. Identify the requirements of intelligent application and Security and Privacy in IoT
5. Explore on applications using Internet of things.

UNIT - I 8hrs

Introduction to Data Warehouse: OLTP and OLAP concepts, Introduction to Data Mining, Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Exploratory Data analysis, Measuring Data Similarity and Dissimilarity, Graphical representation of data.

UNIT - II 8hrs

Introduction to Data Acquisition: Applications, Process, Data Extraction, Data Cleaning and Annotation, Data Integration, Data Reduction, Data Transformation, Data Discretization and Concept Hierarchy Generation.

UNIT - III 8hrs

AIT-320: Data Acquisition and Productization

L: T: P: C: 3:0:0:3 Credits-3

UNIT - IV 8hrs


UNIT – V 8hrs

Virtualization on Embedded Boards IoT: Stream Processing in IoT, Internet of Vehicles and Applications, Case study on Data Acquisition using Dashboards, Android, and iOS apps.

TEXTBOOKS:


REFERENCE BOOKS:

Syllabus

AIT-307 Data Science

L: T: P: C: 3:0:0:3

Credits-3

Course Objectives: 40hrs
1. Generalizable extraction of knowledge from data.
2. Engineering effective solutions.
3. Basic machine learning algorithms.
4. Building recommendation systems.
5. Considerate concepts on Graphs.

Course Outcomes:

1. Describe what Data Science is and the skill sets needed to be a data scientist, the Data Science Process and how its components interact.
2. Explain in basic terms what Statistical Inference means.
3. Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data.
4. Use R to carry out basic statistical modeling and analysis and APIs and other tools to scrap the web and collect data.
5. Apply basic tools (plots, graphs, summary statistics) to carry out EDA and apply EDA and the Data Science process in a case study.

UNIT - I 8hrs

Introduction: What is Data Science? Big Data and Data Science hype, getting past the hype now? Data fication current landscape of perspectives, Skill sets needed, Statistical Inference, Populations and samples, Statistical modeling, probability, distributions, fitting a model, Introduction to R.

UNIT - II 8hrs

Exploratory Data Analysis and the Data Science Process, Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process, Case Study: Real Direct (online real estate firm).


UNIT - III 8hrs

Spam Filters, Naive Bayes, and Wrangling, Thought Experiment: Learning by Example, Naive Bayes, Fancy It Up: Laplace Smoothing, Comparing Naive Bayes to k-NN, Sample Code in bash, Scraping the Web: APIs and Other Tools, Jake’s Exercise: Naive Bayes for Article Classification.
Syllabus

AIT-307 Data Science

L: T: P: C: 3:0:0:3  Credits-3

Logistic Regression: Thought Experiments, Classifiers, M6D Logistic Regression Case Study, Media 6 Degrees Exercise.

UNIT - IV  8hrs


UNIT - V  8hrs

Mining Social-Network Graphs, Social networks as graphs, Clustering of graphs, direct discovery of communities in graphs, Partitioning of graphs, Neighborhood properties in graphs, Data Visualization, Basic principles, ideas and tools for data visualization.

Data Science and Ethical Issues: Discussions on privacy, security, ethics, A look back at Data Science.

TEXTBOOKS:


REFERENCE BOOKS:

2. Foster Provost and Tom Fawcet, —Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking, O’Reilly Media, 2013.
Syllabus

Health Care Data Analytics (AIT-308)

L: T: P: C: 3:0:0:3

Credits-3

Course Objectives: 40hrs

1. To explore the various forms of electronic health care information.
2. To learn the techniques adopted to analyses health care data.
3. To understand the predictive models for clinical data.
4. Understand the role of clinical integration in improving quality, safety and outcomes.

Course Outcomes

1. Analyze health care data using appropriate analytical techniques.
2. Apply analytics for decision making in healthcare services.
3. Apply data mining to integrate health data from multiple sources.
4. Describe the tools and techniques used for data analytics in health care organizations.
5. Develop efficient clinical decision support systems.

UNIT - I 8hrs


UNIT - II 8hrs

Analysis: Biomedical Image Analysis- Mining of Sensor Data in Healthcare- Biomedical Signal Analysis- Genomic Data Analysis for Personalized Medicine.

UNIT - III 8hrs

Analytics: Natural Language Processing and Data Mining for Clinical Text- Mining the Biomedical- Social Media Analytics for Healthcare.

UNIT – IV 8hrs
Syllabus

Health Care Data Analytics (AIT-308)

L: T: P: C: 3:0:0:3                   Credits-3


UNIT - V 8hrs


TEXTBOOKS:


REFERENCE BOOKS:

Syllabus

GPU Computing (AIT-309)  

L: T: P: C: 3:0:0:3  
Credits-3

Objectives:  
40hrs

1. To study all modern multi-core processors, and in order to make effective use of them.
2. To organize the computations of the threads so that they work together and performs the required computations efficiently.
3. To make good use of the available hardware resources.
4. To understand of usage of GPUs for general purpose computing, rather than for graphics.

Course Outcomes:

1. Define terminology commonly used in parallel computing, such as efficiency and speedup.
2. Describe common GPU architectures and programming models.
3. Implement efficient algorithms for common application kernels, such as matrix multiplication.
4. Given a problem, develop an efficient parallel algorithm to solve it.
5. Given a problem, implement an efficient and correct code to solve it, analyze its performance, and give convincing written and oral presentations explaining the achievements.

UNIT - I  
8hrs

Introduction: History, GPU Architecture, Clock speeds, CPU / GPU comparisons, Heterogeneity, Accelerators, Parallel Programming, CUDA OpenCL / OpenACC, Kernels Launch parameters, Thread hierarchy, Warps/Wavefronts, Threadblocks/Workgroups, Streaming multiprocessors, 1D/2D/3D thread mapping, Device properties, Simple Programs.

UNIT - II  
8hrs

Memory: Memory hierarchy, DRAM / global, local / shared, private / local, textures, Constant Memory, Pointers, Parameter Passing, Arrays and dynamic Memory, Multi-dimensional Arrays, Memory Allocation, Memory copying across devices, Programs with matrices, Performance evaluation with different memories.

UNIT - III  
8hrs

Synchronization: Memory Consistency, Barriers (local versus global), Atomics, Memory fence. Prefix sum, Reduction. Programs for concurrent Data Structures such as Worklists, Linked lists. Synchronization across CPU and GPU.

Functions: Device functions, Host functions, Kernels functions, using libraries (such as Thrust), and developing libraries.
Syllabus

GPU Computing (AIT-309)

L: T: P: C: 3:0:0:3 Credits-3

UNIT - IV 8hrs

**Support**: Debugging GPU Programs. Profiling, Profile tools, Performance aspects.

**Streams**: Asynchronous processing, tasks, Task-dependence, overlapped data transfers, Default Stream, Synchronization with streams. Events, Event-based- Synchronization - Overlapping data transfer and kernel execution, pitfalls.

UNIT - V 8hrs

**Advanced Topics**: Dynamic parallelism, Unified Virtual Memory, Multi-GPU, processing, Peer access, Heterogeneous processing.

**Case Studies**: Image Processing, Graph algorithms, Simulations, Deep Learning.

**TEXTBOOKS:**

2. CUDA Programming: A Developer's Guide to Parallel Computing with GPUs; Shane Cook; Morgan Kaufman.
3. GPU Computing and Applications: Yiyu Cai, Simon See; Springer;

**REFERENCE BOOKS:**

Syllabus

Natural Language Processing (AIT-310)

L: T: P: C: 3:0:0:3 Credits-3

Course Objectives: 40hrs

1. To understand natural language processing and to learn how to apply basic algorithms in this field.
2. To get acquainted with the basic concepts and algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics.
3. To design and implement applications based on natural language processing.
4. To implement various language Models.
5. To design systems that uses NLP techniques.

Course Outcomes:

1. Have a broad understanding of the capabilities and limitations of current natural language technologies.
2. Able to model linguistic phenomena with formal grammars.
3. Be able to Design, implement and test algorithms for NLP problems.
4. Understand the mathematical and linguistic foundations underlying approaches to the various areas in NLP.
5. Able to apply NLP techniques to design real world NLP applications such as machine translation, text categorization, text summarization, information extraction...etc.

UNIT - I 8hrs

Introduction: History of NLP, Generic NLP system, levels of NLP, Knowledge in language processing, Ambiguity in Natural language, stages in NLP, challenges of NLP, Applications of NLP.

UNIT - II 8hrs

Syllabus

Natural Language Processing (AIT-310)

L: T: P: C: 3:0:0:3 Credits-3

UNIT - III 8hrs


UNIT - IV 8hrs


Pragmatics: Discourse reference resolution, reference phenomenon, syntactic & semantic constraints on co reference

UNIT – V 8hrs

Applications (preferably for Indian regional languages): Machine translation, Information retrieval, Question answers system, categorization, summarization, sentiment analysis, Named Entity Recognition.

TEXTBOOKS:


REFERENCE BOOKS:

3. Alexander Clark (Editor), Chris Fox (Editor), Shalom Lappin (Editor) — The Handbook of Computational Linguistics and Natural Language Processing — ISBN: 978-1-118-.
4. Syllabus

Natural Language Processing (AIT-310)

L: T: P: C: 3:0:0:3 Credits-3

5. Steven Bird, Ewan Klein, Natural Language Processing with Python, O ‘Reilly.
7. Niel J le Roux, Sugnet Lubbe, A step by step tutorial: An introduction into R application and programming
Course Objectives: 40hrs

1. To provide a strong foundation of fundamental concepts in Artificial Intelligence.
2. To acquire knowledge about agents and their types.
3. To solve problems by searching.
4. To define the ANN, why we need the ANN, and the architecture of ANN.
5. To transform the training set of data using a kernel function.
6. To provide a basic exposition of the goals and methods of Artificial Intelligence.
7. To provide fundamentals of machine learning.

Course Outcomes:

1. Enumerate the impact of the various fields in Artificial Intelligence.
2. Apply the basic principles of AI in problem-solving and the need for the ANN and the architecture of ANN.
3. Choose the appropriate representation of Knowledge.
4. Enumerate the Perspectives and Issues in Machine Learning.
5. Identify the optimal hyperplane in the training phase with a classifier.

UNIT – I 8 Hour


UNIT - II 8 Hour


UNIT - III 8 Hour


Artificial Neural Networks: Introduction, Activation Function, Optimization algorithm Gradient decent, Networks Perceptron’s, Adaline, Multilayer Perceptron’s, Backpropagation Algorithms Training Procedures, Tuning the Network Size.
UNIT – IV 8 Hour

**Introduction to Machine Learning**: Machine Learning basics, Applications of ML, Data Mining Vs Machine Learning vs Big Data Analytics. Supervised Learning Naïve Base Classifier, Classifying with k-Nearest Neighbour classifier, Decision Tree classifier, Naïve Bayes classifier. Unsupervised Learning - Grouping unlabelled items using k-means clustering, Association analysis with the Apriori algorithm Introduction to reinforcement learning

**Forecasting and Learning Theory**: Non-linear regression, Logistic regression, Random Forest, Bayesian Belief networks, Bias/variance trade-off, Tuning Model Complexity, Model Selection Dilemma

**Clustering**: Expectation-Maximization Algorithm, Hierarchical Clustering, Supervised Learning after Clustering, Choosing the number of clusters, Learning using ANN.

UNIT - V 8 Hour


**Ensemble Methods**: Mixture Models, Classifier using multiple samples of the data set, improving classifier by focusing on error, a weak learner with a decision stump, Bagging, Stacking, Boosting, Implementing the AdaBoost algorithm, Classifying with AdaBoost Bootstrapping and cross-validation.

**TEXTBOOKS:**


**REFERENCE BOOKS:**

1. **L: T: P:C: 3:1:0 :4**

   **Credits-4**

**Course Objectives:**

1. To understand various scalable machine learning algorithms to solve big data problems.
2. To understand the SPARK architecture.
3. To implement Machine Learning algorithms using PySpark.

**Course Outcomes**

1. Understand how Machine learning algorithm is made scalable to solve big data problems.
2. Implement scalable Machine Learning algorithms using PySpark.
3. Apply and compare different strategies for big data analytics using various machine learning algorithms
4. Understand Streaming algorithms and Coreset concept to analyze voluminous and high-dimensional data
5. Understanding the Pre-processing concepts in Machine Learning.

**UNIT - I**

**8 Hour**

**Introduction to Big Data** - Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere Big Insights and Big Sheets.

**UNIT - II**

**8 Hour**

**HDFS (Hadoop Distributed File System):** The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro, and File-Based Data structures.

**Map Reduce:** Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle, and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.
UNIT – III 8 Hour

Machine Learning for Big Data (AIT-302)

1. **L**: T: P:C: 3:1:0 :4 Credits-4

**Introduction to Spark:** Spark Architecture, Spark Jobs, and APIs. Resilient Distributed Datasets Creating RDDs, Transformation, Actions. Data frames- Python to RDD communications, Creating Data frames, Data frame queries. MLlib -Loading and Transforming The data. Implementation of Machine Learning algorithms such as Classification and Clustering using MLlib.

UNIT - IV 8 Hour


UNIT – V 8 Hour

**Frequent Item Sets:** Market Basket Analysis, A-Priori Algorithm - PCY Algorithm, Big data Clustering: Clustering in Non-Euclidean Spaces, BFR, CURE.

**Structured Streaming:** Spark Streaming, Application dataflow. Coresets: Coresets for K-means, K-median clustering.

**TEXTBOOKS:**


**REFERENCE BOOKS:**

Syllabus

Reinforcement Learning (AIT-314)

L: T: P: C: 3:0:0:3

Credits-4

40hrs

Course Objectives:

1. Formalize problems as Markov Decision Processes
2. Understand basic exploration methods and the exploration/exploitation tradeoff
3. Understand value functions, as a general-purpose tool for optimal decision-making
4. Know how to implement dynamic programming as an efficient solution approach to an industrial control problem

Course Outcomes:

1. Formalize problems as Markov Decision Processes
2. Understand basic exploration methods and the exploration/exploitation trade-off
3. Understand value functions, as a general-purpose tool for optimal decision-making
4. Know how to implement dynamic programming as an efficient solution approach to an industrial control problem

UNIT – I 8hrs

Introduction
Course logistics and overview. Origin and history of Reinforcement Learning research. Its connections with other related fields and with different branches of machine learning.

Probability Primer
Brush up of Probability concepts - Axioms of probability, concepts of random variables, PMF, PDFs, CDFs, Expectation. Concepts of joint and multiple random variables, joint, conditional and marginal distributions. Correlation and independence.

UNIT – II 8hrs

Markov Decision Process
Introduction to RL terminology, Markov property, Markov chains, Markov reward process (MRP). Introduction to and proof of Bellman equations for MRPs along with proof of existence of solution to Bellman equations in MRP. Introduction to Markov decision process (MDP), state and action value functions, Bellman expectation equations, optimality of value functions and policies, Bellman optimality equations.
Syllabus

Reinforcement Learning (AIT-314)

L: T: P: C: 3:0:0:3

Credits-4

UNIT – III 8hrs

Prediction and Control by Dynamic Programming
Overview of dynamic programing for MDP, definition and formulation of planning in MDPs, principle of optimality, iterative policy evaluation, policy iteration, value iteration, Banach fixed point theorem, proof of contraction mapping property of Bellman expectation and optimality operators, proof of convergence of policy evaluation and value iteration algorithms, DP extensions.

Monte Carlo Methods for Model Free Prediction and Control
Overview of Monte Carlo methods for model free RL, First visit and every visit Monte Carlo, Monte Carlo control, On policy and off policy learning, Importance sampling.

UNIT – IV 8hrs

TD Methods
Incremental Monte Carlo Methods for Model Free Prediction, Overview TD(0), TD(1) and TD(λ), k-step estimators, unified view of DP, MC and TD evaluation methods, TD Control methods - SARSA, Q-Learning and their variants.

Function Approximation Methods
Getting started with the function approximation methods, Revisiting risk minimization, gradient descent from Machine Learning, Gradient MC and Semi-gradient TD(0) algorithms, Eligibility trace for function approximation, Afterstates, Control with function approximation, Least squares, Experience replay in deep Q-Networks.

UNIT – V 8hrs

Policy Gradients
Getting started with policy gradient methods, Log-derivative trick, Naive REINFORCE algorithm, bias and variance in Reinforcement Learning, Reducing variance in policy gradient estimates, baselines, advantage function, actor-critic methods.
Syllabus

Textbooks:


Reinforcement Learning (AIT-314)

L: T: P: C: 3:0:0:3

Credits-4


REFERENCE BOOKS:

Syllabus

Robotics and Planning (AIT-313)

L: T: P: C: 3:0:0:3  
Credits-4  
40hrs

Course Objectives:

1. The motivation behind robotics will be discussed.
2. Applications of robots in different areas like in manufacturing units, medical science, space, and others.
4. The working principles of various sensors used in robots.
5. The principles of motion planning algorithms.

Course Outcomes:

- The fundamentals of image filtering and tracking, and how to apply those principles to face detection, mosaicking and stabilization
- How to use geometric transformations to determine 3D poses from 2D images for augmented reality tasks and visual odometry for robot localization
- How to recognize objects and the basics of visual learning and neural networks for the purpose of classification

UNIT – I  
8hrs

Introduction to Robotics: Types and Classification of robots; Science and Technology of Robots. Rigid Body Transformation: Overview of Rigid Body Kinematics; Homogeneous Transformation; Link Transformation Matrices

UNIT – II  
8hrs

Robotic vision sensors and their interfacing. Fundamentals of Computer Vision: Image accusation and representation, image transformation, filtering, restoration, morphing, Camera Models, Calibration, Single view geometry, Multiple view geometry, Epipolar geometry, RANSAC
Syllabus

Robotics and Planning (AIT-313)

L: T: P: C: 3:0:0:3

Credits-4

UNIT – III

Position and Orientation: Feature based alignment; Pose estimation; Time varying pose and trajectories, Structure from motion, dense Motion Estimation, Visual Odometry (Semi-direct VO, direct sparse odometry), Bundle Assignment.

UNIT – IV

Localization and Mapping: Initialization, Tracking, Mapping, geometric SLAM formulations (indirect vs. direct error formulation, geometry parameterization, sparse vs. dense model, optimization approach), Relocalization and map Optimization, Visual SLAM, Examples: Indirect (Feature based) methods (MonoSLAM, PTAM, ORB-SLAM), Direct methods (DTAM, LSD-SLAM), Sensor combinations (IMU, mono vs. Stereo, RGB-Depth), Analysis and parameter studies.

UNIT – V

Recognition and Interpretations: Concepts of machine learning and deep learning, sequence modeling, Learning for robotic vision: Active learning, incremental and class incremental learning identify unknowns, uncertainty estimation, Embodiment for robotic vision: active vision, spatial and temporal embodiment, reasoning for object, scene and scene semantics.

Textbooks

Syllabus

Robotics and Planning (AIT-313)

L: T: P: C: 3:0:0:3  
Credits-4

References Books:

Course Objectives:

Most problems arising in modern Machine Learning and Data Science are formulated as optimization programs. The most efficiently tractable subclass of these problems is the family of convex programs. The course will consist of two parts:
1) Convex Optimization (CO),
2) Application of the CO machinery in Data Science.

Course Outcomes:

Upon successful completion of the course the students will
1) Understand the theory and methodology of CO,
2) Be familiar with the most efficient and commonly used optimization techniques and advantages of their usage,
3) Will learn about numerous practical applications of the CO to modern statistical and machine learning problems,
4) Will be able to design and apply CO techniques themselves.

Unit I
Convex Optimization. The first part of the course focuses on defining, analyzing, and solving convex optimization problems that arise in applications. We will cover Convex sets, functions, and programs and their properties, Basics of convex analysis, cones, Linear, quadratic, and semi definite programming.

Unit II
Optimality conditions, introduction to duality theory, theorems of alternatives, Algorithms: Unconstrained minimization, Descent methods, Newton’s method, Interior-point methods.

Unit III
Syllabus

Data Driven Optimization (AIT-315)

L: T: P: C: 3:0:0:3

Credits-4

Unit IV 8Hrs
Elements of Bayesian Statistics, SVD, Matrix Norms, Robust Principal Component Analysis, Matrix completion, Examples from big data, engineering, and machine learning.

Unit V 8Hrs

Text Books:
- An Introduction to Statistical Learning with Applications in R, Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, ISBN-13: 978-1461471370 (also available for free online)

Reference Books:
Syllabus

Knowledge Based System (AIT-316)

L: T: P: C: 3:0:0:3 Credits-4
40hrs

Course Objectives:
The unit seeks to impart an understanding of knowledge based concepts and techniques, translating requirements into knowledge models and then generating these using expert systems. Students will be provided with theoretical foundations and practical techniques to build knowledge based systems.

Course Outcomes:
Upon successful completion of this course, the student should be able to: The students should be able to;

• Have a general understanding of A. I. concepts
• Use the various search mechanisms to solve a problem.
• Understand knowledge acquisition techniques
• Use knowledge representation methods.
• Use inference techniques to improve prediction and decision support.

UNIT – I 8hrs
Introduction to Intelligence and Artificial Intelligence- Overview of Artificial Intelligence, History of Artificial Intelligence. Characteristics of AI Programs - Symbolic processing, Knowledge Representation Search, Heuristics Applications of Artificial Intelligence.
Search - Process of Searching Representing search problems Search strategies Uninformed (blind) search Informed (heuristic) search

UNIT – II 8hrs
Introduction to Knowledge based systems – Data, information and knowledge, Types of Knowledge and Knowledge based systems.
Syllabus

Knowledge Based System (AIT-316)

L: T: P: C: 3:0:0:3

Credits-4

UNIT – III


UNIT – IV

Search Techniques. Uninformed Search: DFS, BFS, Iterative Deepening, Heuristic Search: A*, Hill Climbing etc.

Case-based reasoning (CBR) – Case, case-indexing, main components of Case-based systems.

UNIT – V


Textbooks:
1. Artificial Intelligence-Nilsl J Nilson
2. Artificial Intelligence-Elain Rich and Kevin Knight

References Books:

Syllabus

Knowledge Based System (AIT-316)

L: T: P: C: 3:0:0:3

Credits-4

- The CPE/CSC 480 textbook, Artificial Intelligence: A Modern Approach (2nd ed.) by Stuart Russell and Peter Norvig.
Course Objectives: Students will be able to:

1. To understand the fundamentals of research in today’s world controlled by technology, ideas, concept, and creativity.
2. To understand different methods of research designing and data collections.
3. To understand the methods of report writing and its different methods of interpretations.
4. To understand research ethics and methods of research publications.
5. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

Course Outcomes:

1. To understand research problem formulation.
2. To study research design and method of data collections.
3. To study methods of report writing.
4. To follow research ethics.
5. To enhance student’s competence to discover new inventions.

Syllabus Contents:

UNIT I: FUNDAMENTAL OF RESEARCH 8 Hour

Meaning of research; objectives of research; basic steps of research; criteria of good research; Research methods vs. Methodology. Types of research – criteria of good research; Meaning of research problem; selection of research problem; Approaches of investigation of solutions for research problem, Errors in selecting a research problem, Scope and objectives of research problem, Review of related literature- Meaning, necessity and sources.

Unit 2: RESEARCH DESIGN AND DATA COLLECTION 8 Hour

Research design: Types of research design- exploratory, descriptive, diagnostic and experimental; Variables- Meaning and types; Hypothesis- Meaning, function and types of hypothesis; Null/Alternative hypothesis; Sampling- Meaning and types of sampling; Probability and Non-Probability; Tools and techniques of data collection- questionnaire, schedule, interview, observation, case study, survey etc.

Unit 3: REPORT WRITING AND ITS INTERPRETATION 8 Hour

Syllabus
Research Methodology and IPR (AHT-302)

L:T:P:: 2:0:0

Credits-2

Unit 4: RESEARCH ETHICS AND SCHOLARY PUBLISHING

8 Hour

Ethics-ethical issues, ethical committees (human & animal); scholarly publishing- IMRAD concept and design of research paper, citation and acknowledgement, plagiarism and its concept and importance for scholar.

Unit 5: INTELLECTUAL PROPERTY RIGHT (IPR)

8 Hour


Reference Books:

2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
Technical Writing and Presentation Skills (AHT-303)

Course Objectives:
- To develop effective writing and presentation skills in students.
- To develop textual, linguistic and presentation competencies in students appropriate for their professional careers.

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

CO1: Write clearly and fluently to produce effective technical documents.
CO2: Demonstrate an appropriate communication style to different types of audiences both orally and written as per demand of their professional careers.
CO3: Communicate in an ethically responsible manner.

Course Contents:

WRITING SKILLS

Unit-I (4 hours)
Technical Writing-Basic Principles: Words-Phrases-Sentences, Construction of Cohesive Paragraphs, Elements of Style.

Unit-II (4 hours)
Principles of Summarizing: Abstract, Summary, Synopsis

Unit-III (6 hours)
Technical Reports: Salient Features, Types of Reports, Structure of Reports, Data Collection, Use of Graphic Aids, Drafting and Writing

PRESENTATION SKILLS

Unit-IV (6 hours)

Unit-V (8 hours)

References: