

B.Tech.(CSE-Big Data Analytics/Cloud and Mobile Computing-IBM)

Choice Based Credit System (CBCS) 2017-18

SEMESTER VII

							TEAC THE	CHING & ORY	EVALUAT P	ALUATION SCHEME PRACTICAL		
COURSE CODE	CATEGORY	CO URSE NAME	L	Т	Р	CREDITS	END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	
BTCS601	UG	Compiler Design	3	1	2	5	60	20	20	30	20	

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:

- 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 practical programming skills 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 to Compiling: 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, Specification of Tokens.

UNIT II

Syntax Analysis: Role of the parser, Writing Grammars, Context-Free Grammars, Top Downparsing, 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:Intermediate languages, Declarations, Assignment Statements, Boolean Expressions, Case Statements, 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 Storage management, Basic Blocks and Flow Graphs, Next-use Information, A simple Code generator, Peephole Optimization.

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Text Books:

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

Reference Books:

- 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

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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COURSE CODE	CATEGORY	CO URSE NAME	L	Т	Р	CREDITS	END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BBAI501	UG	Human Values and Professional Ethics	4	0	0	4	60	20	20	0	0

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 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.

Syllabus:

Unit I: Human Value

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

Unit II: Morality

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

Unit III: Leadership in Indian Ethical Perspective.

1. Leadership, Characteristics

2. Leadership in Business (Styles), Types of Leadership (Scriptural, Political, Business and Charismatic)

3. Leadership Behaviour, Leadership Transformation in terms of Shastras (Upanihads, Smritis and Manu-smriti).

Unit IV: Human Behavior – Indian Thoughts

1. Business Ethics its meaning and definition

2. Types, Objectives, Sources, Relevance in Business organisations.

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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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COURSE CODE	C ATEGO RY	CO URSE NAME	L	Т	Р	CREDITS	END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	
BTCS511	UG	Artificial Intelligence	3	1	2	5	60	20	20	30	20	

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. Know how to build simple knowledge-based systems.
- 2. Know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms).
- 3. Ability to apply knowledge representation, reasoning, and machine learning techniques to realworld problems.
- 4. An ability to use current techniques, skills, and tools necessary for computing practice

Course Outcomes:

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

- 1. Describe the key components of the artificial intelligence (AI) field and its relation and role in Computer Science;
- 2. Identify and describe artificial intelligence techniques, including search heuristics, knowledgerepresentation, automated planning and agent systems, machine learning, and probabilistic reasoning;
- 3. Identify and apply AI techniques to a wide range of problems, including complex problem solving via search, knowledge-base systems, machine learning, probabilistic models, agent decision making, etc.;
- 4. Design and implement appropriate AI solution techniques for such problems;
- 5. Analyze and understand the computational trade-offs involved in applying different AI techniques and models.
- 6. Communicate clearly and effectively using the technical language of the field correctly.

Syllabus:

UNIT-I Introduction To Al And Production Systems:

Introduction to AI-Problem formulation, Problem Definition Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics – Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions –Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms.

UNIT-IIREPRESENTATION OF KNOWLEDGE

Knowledge Representation Issues: Representations and Mappings, Approaches to Knowledge

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Representation. Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation ofknowledge.

UNIT-III KNOWLEDGE INFERENCE

Knowledge Inference -Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory- Bayesian Network-Dempster - Shafer theory.

UNIT IV PLANNING AND MACHINE LEARNING

Basic plan generation systems - Strips - Advanced plan generation systems – K strips - Strategic explanations - Why, Why not and how explanations. Learning- Machine learning, adaptive Learning. **Game Playing:** Overview, And Example Domain : Overview, Mini-Max, Alpha-Beta Cut-off, Refinements, Iterative deepening, The Blocks World, Components Of A Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques.

UNIT-V EXPERT SYSTEMS

Expert Systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XOON, Expert systems shells.

TEXT BOOKS:

- 1. Rich E and Knight K, Artificial Intelligence, TMH New Delhi.
- 2. Nelsson N.J., Principles of Artificial Intelligence, Springer Verlag, Berlin.
- 3. Kos Ko B, Neural Networks and Fuzzy system -PHI.

REFERENCES BOOKS:

- Neural Network, Fuzzy Logic, and Genetic Algorithms Synthesis and Applications", by S. Rajasekaran and G.A. VijayalaksmiPai, (2005), Prentice Hall, Chapter 1-15, page 1-435.
- 2. "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig, (2002), Prentice Hall, Chapter 1-27, page 1-1057.
- 3. Waterman D.A., A guide to Expertsystem, Adision Wesley, Reading
- 4. Artificial Intelligence Hand book, Vol. 1-2, ISA, Research Triangle Park.
- 5. Haykin S, Artificial Neural Networks-Comprehensive Foundation, Asea, Pearson.
- 6. Barr A, Fergenbaub E.A. and Cohen PR. Artificial Intelligence, Addison Wesley, Reading

LIST OF EXPERIMENTS:

- 1. Write a program to implement Tic-Tac-Toe game problem.
- 2. Write a program to implement BFS (for 8 puzzle problem or Water Jug problem or any AI search problem).
- 3. Write a program to implement DFS (for 8 puzzle problem or Water Jug problem or any AI search problem)
- 4. Write a program to implement Single Player Game (Using Heuristic Function)
- 5. Write a program to Implement A* Algorithm.



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- 6. Write a program to solve N-Queens problem.
- 7. Write a program to solve 8 puzzle problems.
- 8. Write a program to solve travelling salesman problem.

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COURSE CODE	C ATEGO RY	C O URSE NAME	L	Т	Р	CREDIT	END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	
BTCS602	UG	Internet of Things	3	1	2	5	60	20	20	30	20	

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:

- 1. To understand the configuration of Internet of Things (IoT) based architecture.
- 2. To identify an IoT device.
- 3. To understand working of IoT devices.

Course Outcomes:

- 1. Able to understand the application areas of IOT.
- 2. Able to realize the revolution of Internet in Mobile Devices, Sensor Networks.
- 3. Able to understand building blocks of Internet of Things and characteristics.

Syllabus:

UNIT-I: Overview of Internet of Things Introduction & Concepts: Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IOT Levels, Sensor, Type of Sensor, Domain Specific IOTs: Home Automation, Cities, Environment, IOT Platforms.

UNIT–II :M2M to IoT The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, Difference between IOT and M2M, A use case example of M2M & IOT, Differing Characteristics, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT.

UNIT-III : Communication Protocols

Introduction to communication architecture- Network protocol stack, Channels and protocols - RF: ZigBee, Blue Tooth, BLE, Zwave, Mesh network. Communication Channels: GSM/GPRS, 2G, And 3G, LTE, WiFi, And PLC, IoT protocols: MQTT/MQTTS, CoAP, 6LoWPAN, IPSO, Thread, like TCP, UDP, HTTP/s, CoAP, and MQTT. Comparison of the different IOT protocols, advantages and disadvantages (limitations) of these IOT protocols. IPv4 addressing problem for IOT and introduction to IPv6 is required to address more devices. Application issues with RF protocol - power consumption, LOS, reliability. Security Aspects.

UNIT-IV: Designing and Developing Network & Communication aspects Wireless medium access issues, Developing Internet of Things & Logical Design using Python: Introduction, IOT Design Methodology, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/Time Operations, Classes, Python Packages.

UNIT-V:IOT Devices IOT Physical Devices & Endpoints: What is an IOT Device, Exemplary Device, Board,Introduction to R-Pi microcomputer, Linux on Raspberry Pi, Interfaces, and Programming & IOT Devices.

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TEXT BOOKS:

- 1. Vijay Madisetti, ArshdeepBahga," Internet of Things A Hands-On- Approach",2014, ISBN:978 0996025515
- Adrian McEwen, Hakim Cassimally "Designing the Internet of Things", John Wiley & Sons (2013), ISBN - 9781118430620

REFERENCES BOOKS:

- 1. Daniel Kellmereit, "The Silent Intelligence: The Internet of Things". 2013, ISBN 0989973700
- 2. Wolfram Donat "Learn Raspberry Pi programming in python", Apress (2014), ISBN 9781430264255
- 3. Massimo Banzi, "Getting Started with Arduino", O'Reilly Media, Inc." (2011), ISBN 9781449309879
- Tero Karvinen, Kimmo Karvinen, Ville Valtokari, "Make: Sensors: A Hands-On Primer for Monitoring the Real World with Arduino and Raspberry Pi", Maker Media, Inc., (2014), ISBN – 9781449368067
- 5. Richard Grimmett, "Raspberry Pi Robotics Essentials", Packt Publishing Ltd (2015), ISBN 978178528564

LIST OF EXPERIMENTS:

- 1. Design use Cases ranging from Smart Home to Smart Cities.
- 2. IOT approach to solve Logistics Business Problem.
- 3. Using an IoT gateway to connect the "Things" to the cloud.
- 4. Case study of IP spoofing attack in 6 LoWPAN network.
- 5. The Challenges of IoT Addressing.

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COURSE CODE	C ATEGO RY	COURSENAME	L	Т	Р	CREDITS	END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTCS503	UG	Computer Graphics and Multimedia	3	1	2	5	60	20	20	30	20

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.

Syllabus:

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**

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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

UNIT III 2D Geometric Transformations Basic transformation, Matrix representation and Homogeneous Coordinates Composite transformationOthertransformations.Transformation between coordinated systems. Window to Viewport coordinate transformation, Clipping operations – Point clipping, Line clipping:-Cohen – Sutherland line clippingLiang – Barsky line **Clipping-**Sutherland clippingMidpoint subdivision Polygon Hodgeman _ polygon clippingWeiler – 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, Other transformations:-Scaling 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
- Parekh "Principles of Multimedia" Tata McGraw Hill
 Prabhat k Andleigh, KiranThakral, "Multimedia System Design "PHI Pub.
- 4. Donald Hearn and M.P. Becker "Computer Graphics" Pearson Pub.

REFERENCES BOOKS:

- 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 EXPERIMENTS:

- 1. Implement DDA Line Drawing algorithm
- 2. Implement Bresenham's line drawing algorithm.
- 3. Implement Mid-Point circle drawing algorithm.



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- 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.
- 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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COURSE CODE	CATEGORY	CO URSE NAME	L	Т	Р	CREDITS	END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS608	UG	Data Science	3	1	2	5	60	20	20	30	20				

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 of the mathematical foundations needed for data science and develop programming skills required to build data science applications.

Course Outcomes:

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

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

Syllabus:

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

Machine Learning: Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression- model assumptions, regularization (lasso, ridge, elastic net), Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic

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regression, support vector machines (SVM), decision trees, and random forest, Classification Errors, Analysis of Time Series- Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks- Learning And Generalization, Overview of Deep Learning.

UNIT-V

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

Text and Reference Books:

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

LIST OF PRACTICALS:

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

user.

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COURSE CODE	C ATEGO RY	C O URSE NAME	L	Т	Р	CREDITS	END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTIBM701	UG	MongoDB and NoSQL	3	1	2	5	60	20	20	30	20

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:

This course will help the students in understanding:

- 1. The basics of NoSQL.
- 2. How it is different from RDBMS.
- 3. Overview on MongoDB.
- 4. Basic MongoDB operation and advanced concept in MongoDB.

Course Outcomes:

After the successful completion of this course students will be able to:

- 1. Describe the key components of NoSQL & MongoDB and its role in Computer Science;
- 2. Identify and describe advantages of NoSQL and understand the difference between NoSQL and RDBMS.
- 3. How to done Installation of MongoDB and understand basics of MongoDB.
- 4. Understand the Advanced MongoDB Concepts and how these concepts help and solve the Big Data problems
- 5. Analyze and understand the computational trade-offs involved in applying different MongoDB query operations.

Syllabus:

UNIT I

Overview of NOSQL: Review of RDBMS, ACID properties, Introduction to NoSQL, CAP Theorem, different data models, Pros & Cons of using NoSQL, Comparison between SQL and NoSQL, Document Databases & it's Advantages.

UNIT II

Introduction to MongoDB: Installation of MongoDB, Document and Collections, Data Model Design (Embedded Data Models and Normalized Data Model), MongoDB Use Cases.

UNIT III

Basic MongoDB Operations: Data Types in Mongo Shell, Operators in MongoDB: Comparison Query operators, Logical Query operators, Element Query operators, Evaluation Query operators, Query operator Array, Projection operator, Inserting and Saving Documents, Batch Insert, Removing & Updating Documents: Updating using update() method, Updating using save() method, Replace a document, Query Document, AND condition in MongoDB, OR condition in MongoDB, OR & AND condition in MongoDB.

Unit IV

Query on Embedded/Nested Documents: Querying Nested field using equality match,



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SEMESTER VII

Querying Nested field using dot (".") operator, Specify match using Query Operator, Specify AND condition, Query an Array: Querying array using equality match, Query an Array for an element, Query an array by filter condition, Query elements that Meets Multiple Criteria, Query for an element by Array by Index Position, Query an array by array length, Query an Array of Embedded Documents: Query a document nested in an array, Query Array Index to Query for a Field in the Embedded Document, Query embedded field in array using a query condition, Nested Documents Meets Multiple Query Conditions on Nested Fields, Project Fields to Return from Query, Return All the fields in documents, Return specific fields in documents, Suppress _id Field, Return all but excluded fields, Return Specific Fields in Embedded Documents on Array, Project Specific Array elements in the Returned Array, Query null or Missing fields, Equality Filter, Type Check, Existence Check.

Unit V:

Advanced MongoDB Operations: Map-Reduce, Data Aggregation, Indexing, Type of Indexes, Replication via Replica Sets, Setting replica set in MongoDB using Docker, Sharding, Shard key, Scalability, Vertical Scaling, Horizontal Scaling, MongoDB-Java/Python Exercise.

TEXT BOOKS:

- 1. Getting Started with Nosql Book by Gaurav Vaish
- 2. IBM Text Book.

REFERENCES:

- 1. SQL & NoSQL Databases: Models, Languages, Consistency Options and Architectures for Big Data Management Book by Andreas Meier and Michael Kaufmann, July 2019.
- 2. MongoDB 4 Quick Start Guide: Learn the Skills You Need to Work with the World's Most Popular NoSQL Database Book by Doug Bierer, September 2018
- 3. NoSQL Data Models: Trends and Challenges, by Olivier Pivert, July 2018.
- 4. Sams Teach Yourself NoSQL with MongoDB in 24 Hours Book by Brad Dayley, August 2014.

LIST OF EXPERIMENTS:

- 1. Explain Mongo DB Comparison Query operators.
- 2. Write OR & AND condition in Mongo DB.
- 3. Write a program to Insert and Saving Documents in Mongo DB.
- 4. Write Query on Nested field using equality match, using dot (".") operator.
- 5. Write Query for an array element by filter condition and Query for elements that Meets Multiple Criteria.
- 6. Write Query for an array element by Index Position
- 7. Write query which return all the fields in documents, which return specific fields in documents.
- 8. Setting replica set in Mongo DB using Docker.
- 9. Install Eclipse IDE which is required for Maven installation

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SEMESTER VII

							TEACHING & EVALUATION SCHEMETHEORYPRACTICAL				
COURSECODE	CATEGORY	C O URSE NAME	L	Т	Р	CREDITS	END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTIBMB701	UG	Planning Analytics-TM1	3	1	2	5	60	20	20	30	20

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 make students able to:

- 1. Understand the evolution and relevance of data science in the world today.
- 2. Explore end-to-end data science industry use cases using the data analytics lifecycle.
- 3. Understand the scientific method for science projects, and the data science team key roles.
- 4. Acquire technical expertise using popular open source data science frameworks including Jupyter notebooks and Python.

Course Outcomes:

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

1. Data engineering and data modelling practices using machine learning

2. Gain a competitive edge using low-code cloud- based platform for data science-IBM Watson Studio

3. Explore data science industry case studies: transportation, automotive, human resources, aerospace, banking and healthcare

4. Experience teamwork agile industry practices using design thinking

Syllabus:

UNIT I

DATA SCIENCE LANDSCAPE: Data Science Overview, Data Science Domains, Data Science Roles, DATA SCIENCE METHODOLOGY: Data Analytics in Practice, Data Analytics Methodologies, Data Science Method, DATA SCIENCE ON THE CLOUD: Integrated environment for Data Science projects, Cloud-based Data Science Lifecycle, Data Science capabilities on the cloud.

UNIT II

EXPLORE AND PREPARE DATA: Business understanding, Explore data and Prepare data, Understanding data, REPRESENT AND TRANSFORM DATA: Statistics and representation techniques, Data transformation, Represent and transform unstructured data, Data transformation tools.

UNIT III

DATA VISUALIZATION AND PRESENTATION: Decision-centered Visualization, Fundamentals of Visualizations, Common Graphs, Common Tools.

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SEMESTER VII

UNIT IV

DATA MODELING: Overview of modelling techniques, Machine learning techniques, Accuracy, precision and recall, Model Deployment.

UNIT V

MACHINE LEARNING ALGORITHMS: About Machine learning, From Regression to Neural Nets, Decision Tree Classifier, Machine Learning Framework.

TEXT BOOKS:

- 1. An Introduction to Statistical Learning: With Applications in R by <u>Gareth M.</u> James, <u>Daniela Witten</u>, <u>Trevor Hastie</u>, <u>Robert Tibshirani</u>, June 2013.
- 2. Data Science from Scratch, Book by Joel Grus, 2015.
- 3. IBM Text Book.

REFERENCES:

- 1. Data Science Theory, Analysis and Applications book by Qurban A. Memon, Shakeel Ahmed Khaja 2020.
- 2. Doing Data Science Straight Talk from the Frontline Book by Cathy O'Neil and Rachel Schutt, 2013.
- 3. The Art of Data Science Book by Elizabeth Matsui and Roger Peng, June 2016.
- 4. Introduction to Machine Learning with Python: A Guide for Data Scientists, Book by Andreas C. Müller and Sarah Guido, 2016.

LIST OF PRACTICALS:

- 1. ACCESSING IBM CLOUD: Create an IBM Cloud Account & Navigate the Catalogue.
- 2. EXPLORING AND PREPARING AUTO DATA: Access IBM Cloud, Provision Watson Studio Service, Import automobile data.
- 3. VALIDATING AUTOMOTIVE DATA: Data Refinery, Sort and filter data, Review Frequency and statistics.
- 4. DATA REFINERY VISUALIZATION: Visualize preliminary data wrangling results, Run summary statistics on the results.
- 5. VISUALIZING AUTOMOTIVE DATA: Create new project in Watson Studio
- 6. Create Jupyter Notebook environment
- 7. Import dataset into Pandas data frame
- 8. Visualize data using Brunel
- 9. PREDICT HEART FAILURE: Load patient data into Object Storage, Create Apache Spark machine learning, Train and evaluate a model, Persist a model in a Watson ML repository.
- 10. APPLY ML MODELS TO ATTRITION: Create a new Watson Studio project, Import dataset from local drive, Perform data cleansing and transformation, apply various machine learning models, Conclude which model gives best prediction.

Rojava Chairperson

Joint Registrar



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SEMESTER VII

							TEAC	HING &	EVALUA	IION SCI	HEME
							THE	ORY	PRACTICAL		
COURSECODE	C ATEGO RY	C O URSE NAME	L	Т	Р	CREDITS	END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTIBMC701	UG	Application Development &	3	1	2	5	60	20	20	30	20
		using IOT									

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:

This course will help the students in:

- 1. Understand the evolution and impact of IoT in the world today.
- 2. Explore IoT by industry domains: automotive, connected homes, manufacture, energy & utilities, transportation, healthcare, aerospace.
- 3. Explore end-to-end case studies for every key IoT industry and identify common patterns.

Course Outcomes:

After the successful completion of this course students will be able to:

- 1. Understand technical aspects of IoT solutions: devices and networks, data, cloud, applications, blockchain, analytics and security.
- 2. Build cognitive IoT solutions, leveraging artificial intelligence and data science.
- 3. Understand industry practices to design and build agile IoT solutions, using the design thinking methodology.
- 4. Work in team's jointly exploring real-world IoT scenarios.
- 5. Prototype bespoke IoT solutions leveraging industry-proven concepts, technologies and methodologies

Syllabus:

UNIT I

IoT Global LANDSCAPE: What is the Internet of things, IoT global adoption, IoT common Patterns: sensor, data, analytics, IoT challenges: security and scalability, Resources.

UNIT II

IoT Application Domains: IoT Technology Domains, Connected Devices, Connected Vehicles, Smart Buildings, Smart Cities, Resources

UNIT III

IoT Solution Anatomy - Device and Networks: IoT Solution Architecture, Physical Layer



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SEMESTER VII

(Devices, Hardware, Sensors), Communication layer (IoT networks), Resources

Unit IV

IoT Solution Anatomy – IoT Data Platform: IoT Platform Layer, Data Analytics and applications Layer, Resources

Unit V:

Cognitive IoT Solutions: IoT Sensor Data and AI, Data Science on the Cloud, Resources **IoT Industry Case Studies:** IoT Trends, IoT in Manufacturing, Global Logistics with IoT, Worker Safety, Industry Predictions, Resources

TEXT BOOKS:

- 1. Vijay Madisetti, ArshdeepBahga," Internet of Things A Hands-On- Approach",2014, ISBN:978 0996025515
- 2. Adrian McEwen, Hakim Cassimally "Designing the Internet of Things", John Wiley & Sons (2013), ISBN 9781118430620
- 3. IBM Skills Academy

REFERENCES:

- 1. Daniel Kellmereit, "The Silent Intelligence: The Internet of Things". 2013, ISBN 0989973700
- Massimo Banzi, "Getting Started with Arduino", O'Reilly Media, Inc." (2011), ISBN-9781449309879
- 3. Richard Grimmett, "Raspberry Pi Robotics Essentials", Packt Publishing Ltd (2015), ISBN-978178528564

LIST OF EXPERIMENTS:

- 1. Remote Sensor Data Visualization: Preface, Remote Sensors
- 2. IBM Cloud Account Creation and Device Setup: Preface, Obtain an IBM Cloud Account, Provision the Node-Red App, Register a new Device
- 3. Node-RED setup & Chart Data: Preface, Node-RED setup, Receive Environmental Sensor Data in Node-RED, Dashboard Charts Plot Sensor Data
- 4. Store Data in Cloudant Storage & Chart Data: Preface, Import the Node-RED Cloudant storage flow, Chart Historical Sensor Data
- 5. Use IoT Sensor Data to track Zebras in Botswana with AI: Preface, Clone & Deploy, Create Services, Run the Application, Links
- 6. Analyze large Data Sets Collected from a Long-range IoT System: Preface, Create Services, and Run Watson Studio Notebook.

Lojowod Chairperson

Joint Registrar Styl Velisbaw Vicyapeth Valewavidyaby