RASHTRASANT TUKDOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FOUR YEAR BACHELOR OF ENGINEERING (B.TECH) DEGREE
COURSE SEMESTER VII (C.B.C.S)
BRANCH OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Subject : DEEP LEARNING **Subject Code: BTAI&ML701T**

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	3+0	30	70	100

Aim: To understand the concepts of Deep Learning

Prerequisite(S): Artificial Intelligence, Machine Learning

Course Objectives:

- To study foundational concepts of deep learning, including neural network architectures, activation functions, optimization algorithms, and backpropagation.
- To implement deep learning models using popular libraries and frameworks such as TensorFlow, PyTorch, or Keras.
- To gain different types of deep learning architectures, such as Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs).
- To study the real-world applications of deep learning across various domains, including computer vision, natural language processing, speech recognition.
- To study the preprocess and prepare data for deep learning tasks, including techniques such as data augmentation, normalization.

Course Outcomes:
At the end of course students are able to,

CO1	Describe the neural network architectures, activation functions, loss functions, optimization algorithms, and backpropagation
CO2	Demonstrate proficiency in building, training, and evaluating neural networks for different tasks.
CO3	Explain deep learning techniques to solve real-world problems across various domains, such as computer vision, natural language processing,

CO4	Classify preprocessing and preparing data for deep learning tasks, including techniques.
CO5	Identify the ethical considerations associated with deep learning, including issues related to bias, fairness, privacy, security, and accountability

Syllabus:

UNIT I: Mathematical Preliminaries: Introduction to Linear Algebra; Principal Component Analysis; Probability and Statistics; Numerical Methods, Gradient and constraint-based optimisation. Machine Learning Basics Learning algorithms: Training, validation and test sets; Neural networks, convolutional and recurrent networks, backpropagation; Performance metrics, hyperparameters and debugging strategies.

UNIT II: Introduction to Deep Networks: Problems with backpropagation and modern approaches; Autoencoders, representation learning; Regularisation, dropout, optimisation strategies.

UNIT III: Sequence Learning and LSTMs: Deep recurrent networks, bidirectional networks and encoder-decoder architectures; Introduction to LSTM, building an LSTM network.

UNIT IV: Applications: Deep convolutional network for Telugu OCR and performance analysis; LSTM networks for text processing.

UNIT V: GANs and Latest Advances: Generative adversarial networks (GAN), building and training GANs; GAN variants and current results; limitations and weaknesses of deep learning.

TEXT BOOKS:

- Ian Goodfellow, Yoshua Bengio, Aaron Courville. Deep Learning, MIT Press, 2015.
- Technical papers from time-to-time on different topics (some of these will be given at the beginning of the semester and others during the semester).

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BRANCH OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Subject : DEEP LEARNING LAB Subject Code: BTAI&ML701P

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	3	30	70	100

Practical List:- Practicals based on above Syllabus

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BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Subject: Digital Signal and Image Processing **Subject Code: BTAI&ML702T**

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	3+0	30	70	100

Aim: To improve the visual effect of people, in image processing, the input is a low-quality image, and the output is an image with improved quality

Prerequisite(S): Digital systems

Course Objectives:

- To teach students time domain, frequency domain, discrete time signals, properties and digital filter design techniques
- To provide knowledge on basic concepts of image and its processing techniques
- To provide knowledge on Enhancement, Restoration, Segmentation techniques
- To provide hand on experience of signal & image processing techniques using MATLAB

Course Outcomes:

At the end of course students are able to,

CO1	Explain the properties and characteristics of discrete-time signals and systems and Demonstrate understanding of Z-transform and its applications
CO2	Analyze the frequency content of signals using Fourier analysis such as DFT and FFT
CO3	Apply digital filter design techniques to solve practical problems and implement digital filters using appropriate tools and programming languages
CO4	Explain the principles behind image enhancement methods (e.g., histogram equalization) and their applications and understand the effects of various enhancement techniques on image quality

CO5	Apply image filtering techniques (e.g., spatial and frequency domain filtering) to process and enhance digital images and implement image filtering algorithms using relevant software tools.

Syllabus:

Unit I: FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING

Characterization and classification of signals, Z-Transform: Direct Z-Transform, inverse Z-Transform, Properties of The ZTransform, Linearity, Time Shifting, Scaling, Time Reversal, Differentiation, Convolution, Correlation, Accumulation, System Function of a Linear Time-Invariant System.

UNIT II: DISCRETE FOURIER TRANSFORM & FAST FOURIER TRANSFORM
DTFT and DFT Relationship, Discrete Fourier transform (DFT), Properties of the DFT: periodicity, linearity, and symmetry properties, relationship of the DFT to other transforms, DFT as a linear transformation, multiplication of two DFT and circular convolution, Efficient Computation of the DFT, FFT Algorithms: Radix-2 FFT Algorithms: Decimation in-Time (DIT), Decimation-in-Frequency (DIF)

UNIT III : DESIGN AND REALIZATION OF DIGITAL FIR FILTERS
FIR Filter Structure: Direct Form-I, Direct Form-II, Linear Phase FIR Filter, Liner Phase FIR Filter, Design of FIR Filters Using Windowing Techniques, Design of FIR Filter by Frequency Sampling Technique

UNIT **IV: DESIGN AND REALIZATION OF DIGITAL IIR FILTERS**
Design of IIR Filters from Analog Filters(Butterworth Approximation): IIR Filter Design by Impulse Invariance, IIR Filter Design By The Bilinear Transformation, Realization of Digital Filter by using Direct Form-I, Direct Form-II, Cascade Form and Parallel Form Structures.

UNIT V: DIGITAL IMAGE FUNDAMENTAL
Image fundamental, Types of Images, A simple Image Model, Steps of Image Processing, Color Image and Color Models, Sampling and Quantization, Pixel Relationship (Neighbor and Adjacency)

TEXT BOOKS:

1. V. K. Ingle and J.G. Proaksis, J.G, “Digital Signal Processing-A MATLAB Based Approach”, Cengage Learning Publisher
2. S. Salivahanan, A. Vallavaraj and C. Gnanapriya, “Digital Signal Processing”, McGraw-Hill Publication

3. Gonzalez, Rafael C., and Richard E. Woods, “Digital Image Processing” 2nd Edition, Pearson Education, 2002.

REFERENCE BOOKS:

1. Tarun K.Rawat, “Digital Signal Processing”, Oxford University Press India
2. Sridhar S. Oxford university publication. Digital Image Processing. 2001.
3. Gonzalez, Rafael C., and Richard E. Woods, Steven L Eddins “Digital Image Processing using MATLAB” , Pearson Education, 2009.

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BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Subject : Digital Signal and Image Processing **Subject Code: BTAI&ML702P**

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
2 Hrs (Per Practical)	1	25	25	50

Practical List:- Practicals Based on above Syllabus

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COURSE SEMESTER V (C.B.C.S)
BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Subject: OPEN ELECTIVE- 2 **Subject Code:BTAI&ML703T-1**
COGNITIVE SYSTEM AND NETWORKS

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
3	3	30	70	100

Prerequisite(s):

Course Objectives:

1	To understand the Cognitive Computing, Cognitive Psychology
2	To learn the Intelligent Decision making, Fuzzy Cognitive Maps, learning algorithms
3	To understand the Hypothesis Generation and Scoring, Natural Language Processing
4	To understand the Cognitive Systems in health care, Cognitive Assistant for visually impaired.

Course Outcomes:

At the end of this course students are able to:

CO1	Compare different types of cognitive science and cognitive computing with AI
CO2	Implement cognitive computing with inference and decision support systems
CO3	Implement cognitive computing with machine learning
CO4	Implement cognitive systems in health care, cognitive assistant for visually impaired
CO5	Learn The IBM’s Power AI Platform

Syllabus:
UNIT I:

Cognitive Computing, Cognitive Psychology, The Architecture of the Mind, The Nature of Cognitive Psychology, Cognitive architecture, Cognitive processes, The Cognitive Modeling Paradigms, Declarative / Logic based Computational cognitive modeling, connectionist models –Bayesian models. Introduction to Knowledge-Based AI – Human Cognition on AI – Cognitive Architectures

UNIT II:
Intelligent Decision making, Fuzzy Cognitive Maps, learning algorithms: Nonlinear Hebbian Learning, Data driven NHL, Hybrid learning, Fuzzy Grey cognitive maps, Dynamic Random fuzzy cognitive Maps

UNIT III:
Machine learning Techniques for cognitive decision making, Hypothesis Generation and Scoring, Natural Language Processing, Representing Knowledge, Taxonomies and Ontologies, N-Gram models, Application

UNIT IV:
Cognitive Systems in health care, Cognitive Assistant for visually impaired – AI for cancer detection, Predictive Analytics, Text Analytics, Image Analytics, Speech Analytics

UNIT V
Introduction to IBM's Power AI Platform - Introduction to Google's TensorFlow Development Environment

Textbooks:

1. Hurwitz, Kaufman, and Bowles, "Cognitive Computing and Big Data Analytics", Wiley, Indianapolis.

Reference books:

1. Jerome R. Busemeyer, Peter D. Bruza, "Quantum Models of Cognition and Decision", Cambridge University Press.
2. Emmanuel M. Pothos, Andy J. Wills, "Formal Approaches in Categorization", Cambridge University Press.
3. Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press.
4. Neil Stillings, Steven E. Weisler, Christopher H. Chase and Mark H. Feinstein, "Cognitive Science: An Introduction", MITPress.

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COURSE SEMESTER V (C.B.C.S)

BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Subject : OPEN ELECTIVE 2
NON-CONVENTIONAL ENERGY SOURCES Subject Code: BTAI&ML703T-2

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	3	30	70	100

Aim:
Prerequisite(s):
Course Objectives:

- To study fundamental concepts of Energy Sources
- To understand roles of Wind Energy
- To Learn different protocols used for Energy from Biomass
- To Understand the fundamental OF Chemical Energy sources
- To Understand the basic ideas OF Magneto Hydro Dynamic (MHD), Thermo-electric and Thermo-ionic Power Generations

Course Outcomes:
At the end of course students are able to,

CO1	**Understand** the various concepts, terminologies OF Energy Sources
CO2	**Learn the** Basic principles of wind energy conversion
CO3	**Understand** the Energy from Biomass: Biomass conversion technologies
CO4	**Summarize** the Chemical Energy sources: Fuel cells -principle of operation of fuel cell

CO5	**Describe** the Magneto Hydro Dynamic (MHD), Thermo-electric and Thermo-ionic Power Generations

Syllabus:

Unit I:

Introduction to Energy Sources: Energy sources and their availability, non-conventional sources, advantages of renewable energy sources, prospects of renewable energy sources. Solar Energy: Solar energy collectors – flat plate collectors and concentrating collectors, solar energy storage systems.

Unit II:

Wind Energy: Basic principles of wind energy conversion, site selection considerations, basic components of Wind Energy Conversion System (WECS), classification of WEC systems, wind energy collectors – horizontal axis machines and vertical axis machines, generating systems, applications of wind energy. Geothermal Energy: Geothermal sources, hydrothermal resources

Unit III:

Energy from Biomass: Biomass conversion technologies, photosynthesis, biogas generation, factors affecting biogas generation, classification of biogas plants – floating drum plants and fixed dome plants, selection of site for biogas plant, utilization of biogas; Methods for obtaining energy from biomass, biomass gasification, classification of biomass gasifiers, fixed bed gasifiers and fluidized bed gasifiers, applications of gasifiers, advantages and limitations of gasifiers;

Unit IV:

Chemical Energy sources: Fuel cells -principle of operation of fuel cell, types of fuel cells – hydrogenoxygen, solid-oxide, alkaline, polymer electrolyte membrane fuel cells, advantages, disadvantages and conversion efficiency of fuel cells, applications of fuel cells.

Unit V:

Magneto Hydro Dynamic (MHD), Thermo-electric and Thermo-ionic Power Generations: Principles of MHD power generation – open cycle and closed cycle – advantages and limitations. Basic principles of thermo-electric and thermo-ionic power generation – advantages and limitations

TEXT BOOKS:

G.D. Rai, Non-Conventional energy sources, 5th Edition, Khanna Publishers, 2011.

REFERENCE BOOKS:

- . D.P. Kothari, R. Rakesh and K.C. Singal, Renewable Energy Resources and Emerging Technologies, 2nd Edition, Prentice India Pvt. Ltd, 2011.
- G.S. Sawhney, Non-Conventional Energy Sources, 1st Edition, Prentice India Pvt. Ltd, 2012.
- G.N. Tiwari and M.K. Ghosal, Renewable Energy Resources: Basic Principles and Applications, 1st Edition, Alpha Science International Ltd, 2004.

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BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Subject : OPEN ELECTIVE 2 **Subject Code: BTAI&ML703T-3**
ENERGY HARVESTING SYSTEM

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	2	15	35	50

Aim: Able to understand the knowledge of ENERGY HARVESTING SYSTEM
Prerequisite(S):

Course Objective:

1.	The aim of this course is not just to impart theoretical knowledge to the students but to provide them with exposure and hands-on learning wherever possible

Course Outcome: By the end of the course, students will be able to

CO1	Acquire knowledge of Fossil fuels and Alternate Sources of energy
CO2	Be able to understand the Wind Energy harvesting
CO3	Develop the Ocean Energy Potential against Wind and Solar
CO4	Able to understand Human power Electromagnetic Energy Harvesting

Syllabus:

Unit 1: Fossil fuels and Alternate Sources of energy: Fossil fuels and Nuclear Energy, their limitation, need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean, Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy, tidal energy, Hydroelectricity.

Unit II:

Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies.

Unit III: Ocean Energy: Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices. Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass.

Unit IV: Human power Electromagnetic Energy Harvesting: Linear generators, physics mathematical models, recent applications, Carbon captured technologies, cell, batteries, power consumption. Environmental issues and Renewable sources of energy, sustainability.

Text and Reference Books:

1. Non-conventional energy sources - G.D Rai - Kh^nna Publishers, New Delhi
2. Solar energy - M P Agarwal - S Chand and Co. Ltd.
3. Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company Ltd.
4. Godfrey Boyle, "Renewable Energy, Power for a feustainable future", 2004, Oxford University Press, in association with The Open University.
5. Dr. P Jayakumar, Solar Energy: Resource Assesment Handbook, 2009
6. J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA).

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COURSE SEMESTER V (C.B.C.S)
BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Elective - 3
Subject : AI Knowledge Representation & Reasoning Subject Code: BTAI&ML704T-1

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	3	30	70	100

Aim: To understand the importance of AI knowledge Representation & Reasoning .

Prerequisite(S): NIL

Course Objectives:·

- This course introduces students to the principles, methods, and algorithms for representing and reasoning with knowledge in artificial intelligence systems.
- Topics include propositional and first-order logic, semantic networks, frames, ontologies, reasoning under uncertainty, Bayesian networks, and common-sense reasoning.
- Emphasis is placed on both theoretical foundations and practical applications.

Course Outcomes:
At the end of course students are able to,

CO1	Understand various knowledge representation formalisms and their applications.
CO2	Apply reasoning algorithms to solve problems in artificial intelligence.
CO3	Evaluate the trade-offs between different representation and reasoning approaches.
CO4	Develop AI systems capable of representing and reasoning about complex knowledge domains.

Syllabus:

Unit I: Introduction to Knowledge Representation: Overview of AI knowledge representation, Propositional logic: Syntax, semantics, and inference, First-Order Logic: Syntax and semantics of first-order logic, Resolution in first-order logic, Unification and substitutions, Knowledge representation using first-order logic, Resolution theorem proving, Knowledge engineering methodologies.

Unit II: Semantic Networks and Frames: Semantic networks: Concepts and representation, Frames: Structure and inheritance, Description Logics, Application of semantic networks in AI, Ontologies and Knowledge Graphs, Introduction to ontologies, RDF, RDFS, OWL: Ontology languages, Reasoning with ontologies, Knowledge graphs and their applications

Unit III: Reasoning under Uncertainty: Introduction to uncertainty in AI, Bayesian networks: Representation and inference, Decision networks, Fuzzy logic and fuzzy inference

Unit IV: Common-sense Reasoning, Challenges in common-sense reasoning, Qualitative reasoning, Non-monotonic reasoning, Case-based reasoning

Unit V: Advanced Topics and Applications, Temporal reasoning, Spatial reasoning
Multi-agent systems and distributed reasoning, Applications of knowledge representation and reasoning in real-world AI systems

REFERENCE BOOKS:

"Artificial Intelligence: A Modern Approach," Pearson, 2016.
Ronald Brachman and Hector Levesque, "Knowledge Representation and Reasoning," Elsevier, 2004.
Richard E. Fikes and Nils J. Nilsson, "Strips: A New Approach to the Application of Theorem Proving to Problem Solving," Artificial Intelligence, 1971.
James F. Allen, "Towards a General Theory of Action and Time," Artificial Intelligence, 1984.

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COURSE SEMESTER V (C.B.C.S)
BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

(ELECTIVE-I)

Subject : Distributed and Object Oriented Database Subject Code:BTAI&ML704T-2

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	3	30	70	100

Aim: Emphasis is placed on understanding theoretical concepts as well as practical implementation aspects.

Prerequisite(S): Database Management Systems

Course Objectives:·

- Learn about the challenges and advantages of distributed databases compared to centralized databases.
- Understand techniques for ensuring data consistency, concurrency control, and distributed transaction management in distributed environments.
- Understand query processing and optimization in object-oriented database systems.

Course Outcomes:

After completing the course, students will able to:

CO1	Understand the principles and challenges of distributed database systems.
CO2	Design and implement distributed database applications.
CO3	Apply concurrency control and distributed transaction management techniques.
CO4	Comprehend the principles of object-oriented database systems.

CO5	Develop object-oriented database applications using appropriate tools and frameworks.

Syllabus:

Unit I:

Introduction to Distributed Databases: Overview of distributed database systems
Distributed database architecture, Distributed data storage and replication, Distributed query processing and optimization, Distributed Database Design: Fragmentation, replication, and allocation strategies, Data consistency and distributed transactions, Distributed deadlock detection and resolution, Distributed recovery and fault tolerance**.**

Unit II: Concurrency Control in Distributed Databases, Centralized and distributed concurrency control techniques, Two-phase locking and timestamp ordering, Multiversion concurrency control (MVCC), Distributed deadlock detection and prevention

Unit III: Distributed Transaction Management, Distributed transaction models, Two-phase commit (2PC) protocol, Three-phase commit (3PC) protocol, Distributed concurrency control and recovery algorithms, Object-Oriented Database Systems (OODBMS), Introduction to object-oriented database systems, Object-oriented data modeling concepts, Persistence in OODBMS, Query processing and optimization in OODBMS

Unit IV: Implementation of Object-Oriented Databases, Object-oriented database architecture
Object-oriented database languages (e.g., OQL, ODMG), Object-relational mapping (ORM) frameworks, Case studies and applications of OODBMS

Unit V: Advanced Topics and Applications, Mobile and web database systems, Big data and distributed storage systems, Cloud database services, Emerging trends in distributed and object-oriented databases

REFERENCE BOOKS:

- Ozsu, M. Tamer, and Patrick Valduriez. "Principles of Distributed Database Systems." Springer, 2011.
- Ceri, Stefano, et al. "Distributed Databases: Principles and Systems." McGraw-Hill, 1993.
- Kim, W. "Modern Database Management." Pearson, 2019.
- Elmasri, Ramez, and Shamkant B. Navathe. "Fundamentals of Database Systems." Pearson, 2020.

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COURSE SEMESTER VII (C.B.C.S)
BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Elective 3

Subject: SWITCHING THEORY **Subject Code:BTAI&ML704T-3**

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	3+0	30	70	100

Aim: To make them learn the basic theory of switching circuits and their applications in detail. Starting from a problem statement they will learn to design circuits of logic gates that have a specified relationship between signals at the input and output terminals

Prerequisite(S): Digital systems

Course Objectives:

- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems. To provide knowledge on basic concepts of image and its processing techniques
- To understand common forms of number representation in digital electronic circuits To be able to convert between different representations.
- To implement simple logical operations using combinational logic circuits

Course Outcomes:

At the end of course students are able to,

CO1	Understand number systems, binary addition and subtraction, 2's complement representation and operations with this representation and understand the different binary codes.
CO2	Explain switching algebra theorems and apply them for logic functions
CO3	Identify the importance of SOP and POS canonical forms in the minimization or other optimization of Boolean formulas in general and digital circuits.
CO4	Discuss about digital logic gates and their properties
CO5	Evaluate functions using various types of minimizing algorithms like Boolean algebra, Karnaugh map or tabulation method.

Syllabus:

UNIT-I Number System and Boolean algebra And Switching Functions: Review of number systems, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties, Unit Distance Codes, Error Detecting and Correcting Codes. Boolean Algebra: Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, P
roperties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT –II Minimization and Design of Combinational Circuits: Introduction, The Minimization of switching function using theorem, The Karnaugh Map Method-Up to Five Variable Maps, Don't Care Map Entries, Tabular Method, Design of Combinational Logic: Adders, Subtractors, comparators, Multiplexers, Demultiplexers, Decoders, Encoders and Code converters, Hazards and Hazard Free Relations.

UNIT-III Sequential Machines Fundamentals and Applications: Introduction: Basic Architectural Distinctions between Combinational and Sequential circuits, The Binary Cell, Fundamentals of Sequential Machine Operation, Latches, Flip Flops: SR, JK, Race Around Condition in JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Design of a Clocked Flip-Flop, Timing and Triggering Consideration, Clock Skew, Conversion from one type of Flip-Flop to another. Registers and Counters: Shift Registers, Data Transmission in Shift Registers, Operation of Shift Registers, Shift Register Configuration, Bidirectional Shift Registers, Applications of Shift Registers, Design and Operation of Ring and Twisted Ring Counter, Operation Of Asynchronous And Synchronous Counters.

UNIT - IV Sequential Circuits - I: Introduction, State Diagram, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines, Synthesis of Synchronous Sequential Circuits, Serial Binary Adder, Sequence Detector, Parity-bit Generator, Design of Asynchronous Counters, Design of Synchronous Modulo N – Counters.

UNIT - V Sequential Circuits - II: Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques, and Merger chart methods-concept of minimal cover table.

TEXT BOOKS:

1. Switching and Finite Automata Theory- Zvi Kohavi & Niraj K. Jha, 3rdEdition,Cambridge .
2. Digital Design- Morris Mano, 5rd Edition, Pearson.

REFERENCE BOOKS:

1. Fredriac J. Hill, Gerald R.Peterson, 3rd edition, Introduction to switching theory and

logic design.
2. Thomas L.Floyd , Pearson 2013, Digital fundamentals – A Systems Approach
3. Ye Brian and Holds Worth, Elsevier, Digital logic design.

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BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Elective 3

Subject: BIOMEDICAL INSTRUMENTATION **Subject Code:BTAI&ML704T-4**

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	3+0	30	70	100

Aim:

Prerequisite(S):

Course Objectives:

- To learn basic of biomedical instrumentation and its applications
- To understand the concept of Biopotential amplifiers and filters
- To learn the concept of Magnetic Resonance Imaging

Course Outcomes:

At the end of course students are able to,

CO1	Understand the principles and components of biomedical instrumentation.
CO2	Analyze and design sensors and transducers for biomedical applications.
CO3	Describe various medical imaging techniques and their applications.
CO4	Apply signal processing techniques to enhance biomedical signals.
CO5	Evaluate the performance and limitations of biomedical instrumentation systems.

Syllabus:

UNIT-I Introduction to Biomedical Instrumentation: Overview of biomedical instrumentation and its applications, Biomedical sensors and transducers, Signal conditioning and amplification, Noise reduction techniques, Bioelectric Signals: Basics of bioelectricity, Electrodes and electrode-skin interface, Measurement of bioelectric signals (ECG, EEG, EMG), Biopotential

amplifiers and filters, Bioelectric Signals: Basics of bioelectricity, Electrodes and electrode-skin interface, Measurement of bioelectric signals (ECG, EEG, EMG), Biopotential amplifiers and filters

UNIT – II Medical Imaging Techniques: X-ray imaging: Principles and applications
Computed Tomography (CT) scanning,Magnetic Resonance Imaging (MRI), Ultrasound imaging, Physiological Measurement Devices, Blood pressure measurement: Techniques and instruments, Pulse oximetry, Temperature measurement device, Glucose monitoring systems

UNIT- III Signal Processing in Biomedical Instrumentation, Basics of digital signal processing
Filtering techniques (low-pass, high-pass, band-pass), Fourier analysis and frequency domain processing, Time-frequency analysis techniques

UNIT - IV Advanced Topics: Biomaterials and biocompatibility in instrumentation, Wearable biomedical devices, Telemedicine and remote monitoring systems, Ethical considerations in biomedical instrumentation research.

UNIT - V. Project Presentations and Review, Students present their final projects, Review of course topics and discussions on emerging trends in biomedical instrumentation

REFERENCE BOOKS:

- Webster, John G., and Halit Eren. "Measurement, Instrumentation, and Sensors Handbook." CRC Press, 2018.
- Cromwell, Leland, et al. "Biomedical Instrumentation and Measurements." Pearson, 2011.
- Geddes, Leslie A., and L. E. Baker. "Principles of Applied Biomedical Instrumentation." Wiley, 1989.

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COURSE SEMESTER VIII (C.B.C.S)
BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Elective 4

Subject: Augmented and Virtual Reality **Subject Code**: BTAI&ML801T-1

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	3+0	30	70	100

Aim: To make them learn the basic augmented reality and their applications in detail. Starting from a problem statement they will learn to design circuits of logic gates that have a specified relationship between signals at the input and output terminals.

Prerequisite(S): Digital systems

Course Objectives:

- To learn basic techniques for the design of augmented reality concepts used in the design of digital systems. To provide knowledge on basic concepts of image and its processing techniques.
- To implement simple logical operations using combinational logic circuits

Course Outcomes:

At the end of course students are able to,

CO1	To understand the importance of augmented reality in Industry 4.0 with real-time examples
CO2	To describe the history and recent developments of AR
CO3	To provide the need on emerging technologies AR and VR
CO4	To discuss the revolution and impact of AR
CO5	To understand the applications of AR and VR

Syllabus:

UNIT-I Introduction to Augmented Reality

History of AR, Augmented reality characteristics , Difference between Augmented Reality and Virtual Reality , technological components , Technologies used in AR– Feature Extraction , Hardware components , AR devices , Importance of AR , Real world uses of AR – AR types ,Software tools available for AR

UNIT –II Need of technologies for Augmented Reality

Hardware technology , virtual scenes , 3D objects , AR components , Display , HMD – Eyeglasses , Contact Lenses, significance of AR, AR powered devices ,AR application development drawbacks, Compatibility – Performance , AR libraries , Motion tracking , Environmental understanding – Anchors

UNIT-III Technology Integration and Implementation of AR

Technology use and integration in industrial settings , Assistive training to faculty members ,Planning and administration for implementation , AR implications , Practical data – AR labs , Platforms to form AR content , Coordinated utilization of AR applications – Handson preparation

UNIT – IV Augmented Reality and Virtual Reality for Micro Learning

Micro learning techniques, Utilizing VR for learning – VR for Practical online assessment , VR info graphics , Virtual case considerations , Utilizing AR for learning , Accessible , sensible data , elevated learner engagement , VR technology , Components of VR , VR Hardware , VR applications , – Civil Engineering , – Real Estate , – Biology and Medicine , Virtual Mall ,VR in Education , Virtual Laboratory – Factory Planning – Automobile Industry

UNIT - V Tools and Applications of Augmented Reality

Tools available for Augmented Reality and Recognition , Software Tools , Google Poly – Unity – software approaches – recognition types , native software solutions , ARKit , ARCore , software development kit - Cloud services - AR business applications , weather prediction , market prediction , – smart cities , AR application for Education ,AR application for Healthcare sector , Agriculture – Civil Engineering – Architecture – Archaeology – Crime and Security ,Games , IoT , Use cases, Social Media , Gaming , Education , Healthcare , Shopping and Business

TEXT BOOKS:

1. Kaliraj P, Devi T, (2021). Innovating with Augmented Reality: Applications in Education and Industry (P. Kaliraj, Ed.) (1st ed.). Auerbach Publications

REFERENCE BOOKS:

1. Fredriac J. Hill, Gerald R.Peterson, 3rd edition, Introduction to switching theory and logic design.
2. Thomas L.Floyd , Pearson 2013, Digital fundamentals – A Systems Approach
3. Ye Brian and Holds Worth, Elsevier, Digital logic design.

RASHTRASANT TUKDOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FOUR YEAR BACHELOR OF ENGINEERING (B.TECH) DEGREE
COURSE SEMESTER VIII (C.B.C.S)
BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Elective 4

Subject: Mobile Application Development **Subject Code**:BTAI&ML801T-2

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	3+0	30	70	100

Aim: To make them learn the basic augmented reality and their applications in detail. Starting from a problem **sta**tement they will learn to design circuits of logic gates that have a specified relationship between signals at the input and output terminals.

Prerequisite(S): Digital systems

Course Objectives:

- To facilitate students to understand android SDK
- To help students to gain a basic understanding of Android application development
- To inculcate working knowledge of Android Studio development tool

Course Outcomes:

At the end of course students are able to,

CO1	Identify various concepts of mobile programming that make it unique from programming for other platforms
CO2	Critique mobile applications on their design pros and cons
CO3	Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces
CO4	Program mobile applications for the Android operating system that use basic and advanced phone features
CO5	Deploy applications to the Android marketplace for distribution

Syllabus:

UNIT - I Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.

UNIT - II Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

UNIT - III Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

UNIT –IV Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

UN**IT - V** Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

TEXT BOOKS:

1. T1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)

REFERENCE BOOKS:

1. R1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd
2. R2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd 3. R3. Android Application Development All in one for Dummies by Barry Burd, Edition: I

RASHTRASANT TUKDOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
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COURSE SEMESTER VIII (C.B.C.S)
BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Elective 4

Subject: Big Data and NoSQL **Subject Code**: BTAI&ML801T-3

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	3+0	30	70	100

Aim: To make them learn the basic Big Data and NoSQL and their applications in detail. Starting from a problem **sta**tement they will learn to design circuits of logic gates that have a specified relationship between signals at the input and output terminals

Prerequisite(S): Basic Knowledge about DBMS

Course Objectives:

- To provide an overview of an exciting growing field of big data analytics.
- To introduce the tools required to manage and analyze big data like Hadoop, NoSql apReduce.
- To teach the fundamental techniques and rinciples in achieving big data analytics with scalability and streaming capability.
- To enable students to have skills that will help them to solve complex real- world problems in for decision support

Course Outcomes:

At the end of course students are able to,

CO1	Define, compare and use the four types of NoSQL Databases (Document-oriented, KeyValue Pairs, Column-oriented and Graph).
CO2	Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.

CO3	algorithms like Hadoop, Map Reduce and NO SQL in big data analytics
CO4	Interpret business models and scientific computing paradigms, and apply software tools for big data analytics
CO5	Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc

Syllabus:

UNIT - I The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, A (Mostly) Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Aggregate Data Models; Aggregates, Example of Relations and Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores, Summarizing Aggregate-Oriented Databases. More Details on Data Models; Relationships, Graph Databases, Schemaless Databases, Materialized Views, Modeling for Data Access,

UNIT - II Distribution Models; Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication. Consistency, Update Consistency, Read Consistency, Relaxing Consistency, The CAP Theorem, Relaxing Durability, Quorums. Version Stamps, Business and System Transactions, Version Stamps on Multiple Nodes

UNIT - III Map-Reduce, Basic Map-Reduce, Partitioning and Combining, Composing Map-Reduce Calculations, A Two Stage Map-Reduce Example, Incremental Map-Reduce Key-Value Databases, What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preference, Shopping Cart Data, When Not to Use, Relationships among Data, Multioperation Transactions, Query by Data, Operations by Sets

UNIT –IV Document Databases, What Is a Document Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, ECommerce Applications, When Not to Use, Complex Transactions Spanning Dif erent Operations, Queries against Varying Aggregate Structure

UNIT - V Graph Databases, What Is a Graph Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines, When Not to Use.

TEXT BOOKS:

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019.

RASHTRASANT TUKDOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
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BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Elective 4
Subject: Stastical Methods **Subject Code**: BTAI&ML801T-4

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	3+0	30	70	100

Aim: To make them learn the basic stastical methods and their applications in detail.
Prerequisite(S): Basic Knowledge about DMGT

Course Objectives:

- Tell how descriptive and inferential statistics are used in the modern world.
- Show an understanding of statistics encountered in daily life and recognize bias.
- Calculate basic probabilities including ones that use the addition and/or multiplication rules.
- Calculate conditional probabilities.

Course Outcomes:
At the end of course students are able to,

CO1	Analyze the data pertaining to attributes and to interpret the results.
CO2	To recognize and evaluate the relationship between two quantitative variables through simple linear correlation and regression .
CO3	To understand the relationship between sample statistics and population parameters.
CO4	Knowledge of interval estimation and estimation of parameters using method of moments and MLE.
CO5	To understand exact sampling distribution

Syllabus:

UNIT – I Introduction: Definition and scope of Statistics, concepts of statistical population and sample. Data: quantitative and qualitative, attributes, variables, scales of measurement - nominal, ordinal, interval and ratio. Presentation: tabular and graphic, including histogram and ogives.

UNIT - II Measures of Central Tendency: mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, moments, skewness and kurtosis.

UNIT - III Bivariate data: Definition, scatter diagram, simple and rank correlation. Simple linear regression, principle of least squares and fitting of polynomials, Application

UNIT –IV Theory of attributes, consistency of data, independence and association of attributes, measures of association and contingency.

UNIT - V Concept and analysis of Latin square of design, one missing plot technique for RBD and LSD. Factorial experiments, their advantages, Factorial experiments for 22 and 23 design, main effects, interaction and their analysis

TEXT BOOKS:

1. Gupta, S. C. and Kapoor, V.K. (2008): Fundamentals Of Mathematical Statistics, 4 thEdition (Reprint), Sultan Chand &Sons 2. Goon, A.M., Gupta M.K. & Das Gupta, Fundamentals of statistics, Vol.-I & II (2005).

Reference TextBook :

1. Miller, Irwin and Miller, Marylees(2006):John E. Freund’s Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia. 2. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.

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COURSE SEMESTER VIII (C.B.C.S)
BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Elective 5
Subject: Salesforce **Subject Code**: BTAI&ML802T-1

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	3+0	30	70	100

Aim: To make them learn the basic stastical methods and their applications in detail.
Prerequisite(S): Basic Knowledge about DMGT

Course Objectives:

- Tell how descriptive and inferential statistics are used in the modern world.
- Show an understanding of statistics encountered in daily life and recognize bias.
- Calculate basic probabilities including ones that use the addition and/or multiplication rules.
- Calculate conditional probabilities.

Course Outcomes:
At the end of course students are able to,

CO1	Understand core concepts of cloud, database essentials and framework of Salesforce
CO2	Explore the fundamental of apex and visual force for creating standard and custom controllers.
CO3	Use tools and techniques for exporting/importing data through Force.com and understanding the process of deployment of an app in the cloud.
CO4	Use batch processing to perform data intensive tasks offline,
CO5	Utilize external APIs to integrate any third party system with Salesforce.

Syllabus:

UNIT I : Basic cloud concepts, Introduction to Salesforce, Sales Cloud, Service Cloud, Collaboration Cloud, Security, Salesforce Customer Relationship Management Concepts, Types of Orgs

UNIT II : Database essentials: objects, fields, relationships, query language, data integration, working with custom objects, Database Security, Object-Level Security, Record-Level Security

UNIT III : Apex Language Fundamentals, Loops, Arrays and Collections, Exception Statements, Asynchronous Execution, Governor Limits, Database Integration in Apex, Database Records as Objects, Database Queries, DML Operations. Triggers, Object-Oriented Apex

UNIT IV : Creating Visualforce page, Customizing Visualforce Page, Standard Controllers, Custom Controllers and Controller Extensions, Using Static Resources, View Components

UNIT V : Batch processing, Batch Apex Concepts, Batchable Interface, Limits of Batch Apex, Scheduling Batch Apex, External ID's, Basic concepts of CSS, API's and Web Services

TEXT BOOKS :

1. Jason Ouellette; Development with the Force.com Platform, Second Edn, Addison Wesley, 2011.

RASHTRASANT TUKDOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FOUR YEAR BACHELOR OF ENGINEERING (B.TECH) DEGREE
COURSE SEMESTER VIII (C.B.C.S)
BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Elective 5

Subject: Optical Circuits and fibres **Subject Code**: BTAI&ML802T-2

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	3+0	30	70	100

Aim: To develop the ability to apply concepts in elementary physics to understanding of engineering applications.
Prerequisite(S): Basic Knowledge about Physics

Course Objectives:

- will be able to recognize and analyze phenomena of interference, diffraction and polarization of light waves
- will understand principles of laser action and basic working of many types of laser devices
- will understand geometrical theory of optical fibre communication and the phenomena of attenuation and dispersion of electrical signals in the fibre.

Course Outcomes:
At the end of course students are able to,

CO1	To develop the ability to apply concepts in elementary physics to understanding of engineering applications
CO2	To introduce more advanced physics concepts, which form the basis of modern engineering
CO3	To provide a sound foundation in mathematical formulation of concepts learnt and their applications
CO4	To elaborate the general nature of concepts learnt and of possibility of their cross-disciplinary application
CO5	To develop skills for numerical problem solving in areas covered

Syllabus:

Unit-I: Optics: Interference in thin films, division of amplitude and wavefront, wedge-shaped films, Newton's rings, antireflection coatings; Diffraction, single slit, double slit, Different types of polarization of light, Malus' law, production of plane polarized light, birefringence, wave plates.

Unit-II: Quantum Physics: Wave-particle duality, wave packets, Heisenberg uncertainty relations; Wave function, probability Schrodinger's equation, time dependent equation and its separation; Infinite potential and finite potential wells, phenomenon of tunneling.

Unit-III: LASERs and Optical Fibres: Interaction of matter and radiation, LASER, spontaneous and stimulated emission, population inversion; Common types of lasers and their applications; Optical fibres, structure, types, propagation in a fibre, modes of propagation, signal attenuation, signal distortion.

Unit-IV: Mass Spectrograph and Particle Accelerators: Principles of electron optics, cathode ray tube, cathode ray oscilloscope, mass spectrographs, particle accelerators.

Unit-V: Semiconductors: Band structure of solids, band diagrams of insulators, semiconductors and conductors, Fermi level in conductors and semiconductors, carrier concentration, conductivity, effective mass; Junction diode and its band diagram, depletion region and barrier potential, diode rectifier equation.

Text Books:

1. Fundamentals of Physics: D. Halliday, R. Resnik and J. Walker, John Wiley.

2. Engineering Physics: S. Jain and G.G. Sahasrabudhe, Universities Press (2010) / Applied Physics : S. Jain Sahastrabuddhe and S.M. Pande.

3. Introduction to Nanoscience and Nanotechnology: K.K. Chattopadhyay and A.N. Banerjee, PHI Learning (2009)

Reference Books:

1. Electronic Engineering Materials and Devices: J. Allison, TMH.

2. Engineering Physics: H. Malik and A.K. Singh, TMH (2010). 3. Engineering Physics: D.K. Bhattacharya and A.Bhaskaran, Oxford University Press (2010)

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COURSE SEMESTER VIII (C.B.C.S)
BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Elective 5

Subject: Business Intelligence **Subject Code**: BTAI&ML802T-3

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	3+0	30	70	100

Aim: To develop the ability to apply concepts in elementary Business Intelligence to understanding of engineering applications.

Prerequisite(S): Basic understanding of computer technology

Course Objectives:

- To analysis, and presentation of business information. The purpose of business intelligence is to support better business decision making
- To provides an overview of the technology of BI and the application of BI to an organization's strategies and goals

Course Outcomes:

At the end of course students are able to,

CO1	Introduce the concepts and components of Business Intelligence (BI)
CO2	Evaluate the technologies that make up BI (data warehousing, OLAP)
CO3	Define how BI will help an organization and whether it will help yours
CO4	Identify the technological architecture that makes up BI systems
CO5	Plan the implementation of a BI system

Syllabus:

Unit 1: Understanding Business Intelligence

The Challenge of Decision Making, What Is Business Intelligence, The Business Intelligence Value Proposition, The Combination of Business and Technology

Unit 2: Business Intelligence Technology Counterparts

Data Warehousing, What Is a Data Warehouse, Data Marts and Analytical Data, Organization of the Data Warehouse, Enterprise Resource Planning, Distributing the Enterprise, First ERP, then Business Intelligence, The Current State of Affairs, Customer Relationship Management ,CRM, ERP, and Business Intelligence, Customer Decisions, Decisions About Customers ,Business Intelligence and Financial Information

Unit 3: The Spectrum of Business Intelligence

Enterprise and Departmental Business Intelligence, Strategic and Tactical Business Intelligence, Power and Usability in Business Intelligence, Finding the Right Spot on the Continuum, Business Intelligence: Art or Science?

Unit 4: Business Intelligence User Interfaces

Querying and Reporting, Reporting and Querying Toolkits, Basic Approaches, Building Ad-Hoc Queries, Building On-Demand Self-Service Reports, Enhancing and Modifying, Data Access, Pull-Oriented Data Access, Push-Oriented Data Access, Dashboards ,EIS Is the Engine ,Metric System and KPIs, Business Intelligence Dashboards, Briefing Books

Unit 5: On-Line Analytical Processing (OLAP)

What Is OLAP ,OLAP and OLTP ,Operational Data Stores, Variations in Data and Approach, OLAP Applications and Functionality ,Multi-Dimensions, Thinking in More Than Two Dimensions, What Are the Possibilities, Drilling and Pivoting, OLAP, Architecture, Cubism, Tools ,ROLAP ,MOLAP, HOLAP ,Data Mining

TEXTBOOKS

1. David Loshin and David Loshin, “Business Intelligence”, First Edition, 2003.
2. Mike Biere, “Business intelligence for the enterprise”, Pearson Publication, First Edition.

REFERENCE Books

1. Larissa Terpeluk Moss, ShakuAtre , “Business intelligence roadmap” , First Edition.
2. CindiHowson, “Successful Business Intelligence: Secretsto making Killer BI Applications” McGraw-Hill Education, Second Edition, 2013.
3. Brain, Larson, “Delivering business intelligence with Microsoft SQL server 2008”, McGraw-Hill Education, 2008.

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COURSE SEMESTER VIII (C.B.C.S)
BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Elective 5

Subject: Cyber Crimes and Digital Forensics **Subject Code**: BTAI&ML802T-4

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	3+0	30	70	100

Aim: To develop the ability to apply concepts in elementary Digital Forensics to understanding of engineering applications.

Prerequisite(S): Basic Knowledge about Physics

Course Objectives:

- To understand the ethics and laws by which cyberspace is governed in our country and worldwide
- To understand techniques used for building digital forensics

Course Outcomes:

At the end of course students are able to,

CO1	Explain how to prepare a digital forensics investigation by taking a systematic approach
CO2	Analyze how the advent of computer technologies changes the nature of cybercrime
CO3	Determine what data to collect and analyze
CO4	Explain standard procedures for conducting forensic analysis
CO5	Apply different computer forensic tools to a given cybercrime scene

Syllabus:

Unit-I: Cyber Crime and computer crime Introduction to Digital Forensics, Definition and types of cybercrimes, electronic evidence and handling, electronic media, collection, searching and storage of electronic media, introduction to internet crimes, hacking and cracking, credit card and ATM frauds, web technology, cryptography, emerging digital crimes and modules

Unit-II: Basics of Computer organization, components of computer- input and output devices, CPU, Memory hierarchy, types of memory, storage devices, system software, application software, basics of computer languages.

Unit-III: Computer Forensics Definition and Cardinal Rules, Data Acquisition and Authentication Process, Windows Systems-FAT12, FAT16, FAT32 and NTFS, UNIX file Systems, mac file systems, computer artifacts, Internet Artifacts, OS Artifacts and their forensic applications

Unit-IV : Introduction to Forensic Tools, Usage of Slack space, tools for Disk Imaging, Data Recovery, Vulnerability Assessment Tools, Encase and FTK tools, Anti Forensics and probable counters, retrieving information, process of computer forensics and digital investigations

Unit-V: processing of digital evidence, digital images damaged SIM and data recovery, multimedia evidence, retrieving deleted data: desktops, laptops and mobiles, retrieving data from slack space, renamed file, ghosting, and compressed files..

Text Books:

1. C. Altheide& H. Carvey Digital Forensics with Open Source Tools, Syngress, 2011. ISBN: 9781597495868

2. BehrouzA.Forouzan, ―Cryptography• & Network Security‖, Tata McGraw Hill, India, New Delhi, 2009

Reference Books:

1. Charles P. Fleeger, "Security in Computing", Prentice Hall, New Delhi, 2009.

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COURSE SEMESTER VIII (C.B.C.S)
BRANCH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Elective 5

Subject: Natural Language Engineering **Subject Code**: BTAI&ML802T-5

Load (Th+Tu)	Credits (Th+Tu)	College Assessment Marks	University Evaluation	Total Marks
[36+0] hrs	3+0	30	70	100

Aim: To develop the ability to apply concepts in Natural Language Engineering to understanding of engineering applications.

Prerequisite(S): Basic understanding of Language processing

Course Objectives:

- To analysis, and presentation of natural language.
- To provides an overview of the technology of natural language and application

Course Outcomes:

At the end of course students are able to,

CO1	To analyze the natural language text
CO2	To define the importance of natural language
CO3	To understand the concepts Text mining
CO4	To illustrate information retrieval techniques
CO5	To understand information retrieval and lexical resources

Syllabus:

Unit 1: Overview and language modeling:

Overview: Origins and challenges of NLP-Language and Grammar-Processing Indian Languages- NLP Applications-Information Retrieval. Language Modeling: Various Grammar-based Language Models-Statistical Language Model

Unit 2: Word level and syntactic analysis:

Word Level Analysis: Regular Expressions-Finite State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar Constituency- Parsing-Probabilistic Parsing.

Unit 3: **Extracting Relations from Text: From Word Sequences to Dependency Paths:**

Introduction, Subsequence Kernels for Relation Extraction, A Dependency-Path Kernel for Relation Extraction and Experimental Evaluation.

Unit 4: Evaluating Self-Explanations in iSTART:

Word Matching, Latent Semantic Analysis, and Topic Models: Introduction, iSTART: Feedback Systems, iSTART: Evaluation of Feedback Systems

Unit 5: INFORMATION RETRIEVAL AND LEXICAL RESOURCES:

Information Retrieval: Design features of Information Retrieval Systems-Classical, Non classical, Alternative Models of Information Retrieval – valuation Lexical Resources: World Net-Frame Net Stemmers-POS Tagger- Research Corpora.

Text Books:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

2. Anne Kao and Stephen R. Poteet (Eds), "Natural Language Processing and Text Mining", Springer-Verlag London Limited 2007.

Reference Books:

1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", 2nd Edition, Prentice Hall, 2008.

2. James Allen, "Natural Language Understanding", 2nd edition, Benjamin/Cummings publishing company, 1995.