



**Shri Vaishnav Vidyapeeth Vishwavidyalaya  
Shri Vaishnav Institute Of Information Technology**

**B.Tech (CSE with specialization in Enterprise System in association with RedHat)**

**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*				
<b>BBAI501</b>	<b>AECC</b>	<b>Human Values and Professional Ethics</b>	<b>60</b>	<b>20</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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).

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BBAI501	AECC	<b>Human Values and Professional Ethics</b>	60	20	20	0	0	3	0	0	3

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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*. 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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<b>BTCS702N</b>	<b>DCC</b>	Big Data and Hadoop	<b>60</b>	<b>20</b>	<b>20</b>	<b>30</b>	<b>20</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

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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.

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**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 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

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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 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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BTCS504N	DCC	<b>Internet Of Things</b>	60	20	20	30	20	3	0	2	4

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**COURSE OBJECTIVES**

The objective of this course is to impart necessary and practical knowledge of components of Internet of Things and develop skills required to build real-life IoT based projects.

**COURSE OUTCOMES**

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

1. Understand internet of Things and its hardware and software components
2. Interface I/O devices, sensors & communication modules
3. Remotely monitor data and control devices
4. Develop real life IoT based projects

**SYLLABUS:**

**UNIT-I**

**10 HOURS**

**Introduction to IoT:** Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service (XaaS), Role of Cloud in IoT, Security aspects in IoT.

**UNIT-II**

**9 HOURS**

**Elements of IoT:** Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python/Node.js/Arduino) for Communication. Protocols- MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

**UNIT-III**

**8 HOURS**

**IoT Application Development:** Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration.

**UNIT-IV**

**7 HOURS**

**Device data storage:** Unstructured data storage on cloud/local server, Authentication, authorization of devices.

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<b>BTCS504N</b>	DCC	<b>Internet Of Things</b>	<b>60</b>	<b>20</b>	<b>20</b>	<b>30</b>	<b>20</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

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**UNIT-V**

**8 HOURS**

**IoT Case Studies:**IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation

**TEXT BOOKS:**

- Vijay Madiseti, ArshdeepBahga, Internet of Things, “A Hands on Approach”, UniversityPress.
- Dr. SRN Reddy, RachitThukral and Manasi Mishra, “Introduction to Internet of Things: A practical Approach”, ETI Labs.
- Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, CRC Press
- Jeeva Jose, “Internet of Things”, Khanna Publishing House, Delhi.
- Adrian McEwen, “Designing the Internet of Things”, Wiley.
- Raj Kamal, “Internet of Things: Architecture and Design”, McGraw Hill.
- Cuno Pfister, “Getting Started with the Internet of Things”, O Reilly Media.

**LIST OF PRACTICALS:**

- Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
- To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
- To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
- To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
- To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
- To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.
- To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
- To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when ‘1’/‘0’ is received from smartphone using Bluetooth.
- Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud.
- Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.
- To install MySQL database on Raspberry Pi and perform basic SQL queries.
- Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.
- Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it.
- Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.
- Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.

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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.

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

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**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.

**REFERENCES:**

1. Turbian 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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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 machine 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

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Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth	Vishwavidyalaya,Indore	Vishwavidyalaya,Indore
Vishwavidyalaya,Indore	Vishwavidyalaya,Indore		



**Shri Vaishnav Vidyapeeth Vishwavidyalaya  
Shri Vaishnav Institute Of Information Technology**

**B.Tech (CSE with specialization in Enterprise System in association with RedHat)**

**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*				
BTDSE711N	DSE	Soft Computing	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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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
6. David E. Goldberg, Genetic Algorithms in search, Optimization & Machine Learning, 1ed., Addison-Wesley Publishing Company, 1989

**REFERENCES:**

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**Shri Vaishnav Vidyapeeth Vishwavidyalaya  
Shri Vaishnav Institute Of Information Technology**

**B.Tech (CSE with specialization in Enterprise System in association with RedHat)**

**Choice Based Credit System (CBCS)-2021-25**

**SEMESTER-VII**

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
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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.

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.

**List of Practicals:**

1. Implementation of Fuzzy Operations.
2. Implementation of Fuzzy Relations (Max-min Composition)
3. Implementation of Fuzzy Controller (Washing Machine)
4. Implementation of Simple Neural Network (McCulloch-Pitts model)
5. Implementation of Perceptron Learning Algorithm
6. Implementation of Unsupervised Learning Algorithm
7. Implementation of Simple Genetic Application
8. Study of ANFIS Architecture
9. Study of Derivative-free Optimization
10. Study of research paper on Soft Computing.

Chairperson  
Board of Studies  
Shri Vaishnav Vidyapeeth  
Vishwavidyalaya, Indore

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Shri Vaishnav Vidyapeeth  
Vishwavidyalaya, Indore

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Vishwavidyalaya, Indore



**Shri Vaishnav Vidyapeeth Vishwavidyalaya  
Shri Vaishnav Institute Of Information Technology**

**B.Tech (CSE with specialization in Enterprise System in association with RedHat)**

**Choice Based Credit System (CBCS)-2021-25**

**SEMESTER-VII**

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
<b>BTDSE715N</b>	<b>DSE</b>	<b>Quantum Computing</b>	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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**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.

**UNIT-IV**

Chairperson	Chairperson	Controller of Examination	Joint Registrar
Board of Studies	Faculty of Studies	Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth
Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth	Vishwavidyalaya, Indore	Vishwavidyalaya, Indore
Vishwavidyalaya, Indore	Vishwavidyalaya, Indore		



**Shri Vaishnav Vidyapeeth Vishwavidyalaya**  
**Shri Vaishnav Institute Of Information Technology**  
**B.Tech (CSE with specialization in Enterprise System in association with RedHat)**  
**Choice Based Credit System (CBCS)-2021-25**  
**SEMESTER-VII**

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
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BTDSE715N	DSE	<b>Quantum Computing</b>	60	20	20	30	20	3	0	2	4

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**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 Sphere.
3. Implementation of Shor’s Algorithm.
4. Implementation of Grover’s Algorithm.
5. Implementation of Deutsch’s Algorithm.
6. Implementation of Deutsch -Jozsa Algorithm.

Chairperson  
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Vishwavidyalaya, Indore

Chairperson  
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Vishwavidyalaya, Indore

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Vishwavidyalaya, Indore

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Vishwavidyalaya, Indore





Shri Vaishnav Vidyapeeth Vishwavidyalaya  
Shri Vaishnav Institute Of Information Technology

B.Tech (CSE with specialization in Enterprise System in association with RedHat)

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*				
BTDSE716N	DSE	Virtual Reality	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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**Course Educational Objectives (CEOs):**

The objective of this course is to provide a detailed understanding of the concepts of Virtual Reality and its applications.

**Course Outcomes (COs):**

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 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 in between, free from deformation, particle system.

Chairperson  
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Vishwavidyalaya, Indore

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Faculty of Studies  
Shri Vaishnav Vidyapeeth  
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Shri Vaishnav Vidyapeeth  
Vishwavidyalaya, Indore

Joint Registrar  
Shri Vaishnav Vidyapeeth  
Vishwavidyalaya, Indore



**Shri Vaishnav Vidyapeeth Vishwavidyalaya  
Shri Vaishnav Institute Of Information Technology**

**B.Tech (CSE with specialization in Enterprise System in association with RedHat)**

**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*				
BTDSE716N	DSE	<b>Virtual Reality</b>	60	20	20	30	20	3	0	2	4

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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 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](http://www.w3.org/MarkUp/VRM).

**List of Practicals:**

1. Study of tools like Unity, Maya, 3DS MAX, AR toolkit, Vuforia and Blender.
2. Use the primitive objects and apply various projection types by handling camera.
3. Download objects from asset store and apply various lighting and shading effects.
4. Model three dimensional objects using various modelling techniques and apply textures over them.
5. Create three dimensional realistic scenes and develop simple virtual reality enabled mobile applications which have limited interactivity.
6. Add audio and text special effects to the developed application.

Chairperson	Chairperson	Controller of Examination	Joint Registrar
Board of Studies	Faculty of Studies	Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth
Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth	Vishwavidyalaya, Indore	Vishwavidyalaya, Indore
Vishwavidyalaya, Indore	Vishwavidyalaya, Indore		



**Shri Vaishnav Vidyapeeth Vishwavidyalaya**  
**Shri Vaishnav Institute Of Information Technology**  
**B.Tech (CSE with specialization in Enterprise System in association with RedHat)**  
**Choice Based Credit System (CBCS)-2021-25**  
**SEMESTER-VII**

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
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<b>BTDSE716N</b>	<b>DSE</b>	<b>Virtual Reality</b>	60	20	20	30	20	3	0	2	4

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7. Develop VR enabled applications using motion trackers and sensors incorporating fullhaptic interactivity.
8. Develop AR enabled applications with interactivity like E learning environment, Virtualwalkthroughs and visualization of historic places.
9. Develop AR enabled simple applications like human anatomy visualization, DNA/RNAstructure visualization and surgery simulation.
10. Develop simple MR enabled gaming applications.

Chairperson  
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Shri Vaishnav Vidyapeeth  
Vishwavidyalaya,Indore

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Faculty of Studies  
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Vishwavidyalaya,Indore

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Shri Vaishnav Vidyapeeth  
Vishwavidyalaya,Indore

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