



Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE - Mobile Applications-Apple Authorized Training Center)
Choice Based Credit System (CBCS)-2021-25
SEMESTER-VII

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BBAI501	AECC	Human Values and Professional Ethics	60	20	20	0	0	3	0	0	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

The objective of the course is to disseminate the theory and practice of moral code of conduct and familiarize the students with the concepts of “right” and “good” in individual, social and professional context

Course Outcomes (COs):

1. Help the learners to determine what action or life is best to do or live.
2. Right conduct and good life.
3. To equip students with understanding of the ethical philosophies, principles, models that directly and indirectly affect business.

COURSE CONTENT

Unit I: Human Value

1. Definition, Essence, Features and Sources
2. Sources and Classification
3. Hierarchy of Values
4. Values Across Culture

Unit II: Morality

1. Definition, Moral Behaviour and Systems
2. Characteristics of Moral Standards
3. Values Vs Ethics Vs Morality
4. Impression Formation and Management

Unit III: Leadership in Indian Ethical Perspective.

1. Leadership, Characteristics
2. Leadership in Business (Styles), Types of Leadership (Scriptural, Political, Business and Charismatic)
3. Leadership Behaviour, Leadership Transformation in terms of Shastras (Upanihads, Smritis and Manu-smriti).

Unit IV: Human Behavior – Indian Thoughts

1. Business Ethics its meaning and definition
2. Types, Objectives, Sources, Relevance in Business organisations.
3. Theories of Ethics, Codes of Ethics

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Unit V: Globalization and Ethics

1. Sources of Indian Ethos & its impact on human behavior
2. Corporate Citizenship and Social Responsibility – Concept (in Business),
3. Work Ethics and factors affecting work Ethics.

Suggested Readings

1. Beteille, Andre (1991). *Society and Politics in India*. AthlonePress:New Jersey.
2. Chakraborty, S. K. (1999). *Values and Ethics for Organizations*. oxford university press
3. Fernando, A.C. (2009). *Business Ethics - An Indian Perspective* .India: Pearson Education: India
4. Fleddermann, Charles D. (2012). *Engineering Ethics*. New Jersey: Pearson Education / Prentice Hall.
5. Boatright, John R (2012). *Ethics and the Conduct of Business*.Pearson. Education: New Delhi.
6. Crane, Andrew and Matten, Dirk (2015). *Business Ethics*. Oxford University Press Inc:New York.
7. Murthy, C.S.V. (2016). *Business Ethics – Text and Cases*. Himalaya Publishing House Pvt. Ltd:Mumbai
8. Naagrajan, R.R (2016). *Professional Ethics and Human Values*. New Age International Publications:New Delhi.



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BTCS702N	DCC	Big Data and Hadoop	60	20	20	30	20	3	0	2	4

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Course Educational Objectives (CEOs):

The objectives of this course are to make the students to:

1. Introduce students to Big Data Analysis using hadoop
2. Introduce to Hadoop Eco System, HDFS, commands, management and map reduce.
3. Understating machine learning concept and Introduce JAQL, pig and HIVE
4. Data stream, partitioning, debugging and toolkits

Course Outcomes (COs):

At the end of the course, students shall be able to:

1. Install Hadoop, configure HDFS, Install Zookeeper , Pig Installation, Sqoop Installation, Hbase Installation run commands
2. Use Zookeeper , Sqoop, Hbase, JAQL, PIG & HIVE
3. Use BigInsite, data streams, partitioning and other toolkits
4. appreciate the influence of big data for business decisions and approach

Syllabus:

UNIT I

Introduction about big data ,Describe details Big data: definition and taxonomy , explain Big data value for the enterprise , Setting up the demo environment ,Describe Hadoop Architecture , Hadoop Distributed File System, MapReduce& HDFS , First steps with the Hadoop , Deep to understand the fundamental of MapReduce

UNIT II

Hadoop ecosystem, Installing Hadoop Eco System and Integrate With Hive Installation , PigInstallation ,Hadoop , Zookeeper Installation , Hbase Installation , , Sqoop Installation, Installing Mahout Introduction to Hadoop , Hadoop components: MapReduce/Pig/Hive/HBase, Loading data into Hadoop, Getting data from Hadoop.

UNIT III

Using Hadoop to store data, Learn NoSQL Data Management, Querying big data with Hive, Introduction to the SQL Language , From SQL to HiveQL , Querying big data with Hive,

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Introduction to HIVE e HIVEQL, Using Hive to query Hadoop files. Moving the Data from RDBMS to Hadoop , Moving the Data from RDBMS to Hbase , Moving the Data from RDBMS to Hive

UNIT IV

Machine Learning Libraries for big data analysis, Machine Learning Model Deployment, Machine learning tools , Spark & SparkML , H2O , Azure ML.

UNIT V

Monitoring The HadoopCluster , Monitoring Hadoop Cluster, Monitoring Hadoop Cluster with Nagios , Monitoring Hadoop Cluster, Real Time Example in Hadoop , Apache Log viewer Analysis , Market Basket Algorithms Big Data Analysis in Practice , Case Study , Preparation of Case Study Report and Presentation , Case Study Presentation

Text Books:

1. Tom White,” Hadoop: The Definitive Guide Paperback – 2015” Shroff Publishers & Distributers Private Limited - Mumbai; Fourth edition (2015).
2. V. K. Jain (Author),” Big Data and Hadoop” Khanna Publishers; 1 edition (1 June 2015)
3. Jason Bell (Author) “Machine Learning for Big Data: Hands-On for Developers and Technical Professionals” Wiley (2014)
4. Big Data Analytics & Hadoop by IBM ICE Publications

References:

1. Big data. Architettura, tecnologie e metodi per l'utilizzo di grandibasi di dati, A. Rezzani, Apogeo Education, 2013
2. Hadoop For Dummies, Dirk deRoos, For Dummies, 2014
3. Cohen et al. “MAD Skills: New Analysis Practices for Big Data”, 2009
4. Ullman, Rajaraman, Mining of Massive Datasets, Chapter 2
5. Stonebraker et al., “MapReduce and Parallel DBMS’s: Friends or Foes?”, Communications of the ACM, January 2010.
6. Dean and Ghemawat, “MapReduce: A Flexible Data Processing Tool”, Communications of the ACM, January 2010.

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List of Practicals:

1. Installing Hadoop, configure HDFS, Install Zookeeper , Pig Installation, Sqoop Installation, Hbase Installation
2. Configuring Hadoop
3. Running jobs on Hadoop
4. Working on HDFS
5. Hadoop streaming
6. Creating Mapper function using python.
7. Creating Reducer function using python
8. Python iterator and generators
9. Twitter data sentimental analysis using Flume and Hive
10. Business insights of User usage records of data cards
11. Wiki page ranking with hadoop
12. Health care Data Management using Apache Hadoop ecosystem

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BTMACS701	DCC	Machine Learning and Artificial Intelligence Using Swift	60	20	20	30	20	3	0	2	4

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COURSE OBJECTIVES:

The student will have the ability:

1. To study about the basics of artificial intelligence and machine learning
2. To study about the various types of data set and various preprocessing steps related to dataset.
3. Understand and analyze various types of images and detect facial expressions using AI tools
4. Parse and classify various audio and text files
5. Deep understanding of detecting motion and gesture using machine learning

COURSE OUTCOMES:

At the end of the course the students will be able: -

1. Understand the underlying concepts of various machine learning techniques.
2. Understand various important features of swift and implement it for various machine learning concepts
3. To master the concept of creating, building, preprocessing dataset
4. To be familiar with contemporary technique of Image classification, face detection and audio file analysis.
5. To be able apply the machine learning concept in textual analysis and language parsing in the context of Swift
6. To be able to Understand and implement various motion and gesture technique using Swift

SYLLABUS

UNIT I. Fundamentals and Tools:

Artificial Intelligence: Why Swift? Why AI? What Is AI and What Can It Do?, Deep Learning versus AI?, Neural Networks ,Ethical, Effective, and Appropriate Use of AI, Practical AI Tasks, A Typical Task-Based Approach

Tools for Artificial Intelligence: Top Down, Great Tools for Great AI, Tools from Apple: CoreML, CreateML, Turi Create. Apple’s Other Frameworks,CoreML Community Tools, Tools from Others, Swift for TensorFlow, TensorFlow to CoreML Model Converter, Other Converters, AI-Adjacent Tools, Python

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UNIT II. Finding and Building a Dataset

Planning and Identifying Data to Target, Negation as Failure, Closed-World Assumptions, finding a Dataset: Where to Look, What to Look Out for. Building a Dataset, Data Recording, Data Collation, Data Scraping, preparing a Dataset, Getting to Know a Dataset, cleaning a Dataset, transforming a Dataset, Verifying the Suitability of a Dataset, Apple’s Models

UNIT III. Vision and Audio Image Classification:

What is Image Classification, Downloading Pre-existing Machine Learning Model, Integrating Model in iOS Unperforming and Displaying Image Classification, Displaying Classification Details, Training Model Using Pretelevision Framework, Implementing Vision Classifier, Implementing the Classify Function for Vision Classifier

Face Detection: Detecting Number of Faces in an Image, Highlighting Faces Using Face Detection, Recognizing Facial Landmarks Using Vision

Audio: Audio and Practical AI, Speech Recognition, Sound Classification, Downloading and Structuring the Dataset, Creating a Model, Training Sound Classification Using Create ML, Integrating Sound Classifier with iOS App, Sound Classification Using Turi Create.

UNIT IV. Text and Language Understanding

Machine Learning and AI in Text and Language, Language Identification, Named Entity Recognition, Language Identification Using NSLinguisticTagger, Lemmatization, Tagging, and Tokenization, Parts of Speech, Tokenizing a Sentence, Sentiment Analysis, Custom Text Classifiers, Text and Barcode: Implementing Text Detection, Implementing Barcode Detection

UNIT V. Motion and Gestures:

Activity Recognition, Gestural Classification for Drawing, Activity Classification, Using Augmented Reality with AI, Regressor Prediction, Using a Recommender.

TEXT BOOKS:

1. Mars Geldard, Jonathon Manning, Paris Buttfeld-Addison, Tim Nugent: Practical Artificial Intelligence with Swift, 2019 ,O'Reilly Media, Inc.
2. Oleksandr Sosnovshchenko , Oleksandr Baiev :Machine Learning with Swift: Artificial Intelligence for iOS, Packt Publishing 2018. Abhishek Mishra:Machine

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Learning for iOS Developers,Wiley 2020.

REFERENCE BOOKS:

1. Oleksandr Sosnovshchenko, Oleksandr Baiev: Machine Learning with Swift

LIST OF PRACTICALS:

Practical: Create programs, apps and projects based on following topics

Vision:

Face Detection
Barcode Detection
Saliency Detection
Image Classification
Image Similarity
Bitmap Drawing Classification

Audio:

Sound Classification
Speech Recognition

Text and Language:

Language Identification
Named Entity Recognition
Lemmatization, Tagging, Tokenization
Recommendations
Prediction
Text Generation

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BTCS707N	SEC	Technical presentation skill	0	0	0	0	50	0	0	2	1

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Course Educational Objectives (CEOs):

The student will have ability to:

1. To encourage the students to study advanced engineering developments.
2. To prepare and present technical reports.
3. To prepare technical material using audiovisual materials.
4. To encourage the students to use various teaching aids such as over head projectors, PowerPoint presentation and demonstrative models.

Course Outcomes (COs):

Upon completion of the subject, students will be able to:

1. Ability to review, prepare and present technological developments.
2. Ability to face the placement interviews.
3. Ability to effectively communicate technical material in print.
4. Ability to present technical material orally with confidence and poise.
5. Ability to present technical material using audiovisual materials.
6. Ability to communicate technical material to a variety of audiences, from members of the building and engineering trades and medical fields to government representatives and the general public.
7. Ability to work well in teams.

GUIDELINES:

During the Presentation Session each student is expected to prepare and present a topic on engineering/technology, for duration of about 15-20 minutes. Each student is expected to present at least twice during the semester and the student is evaluated based on that. At the end of the semester, he / she can submit a report on his / her topic of presentation and marks are given based on the report.

TEXT BOOKS:

1. The Chicago Manual of Style, 13th Edition, Prentice Hall of India 1989.
2. Gowers Ernest, "The Complete Plan in Words" Penguin, 1973.
3. Menzel D.H., Jones H.M, Boyd, LG., "Writing a Technical Paper". McGraw Hill, 1961.
4. Strunk, W., & White E.B., "The Elements of Style", 3rd Edition , McMillan, 1979.

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BTCS707N	SEC	Technical presentation skill	0	0	0	0	50	0	0	2	1

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REFERENCES:

1. Turbrian K.L., "A Manual for Writers of Term Papers, Thesis and dissertations" Univ of Chicago Press, 1973.
2. IEEE Transactions on "Written and Oral Communication" has many papers.

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BTCS705N	SEC	Industrial Training	0	0	0	0	50	0	0	2	1

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BTCS706N	SEC	Project	0	0	0	120	80	0	0	8	4

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Guideline and instruction for Project:-

S.No	Particular
1.	Group formation and Submission of Project Topic (At least three(03))
2.	Guide allotment and Topic Finalization
3.	Presentation – I Contents: 1. Problem Domain 2. Literature Survey 3. Feasibility Study 4. References
4.	Synopsis Submission
5.	Presentation – II Contents: 1. SRS / URD 2. Conceptual Design
6.	Presentation – III Contents: 1. Detail Design 2. Implementation & Test Plan
7.	Project Report Submission

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BTCS708N	DSE	Introduction to Data science	60	20	20	30	20	3	0	2	4

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Course Educational Objectives (CEOs):

The objective of this course is to impart necessary knowledge of the mathematical foundations needed for data science and develop programming skills required to build data science applications.

Course Outcomes (COs):

Upon completion of the subject, students will be able to:

1. Demonstrate understanding of the mathematical foundations needed for data science.
2. Collect, explore, clean, munge and manipulate data.
3. Implement models such as k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees, neural networks and clustering.
4. Build data science applications using Python based toolkits.

SYLLABUS

UNIT-I

Introduction to Data Science: Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting.

UNIT-II

Introduction to Programming Tools for Data Science: Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK, Visualizing Data: Bar Charts, Line Charts, Scatterplots, Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.

UNIT-III

Mathematical Foundations: Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Correlation and Causation, Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem, Hypothesis and Inference: Statistical Hypothesis Testing, Confidence Intervals, P-hacking, Bayesian Inference.

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			THEORY			PRACTICAL					
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BTCS708N	DSE	Introduction to Data science	60	20	20	30	20	3	0	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
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UNIT-IV

Machine Learning: Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression- model assumptions, regularization (lasso, ridge, elastic net), Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors, Analysis of Time Series- Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks-Learning And Generalization, Overview of Deep Learning.

UNIT-V

Case Studies of Data Science Application: Weather forecasting, Stock market prediction, Object recognition, Real Time Sentiment Analysis.

TEXT BOOKS:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media.
2. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media.
3. Jain V.K., "Data Sciences", Khanna Publishing House, Delhi.
4. Jain V.K., "Big Data and Hadoop", Khanna Publishing House, Delhi.
5. Jeeva Jose, "Machine Learning", Khanna Publishing House, Delhi.
6. Chopra Rajiv, "Machine Learning", Khanna Publishing House, Delhi.
7. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press
<http://www.deeplearningbook.org>
8. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, Morgan Kaufmann Publishers

LIST OF PRACTICALS:

1. Write a programme in Python to predict the class of the flower based on available attributes.
2. Write a programme in Python to predict if a loan will get approved or not.
3. Write a programme in Python to predict the traffic on a new mode of transport.
4. Write a programme in Python to predict the class of user.
5. Write a programme in Python to identify the tweets which are hate tweets and which are not.
6. Write a programme in Python to predict the age of the actors.
7. Mini project to predict the time taken to solve a problem given the current status of the user

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BTDSE710N	DSE	Object Oriented Analysis and Design	60	20	20	30	20	3	0	2	4

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COURSE OBJECTIVES:

1. To learn the concept of Object Oriented Software Development Process
2. To get acquainted with UML Diagrams
3. To understand Object Oriented Analysis Processes

COURSE OUTCOMES:

1. Understand Object Oriented Software Development Process
2. Gain exposure to Object Oriented Methodologies & UML Diagrams
3. To apply Object Oriented Analysis Processes for projects

SYLLABUS

UNIT-I

10 HOURS

Introduction: About Object Oriented Technology, Development and OO Modeling History. Modeling Concepts: Modeling design Technique, Three models, Class Model, State model and Interaction model.

UNIT-II

9 HOURS

Class Modeling: Object and class concepts, link and association, Generalization and Inheritance, Advanced class modeling- aggregation, Abstract class meta data, constraints. State Modeling: Event, state, Transition and conditions, state diagram, state diagram behavior, concurrency, Relation of Class and State models. Interaction Modeling: Use case Models, sequence models, activity models

UNIT-III

8 HOURS

Analysis and Design: Development Life cycle, Development stages, Domain Analysis- Domain class model, domain state model, domain interaction model, Iterating and analysis. Application Interaction model, Application class model, Application state Model, Adding operation.

UNIT-IV

7 HOURS

System Design: Estimating Performance, Making a reuse plan, breaking system into sub systems identifying concurrency, allocation of subsystems, management of data storage,

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BTDSE710N	DSE	Object Oriented Analysis and Design	60	20	20	30	20	3	0	2	4

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Handling Global resources, choosing a software control strategy, Handling boundary condition, common Architectural style.

UNIT–V

8 HOURS

Class design: Overview of class design, designing algorithms recursing downward, refactoring, design optimization, Adjustment of Inheritance, Rectification of Behavior.

LIST OF EXPERIMENTS

1. How to write a Problem Statement
2. Perform the system analysis: Requirement analysis, SRS.
3. Perform the function oriented diagram: DFD and Structured chart.
4. Perform the user’s view analysis: Use case diagram.
5. Draw the structural view diagram: Class diagram, object diagram.
6. Draw the behavioral view diagram: Sequence diagram, Collaboration diagram.
7. Draw the behavioral view diagram: State-chart diagram, Activity diagram.
9. Draw the implementation view diagram: Component diagram.
10. Draw the environmental view diagram: Deployment diagram.



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BTDSE711N	DSE	Soft Computing	60	20	20	30	20	3	0	2	4

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Course Educational Objectives (CEOs):

The student will have ability to:

1. Apply soft computing techniques to real word problems
2. Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic control and other machine intelligence applications of fuzzy logic.
3. Understand the fundamental theory and concepts of neural networks, neuro-modeling, several neural network paradigms and its applications.
4. Understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.
5. Apply hybrid techniques to improve efficiency of the algorithms.

Course Outcomes (COs):

Upon completion of the subject, students will be able to:

1. Design asystems using approaches of soft computing for solving various real-world problems.
2. Applythe rules of fuzzy logic forfuzzy control and Competent with issues related fuzzy systems.
3. Learn training, verification and validation of neural network models.
4. Design Engineering applications that can be optimized using genetic algorithms.
5. Design a robust and low-cost intelligent machines with knowledge of tolerance of imprecision and uncertainty.

SYLLABUS

UNIT-I

Introduction to Soft Computing, Historical Development, Definitions, advantages and disadvantages, solution of complex real life problems, Soft Computing and its Techniques, Soft Computing verses Hard Computing. Applications of Soft Computing in the Current industry.

UNIT-II

Introduction to Fuzzy Logic, Crisp Sets, Fuzzy Sets, Fuzzy Relations, Membership Functions

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BTDSE711N	DSE	Soft Computing	60	20	20	30	20	3	0	2	4

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and features, Fuzzification, Methods of Membership Value Assignments, Defuzzification and methods, Lambda cuts. Fuzzy Measure, Fuzzy Reasoning, Fuzzy Inference System.

UNIT–III

Neural Network (NN), Biological foundation of Neural Network, Neural Model and Network Architectures, Perceptron Learning, Supervised Hebbian Learning, Back-propagation, Associative Learning, Competitive Networks, Hopfield Network, Computing with Neural Nets and applications of Neural Network

UNIT–IV

Genetic Algorithm, Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.

UNIT–V

Neuro-Fuzzy and Soft Computing, Adaptive Neuro-Fuzzy Inference System Architecture, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN. Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum. Hybridization of other techniques

TEXT BOOKS:

1. S.N. Deepa and S.N. Sivanandam, Principles of Soft Computing, 2ed., Wiley, 2011
2. Vojislav Kecman, Learning and Soft Computing - Support Vector Machines, Neural Networks, and Fuzzy Logic Models, 1ed., The MIT Press, 2001.
3. D. K. Pratihari, Soft Computing, 1ed., Alpha Science, 2007.
4. Timothy J. Ross, Fuzzy logic with Engineering Applications, 3ed., John Wiley and Sons, 2010.
5. S. Rajasekaran and G.A.V. Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, 2ed. PHI

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BTDSE711N	DSE	Soft Computing	60	20	20	30	20	3	0	2	4

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***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

- David E. Goldberg, Genetic Algorithms in search, Optimization & Machine Learning, 1ed., Addison-Wesley Publishing Company, 1989

REFERENCES:

- Jang, Sun and Mizutani, Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence, 1ed., Pearson, 1997.
- George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, 1ed., Prentice Hall, 1995
- Simon Haykin, Neural Networks: A Comprehensive Foundation, 2ed. Prentice Hall, 1998
- Samir Roy and Udit Chakraborty, A Beginners Approach to Soft Computing, 1ed., Pearson, 2013.

List of Practicals:

- Implementation of Fuzzy Operations.
- Implementation of Fuzzy Relations (Max-min Composition)
- Implementation of Fuzzy Controller (Washing Machine)
- Implementation of Simple Neural Network (McCulloch-Pitts model)
- Implementation of Perceptron Learning Algorithm
- Implementation of Unsupervised Learning Algorithm
- Implementation of Simple Genetic Application
- Study of ANFIS Architecture
- Study of Derivative-free Optimization
- Study of research paper on Soft Computing.

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BTDSE715N	DSE	Quantum Computing	60	20	20	30	20	3	0	2	4

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Course Educational Objectives (CEOs):

The objective of this course is to impart necessary knowledge to the learner so that he/she can develop and implement algorithm and write programs using these algorithm.

Course Outcomes (COs):

Upon completion of the subject, students will be able to:

1. Explain the working of a Quantum Computing program, its architecture and program model
2. Develop quantum logic gate circuits
3. Develop quantum algorithm
4. Program quantum algorithm on major toolkits

SYLLABUS

UNIT-I

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

UNIT-II

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

UNIT-III

Building Blocks for Quantum Program: Architecture of a Quantum Computing platform, Details of q-bit system of information representation: Bloch Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from quantum algorithmic perspective e.g. Bell State, Operation on qubits: Measuring and transforming using gates, Quantum Logic gates and Circuit: Pauli, Hadamard, phase shift, controlled gates, Ising, Deutsch, swap etc, Programming model for a Quantum Computing Program: Steps performed on classical computer, Steps performed on Quantum Computer, Moving data between bits and qubits.

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BTDSE715N	DSE	Quantum Computing	60	20	20	30	20	3	0	2	4

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UNIT-IV

Quantum Algorithms: Basic techniques exploited by quantum algorithms, Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum Walks, Major Algorithms: Shor’s Algorithm, Grover’s Algorithm, Deutsch’s Algorithm, Deutsch -Jozsa Algorithm,

UNIT-V

OSS Toolkits for implementing Quantum program: IBM quantum experience, Microsoft Q, RigettiPyQuil (QPU/QVM)

TEXT BOOKS And REFERENCES:

1. Michael A. Nielsen, “Quantum Computation and Quantum Information”, Cambridge University Press.
2. David McMahon, “Quantum Computing Explained”, Wiley.
3. IBM Experience:
<https://quantumexperience.ng.bluemix.net>
4. Microsoft Quantum Development Kit
<https://www.microsoft.com/en-us/quantum/development-kit>
5. Forest SDK PyQuil:
<https://pyquil.readthedocs.io/en/stable/>.

List of Practicals:

1. Implementation of Qubits.
2. Visualization of Bloch Spherere.
3. Implementation of Shor’s Algorithm.
4. Implementation of Grover’s Algorithm.
5. Implementation of Deutsch’s Algorithm.
6. Implementation of Deutsch -Jozsa Algorithm.