



SEMESTER - VII

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 ^{4*}	END SEM University Exam Teachers Assessment ^{4*}					
BBAI501	UG	Human Values and Professional Ethics	60	20	20	0	0	4	0	0	4

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

***Teacher Assessment** shall be based on following components: Quiz/Assignment/ Project/Participation in Class,

given that no component shall exceed more than 10 marks.

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 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).



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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**. Athlone Press: 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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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam Teachers Assessment	END SEM University Exam Teachers Assessment ^{4*}						
BTCS601	UG	Compiler Design	60	20	20	30	20	3	1	2	5

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

***Teacher Assessment** shall be based on following components: Quiz/Assignment/ Project/Participation in Class,

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Course Objectives:

1. To introduce the major concept areas of language translation and compiler design
2. To enrich the knowledge in various phases of compiler and its use
3. To provide understanding of steps of programming necessary for constructing a compiler

Course Outcomes:

1. Ability to apply the knowledge of lex tool & yacc tool to develop a scanner & parser
2. Ability to design and develop software system for backend of the compiler
3. 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.

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



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Storagemanagement, 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. Dhamdhare, 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. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001
4. Kenneth C. Loudon, "Compiler Construction: Principles and Practice", Thompson Learning, 2003

List of Practical's:

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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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment	END SEM University Exam	Teachers Assessment				
BTCS503	UG	Computer Graphics & Multimedia	60	20	20	30	20	3	0	2	4

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. Understood basic concepts of computer graphics.
2. Acquire knowledge about drawing basic shapes such as lines, circle ellipse, polygon.
3. Shall be able to perform processing of basic shapes by various processing algorithms /techniques.
4. Acquire knowledge about two and three dimensional transformations.
5. Shall be able to apply the transformation algorithms to the basic shapes.
6. Shall be able to perform Multimedia Operation.

COURSE OUTCOMES:

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

1. Understood basic concepts of computer graphics
2. Acquire knowledge about drawing basic shapes such as lines, circle ellipse, polygon and shall be able to perform processing of basic shapes by various processing algorithms /techniques.
3. Acquire knowledge about two and three dimensional transformations and shall be able to apply the transformation algorithms to the basic shapes.
4. Shall have the basic knowledge of windowing and clipping and shall be able to apply various algorithms of clipping.
5. Acquire knowledge about Visible Surface Detection methods, Illumination Models and Surface Rendering
6. Acquire knowledge to apply advanced techniques such as fractals, introduction to open GL and Multimedia Systems.

UNIT I

Introduction to Computer Graphics:- What is Computer Graphics?, Where Computer Generated pictures are used, Elements of Pictures created in Computer Graphics Graphics display devices,Graphics input primitives and Devices.**Introduction to OpenGL:-** Getting started Making pictures, Drawing basic primitivesSimple interaction with mouse and keyboard

UNIT II

Points and Lines, Antialiasing**Line Drawing Algorithm:-**DDA line drawing algorithm, parallel drawing algorithmBresenham's drawing algorithm with example.

Circle and Ellipse generating algorithms:-Mid-point Circle algorithm with example

Mid-point Ellipse algorithmMid-point Ellipse algorithm with example **Parametric Cubic Curves:-** Bezier curvesB-Spline curves **Filled Area Primitives:-**Scan line polygon fill algorithm, Pattern fill algorithm Inside-Outside Tests, Boundary fill algorithms, Flood fill algorithms



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UNIT III

2D Geometric Transformations

Basic transformation, Matrix representation and Homogeneous Coordinates Composite transformation Other transformations. Transformation between coordinated systems. Window to Viewport coordinate transformation,

Clipping operations – Point clipping, Line clipping:-Cohen – Sutherland line clipping Liang – Barsky line clipping Midpoint subdivision

Polygon Clipping-Sutherland – Hodgeman polygon clipping Weiler – Atherton polygon clipping. 3D object representation methods B-REP, sweep representations, CSG

Basic transformations-Translation, Rotation, Scaling

Other transformations-Reflection, Rotation about an arbitrary axis Composite transformations Projections – Parallel and Perspective 3D clipping

UNIT IV

3D Geometric Transformations and 3D Viewing Classification of Visible Surface Detection algorithm:- Translation, Rotation, Scaling

Other transformations:- Reflection, Rotation about an arbitrary axis Composite transformations Projections, Back Surface detection method Depth Buffer method Scan line method BSP tree method, Area Subdivision method.

UNIT V

Multimedia System: An Introduction, Multimedia hardware, Multimedia System Architecture. Data & File Format standards. i.e RTF, TIFF, MIDI, JPEG, DIB, MPEG, Audio: digital audio, MIDI, processing sound, sampling, compression. Video: Avi, 3GP, MOV, MPEG, compression standards, compression through spatial and temporal redundancy. Multimedia Authoring.

TEXT BOOKS:

1. Sinha and Udai, "Computer Graphics", Tata McGraw Hill
2. Parekh "Principles of Multimedia" Tata McGraw Hill
3. Prabhat k Andleigh, Kiran Thakral, "Multimedia System Design" PHI Pub.
4. Donald Hearn and M.P. Becker "Computer Graphics" Pearson Pub.

REFERENCES:

1. Computer Graphics, C Version, 2e Paperback – 2002
2. Foley, Vandam, Feiner, Huges, "Computer Graphics: Principles & Practice", Pearson Education, second edition 2003.
3. Judith Jeffcoate, "Multimedia in practice technology and Applications", PHI, 1998.
4. David F Rogers, "Procedural elements for Computer Graphics", Tata McGraw Hill, Second Edition.
5. Foley, VanDam, Feiner and Hughes, "Computer Graphics Principles & Practice in C", Second edition, Pearson Education.
6. David Hillmaa, "Multimedia Technology & Applications, Delmar, 1998.

List of Practical's:

1. Implement DDA Line Drawing algorithm
2. Implement Bresenham's line drawing algorithm.
3. Implement Mid-Point circle drawing algorithm.
4. Implement Mid-Point ellipse drawing algorithm.
5. Implement cubic Bezier curve.
6. Implement a menu-driven program for 2D transformations.
7. Implement Line clipping algorithm using Cohen-Sutherland.



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8. Implement Polygon Clipping using Sutherland Hodgeman.
9. Implement Scan line fill algorithm.
10. Study of Multimedia and Program for Flash.

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			THEORY			PRACTICAL			Th	T	P	CREDITS
			END SEM University	Two Term Exams Teachers Assessment	END SEM University Exams Teachers Assessment	+	+	+				
BTIT604	UG	Object Oriented Analysis and Design	60	20	20	30	20	2	0	2	3	

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

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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 Oriented 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

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.



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TEXT BOOKS:

1. Michael Blaha and J. Rumbaugh, “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
2. Learning.
3. O’Docherty, “Object Oriented Analysis and Design Understanding, System Development with UML2.0”, Wiley India.

List of Practical’s:

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.
8. Draw the implementation view diagram: Component diagram.
9. Draw the environmental view diagram: Deployment diagram.

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			END SEM University Exam	Two Term Exam Teachers Assessment	END SEM University Exam Teachers Assessment	END SEM University Exam Teachers Assessment					
BTCC703	UG	Next Generation Telecommunication Networks	60	20	20	0	0	2	1	0	3

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COURSE OBJECTIVES

The student will have ability to:

1. Understand the importance of QoS and resource management in next generation wireless networks. 2. Describe and compare the network and protocol architectures of GPRS and EDGE and the two
2. principle 3G cellular based wireless standards: UMTS and cdma2000.
3. List and provide a high-level discussion on the key enabling technologies for next generation wireless networks.
4. Identify the relationship between WiFi, WiMAX, and 3G cellular-based wireless networks. In addition, the student will be able to outline and discuss the potential impact of these technologies upon wireless network evolution.

COURSE OUTCOMES

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

1. Understand and explain the drivers of service conversion.
2. Define the term “Next Generation Network” and outline it’s main characteristics.
3. Outline the main architectural elements of a Next Generation Network and explain the logic behind it.
4. Understand the concept of Voice over IP (VoIP) and explain how full featured telephony can be provisioned over an IP network.
5. Understand the portfolio of broadband access mechanisms in a fixed network and be able to explain the relative merits of each type.
6. Understand the principles of connection-orientated and connectionless packet switching and the protocols available to enable such networks.
7. understand the principles of mobile networks and they relate to NGN.

SYLLABUS

UNIT-I

Basic history of Mobile Computing Architecture for mobile computing, Three tier architecture, design considerations for mobile computing, mobile computing through internet, Wireless network architecture, Applications, Security, Concerns and Standards, Benefits, Future. Evolution of mobile computing.



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UNIT-II

Next Generation Networks (NGN), Principles and definition of an NGN, The NGN architecture, Outline of technology choices, Network and implementation issues with NGN, Numbering & Addressing

UNIT-III

Wireless n/w. and Technologies Introduction, Different generations. Introduction to 1G, 2G, 3G and 4G, Bluetooth, Radio frequency identification (Rfid), Wireless Broadband, Mobile IP: Introduction, Advertisement, Registration, TCP connections, two level addressing, abstract mobility management model, performance issue, routing in mobile host, Adhoc networks, Mobile transport layer: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, transaction oriented TCP. ,IPv6

UNIT-IV

Next Generation Core Network The role of the core network, Enabling Control and Reconfigurability, Packet Switching (ATM, IP, MPLS, Ethernet), IP Multi-Media System (IMS), Principles of control for IP networks, Concept of IMS

UNIT-V

NGN Service Aspects Services on an NGN, Service compatibility with PSTN and IN, Use of APIs and service provider interfaces, Brief review of the principles of mobile networks, Relationship of mobile developments to NGN

TEXT BOOKS

1. VALDAR, A R: 'Understanding Telecommunications Networks', IET Telecommunications Series 52, 2006
2. Convergence Technologies for 3G Networks: IP, UMTS, EGPRS and ATM Authors: Jeffrey Bannister, Paul Mather, and Sebastian Coope. . John Wiley & Sons, Ltd. ISBN 0-470-86091-X (HB)
3. Mobile Computing , Asoke K Telukder, Roopa R Yavagal, TMH
4. Wireless Communications and Networks, 3G and beyond, ITI Saha Misra, TMH

REFERENCES

1. M Carugi "Introduction to the ITU-T NGN focus group release 1: target environment, services, and capabilities," Communications Magazine, IEEE, vol.43, no.10, pp. 42- 48, Oct. 2005
2. Chae-Sub Lee, Knight, D. , "Realization of the next-generation network," Communications Magazine, IEEE, vol.43, no.10, pp. 34- 41, Oct. 2005.



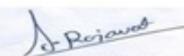
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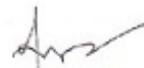
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			THEORY			PRACTICAL		L	T	P	CREDITS
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BTCS706	UG	Project	-	-	-	120	80	-	-	8	4

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


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			THEORY			PRACTICAL		L	T	P	CREDITS
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BTCS711	UG	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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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 (04-05)

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



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

REFERENCES:

1. Jang, Sun and Mizutani, 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 Udit Chakraborty, A Beginners Approach to Soft Computing, 1ed., Pearson, 2013



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BTCS715	UG	Quantum Computing	60	20	20	0	0	2	1	0	3

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COURSE OBJECTIVES

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

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 representation, 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.

UNIT-IV

Quantum Algorithms: Basic techniques exploited by quantum algorithms, Amplitude amplification,



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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, Rigetti PyQuil (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/>



SEMESTER - VII

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 ^{4*}						
BTCS716	UG	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.

COURSE OBJECTIVES

The objective of this course is to provide a detailed understanding of the concepts of Virtual Reality and 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, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual 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, Colour theory, 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, 3D boundary representation.

Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection.

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 Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object inbetweening, free from deformation, particle system.

Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic



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collisions, 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 AND 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.
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