SEMESTER-VII (2019-2023)

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	BS	Human Values and Professional Ethics	60	20	20	--	--	4	0	0	4

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Course Objectives
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
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 Behavior and Systems
2. Characteristics of Moral Standards
3. Values Vs Ethics Vs Morality
4. Impression Formation and Management

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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

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

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8. Naagrajan, R.R (2016). *Professional Ethics and Human Values*. New Age International Publications:New Delhi.

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BTCS601	DCC	Compiler Design	60	20	20	30	20	3	1	2	5

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Course Objectives:
- To introduce the major concept areas of language translation and compiler design
- To enrich the knowledge in various phases of compiler and its use
- To provide understanding of steps of programming necessary for constructing a compiler

Course Outcomes:

- Ability to apply the knowledge of lex tool &yacc tool to develop a scanner & parser
- Ability to design and develop software system for backend of the compiler
- Ability to comprehend and adapt to new tools and technologies in compiler design

Syllabus

Unit – I:
Introduction: Compiler**,** Compilers analysis of the source program**,** Phases of a compiler**,** Cousins of the Compiler, Grouping of Phases and Compiler construction tools, Lexical Analysis, Role of Lexical Analyzer, Input Buffering and Specification of Tokens.

Unit – II:
Syntax Analysis: Role of the parser, Writing Grammars, Context-Free Grammars, Top Down parsing, Recursive Descent Parsing, Predictive Parsing, Bottom-up parsing, Shift Reduce Parsing, Operator Precedent Parsing, LR Parsers, SLR Parser – Canonical LR Parser – LALR Parser.

Unit – III:
Intermediate Code Generation: Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate languages**,** Declarations, Assignment Statements, Boolean Expressions, Case Statements, Three Address code, Back patching, Procedure calls.

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Unit – IV:

Code Optimization and Run Time Environments: Introduction, Principal Sources of Optimization, Optimization of basic Blocks, DAG representation of Basic Blocks - Introduction to Global Data Flow Analysis, Runtime Environments, Source Language issues, Storage Organization, Storage Allocation strategies, Access to non-local names, Parameter Passing, Error detection and recovery.

Unit – V:

Code Generation: Issues in the design of code generator, The target machine, Runtime Storage management, Basic Blocks and Flow Graphs, Next-use Information, A simple Code generator, Peephole Optimization.

Text Books:
1. Alfred V. Aho, Jeffrey D Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education Asia, 2012
2. Jean Paul Tremblay, Paul G Serenson, "The Theory and Practice of Compiler Writing", BS Publications, 2005
3. Dhamdhere, D. M., "Compiler Construction Principles and Practice", 2nd edition, Macmillan India Ltd., New Delhi, 2008

References:
1. Allen I. Holub, "Compiler Design in C", Prentice Hall of India, 2003
2. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings, 2003
3. HenkAlblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001
4. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning, 2003

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List of Experiments:

1. To study the Lex Tool.
2. To study the Yacc Tool.
3. Write a program to implement Lexical Analyzer to recognize few patterns of C.
4. Write a program to implement the Recursive Descent Parser.
5. Write a program to implement the Computation of FIRST and FOLLOW of variables of grammar.
6. Write a program to compute the leading and trailing symbols of grammar.
7. Write a program to implement Operator Precedence Parser.
8. Write a program to implement SLR parser.
9. Write a program to check the data types.
10. Write a program to implement the generation of three address code.
11. Write a program to implement the computation of postfix notation.
12. Write a program to implement the computation of Quadruple.

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BTMACS 701	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

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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

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.

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BTMACS 701	DCC	**Machine Learning and Artificial Intelligence Using Swift**	60	20	20	30	20	3	0	2	4

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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 Buttfield-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 Learning for iOS Developers,Wiley 2020.

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

LIST OF PRACTICAL:
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

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BTMACS 701	DCC	Machine Learning and Artificial Intelligence Using Swift	60	20	20	30	20	3	0	2	4

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

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BTCS702	DCC	Big Data and Hadoop	60	20	20	30	20	3	0	2	4

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Course Objectives:
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:
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 datavalue for the enterprise , Setting up the demo environment ,Describe Hadoop Architecture , HadoopDistributed File System, MapReduce& HDFS , First steps with the Hadoop , Deep to understand thefundamental of MapReduce

UNIT II -
Hadoop ecosystem, Installing Hadoop Eco System and Integrate With Hive Installation, PigInstallation,Hadoop , Zookeeper Installation , Hbase Installation , , Sqoop Installation, Installing

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BTCS702	DCC	**Big Data and Hadoop**	60	20	20	30	20	3	0	2	4

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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, 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 AlgorithmsBig 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

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BTCS702	DCC	**Big Data and Hadoop**	60	20	20	30	20	3	0	2	4

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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.

List of Practical's:
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

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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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BTCS710	DSE	Introduction to Object Oriented Analysis and Design	60	20	20	0	0	2	1	0	3

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

UNIT–II
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

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UNIT–III
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
System Design: Estimating Performance, Making a reuse plan, breaking system into sub systems identifying concurrency, allocation of subsystems, management of data storage, Handling Global resources, choosing a software control strategy, Handling boundary condition, common Architectural style.

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

TEXT BOOKS:
1. Michael Blaha and J. Rumbugh, "Object oriented Modeling and design with UML", Pearson Education

REFERENCES:
1. Satzinger, Jackson and Burd, "Object oriented Analysis and design with the Unified Process", CENGAGE Learning.
2. O'Docherty, "Object Oriented Analysis and Design Understanding, System Development with UML2.0", Wiley India.

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| | | | THEORY | | | PRACTICAL | | | | | |
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS710	DSE	Introduction to Object Oriented Analysis and Design	60	20	20	0	0	2	1	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 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*				
BTCS711	DSE	Soft Computing	60	20	20	0	0	2	1	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 OBJECTIVES
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
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.

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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*				
BTCS711	DSE	Soft Computing	60	20	20	0	0	2	1	0	3

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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 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 Netsand 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 thatCross-fertilize ANFIS and RBFN. Coactive Neuro

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*				
BTCS711	DSE	Soft Computing	60	20	20	0	0	2	1	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical;   **C** - Credit;
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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. Pratihar, 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
6. David E. Goldberg, Genetic Algorithms in search, Optimization & Machine Learning, 1ed., Addison-Wesley Publishing Company, 1989

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

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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*				
BTCS711	DSE	Soft Computing	60	20	20	0	0	2	1	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 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*				
BTCS715	DSE	Quantum Computing	60	20	20	0	0	2	1	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 OBJECTIVES

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

COURSE OUTCOMES

Upon completion of the subject, students will be able to:
1. Explain the working of a Quantum Computing program, its architecture and programmodel
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 playersin 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 Sphererepresentation, Quantum Superposition, Quantum Entanglement.

UNIT–II

Math Foundation for Quantum Computing: Matrix Algebra: basis vectors and orthogonality, innerproduct and Hilbert spaces, matricesand 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 ofq-bit system of information representation:Block Sphere, Multi-qubits States, Quantum superpositionof

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME									
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS715	DSE	**Quantum Computing**	60	20	20	0	0	2	1	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.

qubits (valid and invalid superposition),Quantum Entanglement, Useful states from quantum algorithmic perceptive e.g. Bell State, Operation on qubits: Measuring and transforming using gates, Quantum Logic gates and Circuit: Pauli, Hadamard, phase shift, controlledgates, Ising, Deutsch, swapetc, Programming model for a Quantum Computing Program: Steps performed on classical computer, Steps performed on Quantum Computer, Moving data between bits and qubits.

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 & REFERENCES:
1. Michael A. Nielsen, "Quantum Computation and Quantum Information", CambridgeUniversity 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/

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*				
BTCS716	DSE	Virtual Reality	60	20	20	0	0	2	1	0	3

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COURSE OBJECTIVES
The objective of this course is to provide a detailed understanding of the concepts of Virtual Realityand its applications.

COURSE OUTCOMES
Upon completion of the subject, students will be able to:
1. Understand geometric modelling and Virtual environment.
2. Study about Virtual Hardware and Software
3. Develop Virtual Reality applications.

SYLLABUS

UNIT–I
Introduction to Virtual Reality: Virtual Reality and Virtual Environment: Introduction, Computergraphics, Real time computergraphics, Flight Simulation, Virtual environment requirement, benefits ofvirtual reality,Historical development of VR, Scientific Landmark.
3D Computer Graphics: Introduction, The Virtual world space, positioning the virtual observer,the perspective projection, human vision, stereo perspective projection, 3D clipping, Colourtheory, Simple 3D modelling, Illumination models, Reflection models, Shading algorithms,Radiosity, Hidden Surface Removal, Realism-Stereographic image.

UNIT–II
Geometric Modelling: Geometric Modelling: Introduction, From 2D to 3D, 3D space curves, 3Dboundary representation.
Geometrical Transformations: Introduction, Frames of reference, Modelling transformations,Instances, Picking, Flying, Scaling the VE, Collision detection.

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| 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*				
BTCS716	DSE	Virtual Reality	60	20	20	0	0	2	1	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical;   **C** - Credit;
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Generic VR system: Introduction, Virtual environment, Computer environment, VR technology,Model of interaction, VR Systems.

UNIT–III
Virtual Environment: Animating the Virtual Environment: Introduction, The dynamics of numbers,Linear and Nonlinearinterpolation, the animation of objects, linear and non-linear translation, shape & objectinbetweening, free from deformation, particle system.
Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elasticcollisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

UNIT–IV
VR Hardware and Software: Human factors: Introduction, the eye, the ear, the somatic senses.
VR Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware,Integrated VR systems.
VR Software: Introduction, Modelling virtual world, Physical simulation, VR toolkits,Introduction to VRML

UNIT–V
VR Applications: Introduction, Engineering, Entertainment, Science, Training.
The Future: Virtual environment, modes of interaction

TEXT BOOKS & REFERENCES:
1. John Vince, "Virtual Reality Systems ", Pearson Education Asia, 2007.
2. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.
3. Adams, "Visualizations of Virtual Reality", Tata McGraw Hill, 2000.
4. Grigore C. Burdea, Philippe Coiffet , "Virtual Reality Technology", Wiley Inter Science,2nd Edition, 2006.

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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*				
BTCS716	DSE	Virtual Reality	60	20	20	0	0	2	1	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.

5. William R. Sherman, Alan B. Craig, "Understanding Virtual Reality: Interface,Application and Design", Morgan Kaufmann, 2008.
6. www.vresources.org
7. www.vrac.iastate.edu
8. www.w3.org/MarkUp/VRM

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS705	AECC	Industrial Training	0	0	0	0	50	0	0	2	1

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***Detailed guidelines are available on university website.

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*				
BTCS705	AECC	Industrial Training	0	0	0	0	50	0	0	2	1

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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.

| 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*				
BTCS706	PW/I	Project	0	0	0	120	80	0	0	8	4

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