Regulation: GNITC – R18

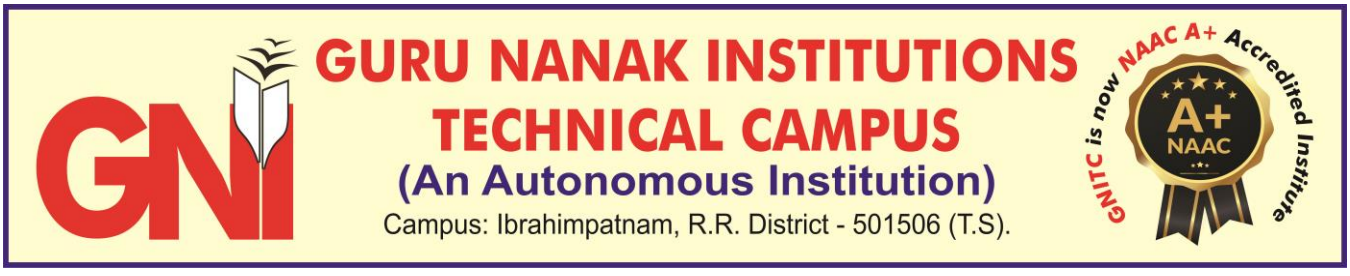
COURSE STRUCTURE
&
DETAILED SYLLABUS

for

III Year – II Sem
B.Tech. Degree Course

(Applicable for the batch admitted from 2020-21)

DEPARTMENT OF
COMPUTER SCIENCE & ENGINEERING
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)



GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

SCHOOL OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

COURSE STRUCTURE

(Applicable for the Batch admitted from 2020-2021)

V SEMESTER (THIRD YEAR)

S. No.	Subject Code	Group	Subject	L	T	P	Credits
1	18PC0AM01	PCC	Design and Analysis of Algorithms	3	0	0	3
2	18PC0AM02	PCC	Artificial Intelligence	3	0	0	3
3	18PC0AM03	PCC	Natural language processing	3	0	0	3
4	18PC0AM04	PCC	Computer Networks	3	0	0	3
5		PEC	Professional Elective – I	3	0	0	3
6		OE	Open Elective-I	3	0	0	3
7	18PC0AM05	PCC	Computer Networks Lab	0	0	3	1.5
8	18PC0AM06	PCC	Artificial Intelligence and Natural Language Processing Lab	0	0	3	1.5
9	**18MC0AM01**	MC	Environmental Science	3	0	0	0
6 Theory + 2 Lab +1 MC			**Total Credits**	**21**	**00**	**06**	**21**

VI SEMESTER (THIRD YEAR)

S. No.	Subject Code	Group	Subject	L	T	P	Credits
1	18PC0AM07	PCC	Web Technologies	3	0	0	3
2	18PC0AM08	PCC	Machine Learning	3	0	0	3
3	18HS0EN04	HSMC	Effective Technical Communication	3	0	0	3
4		PEC	Professional Elective – II	3	0	0	3
5		PEC	Professional Elective – III	3	0	0	3
6		OE	Open Elective-II	3	0	0	3
7	18PC0AM09	PCC	Web Technologies Lab	0	0	3	1.5
8	18PC0AM10	PCC	Machine Learning lab	0	0	3	1.5
9	18MCOAM02	MC	Fundamentals of Cyber Security	3	0	0	0
6 Theory + 2 Lab + 1 MC			**Total Credits**	**21**	**00**	**6**	**21**

L – Lecture **T** – Tutorial **P** – Practical

List of Electives

Professional Elective – 1:

1. Graph theory (18PE0AM1A)
2. Computer vision(18PE0AM1B)
3. Data Mining (18PE0AM1C)

Professional Elective – 2:

1. Pattern Recognition (18PE0AM2A)
2. Data Warehousing and Business Intelligence (18PE0AM2B)
3. Deep Learning (18PE0AM2C)

Professional Elective – 3:

1. Game Theory (18PE0AM3A)
2. Cryptography and Network Security (18PE0AM3B)
3. Information Retrieval System (18PE0AM3C)

List of Open Electives:

1. Python Programming for Artificial Intelligence (18OE0AM01)
2. Basics of Machine Learning (180E0AM02)
3. Artificial Intelligence (18OE0AM03)
4. Introduction to Natural Language Processing (18OE0AM04)

III Year B.Tech. Sem-II

L	T	P	C
3	0	0	3

WEB TECHNOLOGIES

PRE-REQUISITE:

1. A course on "Object Oriented Programming through JAVA"

COURSE OBJECTIVE:

This course is intended to learn the basic web concepts along with client-side and server-side scripting languages.

SYLLABUS:

UNIT-I

Introduction: Web Essentials - Clients, Servers and Communication between Client and Server, Markup Languages – Introduction to HTML, HTML Basic Tags – Headings, Font, Formatting text, Anchor, Image, Table, Lists, Entities, Forms, Cascading Style Sheets (CSS)

UNIT-II

Client-Side Programming: Introduction to JavaScript, Basic Syntax, Variables and Data Types, Statements, Operators, Literals, Functions, Objects, Arrays, Built-in Objects.

Host Objects: Browsers and the DOM: Introduction to the Document Object Model, Event Handling.

UNIT-III

Representing Web Data using XML: Structure of XML Documents and Vocabularies, Defining XML tags, attributes and values, Document Type Definition, XML Schemas, XML Namespaces, Template-based Transformation: XSLT, Displaying XML Documents in Browsers. Parsing XML Data - DOM and SAX parsers in java.

Web Servers: Importance of Web servers, Installation and configuration of Apache Tomcat.

UNIT-IV

Server-Side Programming - Common Gateway Interface(CGI), Introduction to Java Servlets: Servlet Architecture, The Servlet API, Servlet Life Cycle, Parameter Data, Handling HTTP Request and Responses, Cookies, Sessions, URL Rewriting, Connecting to a database using JDBC.

UNIT-V

Separating Programming and Presentation - JSP Processing, JSP Technology: Introduction to Java Server Pages - Declarations, Directives, Expressions, Code Snippets, Implicit objects, Running JSP Applications, Using Beans in JSP Pages, Support for the Model-View-Controller Paradigm, Connecting to database in JSP, Case Study.

TEXT BOOKS:

1. Web Technologies, Uttam K. Roy, Oxford University Press
2. Web Technologies: A Computer Science Perspective, Jeffrey C. Jackson, Pearson Education.

REFERENCE BOOKS:

1. Web programming - Building Internet Applications by Chris Bates, 2nd edition, WILEY Dreamtech
2. Deitel H.M. and Deitel P.J., "Internet and World Wide Web - How to program", Pearson International, 2012, 4th Edition.
3. Java Server Pages - Hans Bergsten, SPD O'Reilly
4. J2EE: The complete Reference By James Keogh, McGraw-Hill.
5. Programming World Wide Web - R.W Sebesta, Fourth Edition, Pearson
6. Web Technologies, Black Book, Dreamtech Press.
7. Gopalan N.P and Akilandeswari J, "Web Technology", Prentice Hall of India.

COURSE OUTCOMES:

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

CO 1 : design static and interactive web sites using HTML tags and CSS
CO 2 : gain knowledge of client side scripting using JavaScript
CO 3 : use XML data by parsing through different languages, and understand about web server
CO 4 : develop server side web applications using Java Servlets
CO 5 : implement the MVC architecture through JSP

III Year B.Tech. Sem-II

L	T	P	C
3	0	0	3

MACHINE LEARNING

PRE-REQUISITE:

1. A course on "Data Structures"

COURSE OBJECTIVE:

This course is intended to learn the basic concepts and techniques of machine learning, understand supervised and unsupervised learning techniques and to study the various probability-based learning techniques along with graphical models of machine learning algorithms

SYLLABUS:

UNIT-I

Introduction: Learning –Types of Machine Learning –Supervised Learning –The Brain and the Neuron –Design a Learning System –Perspectives and Issues in Machine Learning –Concept Learning Task –Concept Learning as Search –Finding a Maximally Specific Hypothesis –Version Spaces and the Candidate Elimination Algorithm –Linear Discriminants –Perceptron –Linear Separability –Linear Regression.

UNIT-II

Linear Models : Multi-layer Perceptron –Going Forwards –Going Backwards: Back Propagation Error –Multi-layer Perceptron in Practice –Examples of using the MLP –Overview –Deriving Back-Propagation –Radial Basis Functions and Splines –Concepts –RBF Network –Curse of Dimensionality –Interpolations and Basis Functions –Support Vector Machines.

UNIT-III

Tree and Probabilistic Models : Learning with Trees –Decision Trees –Constructing Decision Trees –Classification and Regression Trees –Ensemble Learning –Boosting –Bagging –Different ways to Combine Classifiers –Probability and Learning –Data into Probabilities –Basic Statistics –Gaussian Mixture Models –Nearest Neighbor Methods –Unsupervised Learning –K means Algorithms –Vector Quantization –Self Organizing Feature Map.

UNIT-IV

Dimensionality Reduction and Evolutionary Models : Dimensionality Reduction –Linear Discriminant Analysis –Principal Component Analysis –Factor Analysis –Independent

Component Analysis –Locally Linear Embedding –Isomap –Least Squares Optimization –Evolutionary Learning –Genetic algorithms –Genetic Offspring: -Genetic Operators – Using Genetic Algorithms –Reinforcement Learning –Overview –Getting Lost Example –Markov Decision Process.

UNIT-V

Graphical Models : Markov Chain Monte Carlo Methods –Sampling –Proposal Distribution –Markov Chain Monte Carlo –Graphical Models –Bayesian Networks – Markov Random Fields –Hidden Markov Models –Tracking Methods.

TEXT BOOKS:

1. Stephen Marsland, "Machine Learning –An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

2. Tom M Mitchell, "Machine Learning", First Edition, McGraw Hill Education, 2013.

REFERENCE BOOKS:

1. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", First Edition, Cambridge University Press, 2012.
2. Jason Bell, "Machine learning –Hands on for Developers and Technical Professionals", First Edition, Wiley, 2014.

3. Ethem Alpaydin, "Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)", Third Edition, MIT Press, 2014.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO 1: distinguish supervised, unsupervised and semi-supervised learning
CO 2: apply appropriate machine learning strategy for any given problem
CO 3: describe probabilistic models for classification and regression
CO 4: apply evolutionary models to improve classification efficiency
CO5: design systems that uses the appropriate graphical models of machine learning

III Year B.Tech. Sem-II

L	T	P	C
3	0	0	3

EFFECTIVE TECHNICAL COMMUNICATION

PRE-REQUISITES:

1. A course on "English"
2. A course on "English language communication skills lab"

COURSE OBJECTIVE:

The main objective of this course is to impart advance technical communication skills to students in terms of research, writing, editing, and design principles of technical and professional communication. Further, the course prepares students to design effective technical documentation such as Planning, drafting, revising, editing, researching, analyzing, synthesizing and applying information to create technical reports and professional documents through individual and collaborative writing to articulate complex ideas appropriate for target audiences. Moreover, the course inculcates business and professional ethics.

SYLLABUS:

UNIT – I

Information Design and Development- Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design.

UNIT – II

Technical Writing, Grammar and Editing- Technical writing process, Writing drafts and revising, technical writing style and language. editing strategies to achieve appropriate technical style. Basics of grammar, Introduction to advanced technical communication.

UNIT – III

Self-Development and Assessment-Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, Self-esteem. Managing Time; Personal memory, Rapid reading, Taking notes; Complex problem solving; Creativity.

UNIT – IV

Communication and Technical Writing- Public speaking, Oral presentation, Graphic presentation, Presentation aids, Group discussion, Interviews, Personality Development. Writing reports, project proposals, technical articles, manuals, official notes, business letters, memos, minutes of meetings, event report.

UNIT – V

Ethics- Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics, Role and responsibility of engineer, Work culture in jobs.

TEXT BOOKS:

1. David F. Beer, David McCurry, Guide to writing as an Engineer, John Willey, New York, 2004
2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)
3. Shiv Khera, You Can Win, Macmillan Books, New York, 2003

REFERENCE BOOKS:

1. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.
2. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)
3. Sharma, R, Mohan, K, Business Correspondence and Report Writing, TMH New Delhi 2002.
4. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN 0402213)

COURSE OUTCOMES:

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

CO 1: Understand the ethical, international, social, and professional constraints of audience, style, and content for writing situations and communicate effectively
a) among managers or co-workers and colleagues of an organization
b) between organizations, or between an organization and the public.

CO 2: Understand professional writing by studying management communication contexts and genres, researching contemporary business topics, analyzing quantifiable data discovered by researching, and constructing finished professional workplace documents.

CO 3: Practice the unique qualities of professional rhetoric and writing style, such as sentence conciseness, clarity, accuracy, honesty, avoiding wordiness or ambiguity, using direct order organization, readability, coherence and transitional devices and to present technical material orally with confidence and poise.

CO 4: Develop employability skills like time management, values and beliefs, self-esteem, perception and attitude, problem-solving skills and creativity.

CO 5: Understand Business ethics, Etiquettes in social and office settings.

III Year B.Tech. Sem-II

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PATTERN RECOGNITION

PRE-REQUISITES:

1. Students are expected to have knowledge in linear signals and systems, Fourier Transform, basic concepts of linear algebra, probability theory and programming techniques; knowledge of Digital Signal Processing is desirable.
2. A course on "Computational Mathematics"
3. A course on "Computer Oriented Statistical Methods"

COURSE OBJECTIVE:

This course provides a comprehensive study of application-oriented machine learning and pattern recognition techniques.

SYLLABUS:

UNIT-I

Introduction: What is Pattern Recognition, Data Sets for Pattern Recognition, and Different Paradigms for Pattern Recognition.

Representation: Data Structures for Pattern Representation, Representation of Clusters, Proximity Measures, Size of Patterns, Abstractions of the Data Set.

UNIT-II

Feature Extraction, Feature Selection, Evaluation of Classifier, Evaluation of Clustering.

Nearest Neighbor Based Classifier: Nearest Neighbor Algorithm, Variants of the NN Algorithm use of the Nearest Neighbor Algorithm for Transaction Databases, Efficient Algorithms, Data Reduction, Prototype Selection.

UNIT-III

Bayes Classifier: Bayes Theorem, Minimum Error Rate Classifier, Estimation of Probabilities, Comparison with the NNC, Naïve Bayes Classifier, Bayesian Belief Network.

Hidden Markov Models: Markov Models for Classification, Hidden Morkov Models, Classification using HMMs.

UNIT-IV

Decision Trees: Introduction, Decision Tree for Pattern Classification, Construction of Decision Trees, Splitting at the Nodes, Overfitting and Pruning, Examples of Decision Tree Induction.

Support Vector Machines: Introduction, Learning the Linear Discriminant Functions, Neural Networks, SVM for Classification.

UNIT-V

Combination of Classifiers: Introduction, Methods for Constructing Ensembles of Classifiers, Methods for Combining Classifiers

Clustering: Why is Clustering Important, Hierarchical Algorithms, Partitional Clustering, Clustering Large Data Sets.

TEXT BOOK:

1. Pattern Recognition: An Algorithmic Approach: Murty, M. Narasimha, Devi, Susheela, Spinger Pub,1st Ed.

REFERENCE BOOKS:

1. Machine Learning - Mc Graw Hill, Tom M. Mitchell.
2. Fundamentals Of Speech Recognition: Lawrence Rabiner and Biing- Hwang Juang. Prentice-Hall Pub.

COURSE OUTCOMES:

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

CO1: Identify the theory, benefits, inadequacies and possible applications of various machine learning and pattern recognition algorithms
CO2: Employ suitable machine learning techniques in classification
CO3: Contrast the categorization of clustering and decision problems
CO4: Ability to apply classification algorithms to problems
CO5: Ability to perform the clustering algorithms.

III Year B.Tech. Sem-II

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DATA WAREHOUSING AND BUSINESS INTELLIGENCE

PRE-REQUISITE:

A course on "pattern recognition".

COURSE OBJECTIVES:

This course is designed to:

1. Familiarize with BI and DW in today's perspective.
2. Introduce the Architecture of BI and DW. DM Functionalities – Classification of DM Systems and Data Pre processing

SYLLABUS:

UNIT-I

Data Warehouse: Basic Concepts: What Is a Data Warehouse? Differences between Operational Database Systems and Data Warehouses, But, Why Have a Separate Data Warehouse, Data Warehousing: A Multitiered Architecture, Data Warehouse Models: Enterprise Warehouse, Data Mart and Virtual Warehouse,
Extraction, Transformation, and Loading, Metadata Repository.
Data Warehouse Modeling: Data Cube and OLAP : Data Cube: A Multidimensional Data Model, Stars, Snowflakes, and Fact Constellations: Schemas for Multidimensional Data Models, Dimensions: The Role of Concept Hierarchies ,
Measures: Their Categorization and Computation, Typical OLAP Operations,
A Starnet Query Model for Querying Multidimensional Databases.

UNIT-II

A Business Analysis Framework for Data Warehouse Design: Data Warehouse Design Process, Data Warehouse Usage for Information Processing, From Online Analytical Processing to Multidimensional, Data Mining.
Data Warehouse Implementation: Efficient Data Cube Computation: An Overview, Indexing OLAP Data: Bitmap Index and Join Index, Efficient Processing of OLAP Queries, OLAP Server Architectures: ROLAP versus MOLAP versus HOLAP.

UNIT-III

Introduction: Why Data Mining? Moving toward the Information Age, Data Mining as the Evolution of Information Technology, **What Is Data Mining?** **What Kinds of Data Can Be Mined?** Database Data, Data Warehouses, Transactional Data, Other Kinds of Data
What Kinds of Patterns Can Be Mined?: Class/Concept Description: Characterization and Discrimination, Mining Frequent Patterns, Associations, and Correlations, Classification and Regression for Predictive Analysis, Cluster Analysis, Outlier Analysis, Are All Patterns Interesting?
Which Technologies Are Used? : Statistics , Machine Learning ,Database Systems and Data Warehouses , Information Retrieval, **Which Kinds of Applications Are Targeted? :** Business Intelligence, Web Search Engines, **Major Issues in Data Mining:** Mining Methodology, User Interaction , Efficiency and Scalability, Diversity of Database Types ,Data Mining and Society .

UNIT-IV

Data Preprocessing : Data Preprocessing: An Overview - Data Quality: Why Preprocess the Data? Major Tasks in Data Preprocessing ,
Data Cleaning: Missing Values, Noisy Data, Data Cleaning as a Process ,
Data Integration: Entity Identification Problem, Redundancy and Correlation Analysis, Tuple Duplication, Data Value Conflict Detection and Resolution,
Data Reduction : Overview of Data Reduction Strategies, Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection, Regression and Log-Linear Models: Parametric, Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation
Data Transformation and Data Discretization: Data Transformation Strategies Overview, Data Transformation by Normalization , Discretization by Binning, Discretization by Histogram Analysis, Discretization by Cluster, Decision Tree, and Correlation Analyses, Concept Hierarchy Generation for Nominal Data

UNIT-V

Business Intelligence Case Study-1: Retail Sales, Business Intelligence Case Study-2: Healthcare

TEXT BOOK:

"Data Mining – Concepts and Techniques", Jiawei Han & Micheline Kamber, Elsevier, Third Edition, 2014
Yhr DataWarehouse Toolkit by Ralph Kimball,Margy Ross, Third Edition,Wiley.

REFERENCE BOOKS:

1. "Data Warehousing, Data Mining &OLAP", Alex Berson and Stephen J. Smith, Tata McGraw-Hill, Tenth reprint, 2007.
2. "Building the Data Warehouse", W. H. Inmon, Wiley Dreamtech India Pvt. Ltd., Fourth Edition, 2008.
3. "Data Mining Techniques", Arun K Pujari, Universities Press (India) Private Limited,

Eighth Impression, 2005.
4. Data Warehousing Fundamentals by Paulraj Ponnian,,Jhon Willey
5. Data Mining for Business Intelligence:Concepts, Techniques, and Applications in Microsoft Office by G. Shmueli, N.R. Patel, P.C. Bruce

COURSE OUTCOMES:

By the end of the course, students will be able to

CO 1: understand Need and trends for data warehousing
CO 2: understand the implementation of Data Warehousing
CO 3: define the types of the data to be mined and apply appropriate data mining techniques
CO 4: discuss preprocessing methods for any given raw data
CO 5: Understand the case studies on retail sales and health care

III Year B.Tech. Sem-II

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3	0	0	3

DEEP LEARNING

COURSE OBJECTIVE:

This course is intended to introduce the concepts of deep learning, deep feedforward networks, regularization for deep learning, optimization, convolutional networks

SYLLABUS:

UNIT-I

Deep Feedforward Networks: Example: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms, Historical Notes.

UNIT-II

Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop, and Manifold Tangent Classifier.

UNIT-III

Optimization for Training Deep Models, How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and MetaAlgorithms.

UNIT-IV

Convolutional Networks:The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior,Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution.

Algorithms, Random or Unsupervised Features, The Neuro-scientific Basis for Convolutional Networks, Convolutional Networks and the History of Deep Learning.

UNIT-V

Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Other Applications.

TEXT BOOK:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning (Adaptive Computation and Machine Learning series), MIT Press.

REFERENCE BOOKS:

1. Li Deng and Dong Yu, Deep Learning Methods and Applications, Foundations and Trends®in Signal Processing Volume 7 Issues 3-4, ISSN: 1932-8346.
2. Dr. N.D. Lewis, Deep Learning Made Easy with R A Gentle Introduction for Data Science.Create Space Independent Publishing Platform (January 10, 2016).
3. François Chollet, JJ Allaire, MEAP Edition Manning Early Access Program Deep Learning with R Version 1, Copyright 2017 Manning Publications

COURSE OUTCOMES:

By the end of the course, students should be able to:

CO 1: acquire the idea of deep feedforward networks
CO 2: employ the regularization for deep Learning
CO 3: apply optimization for training deep models
CO 4: implement the convolutional networks
CO 5: develop the deep learning applications

III Year B.Tech. Sem-II

L	T	P	C
3	0	0	3

GAME THEORY

PRE-REQUISITE: NIL

COURSE OBJECTIVE:

The aim of the course is to provide an introduction to the study of game theory which has found wide applications in economics, political science, sociology, engineering apart from disciplines like mathematics and biology

SYLLABUS:

UNIT-I

Introduction to Game Theory: What is game theory? Theory of rational choice.
Strategic Games and Nash Equilibrium: Strategic games: examples, Nash equilibrium: concept and examples, Best response functions, Dominated Actions, Symmetric games and symmetric equilibria.

UNIT-II

Illustrations of Nash Equilibrium: Cournot's model of duopoly market, Bertrand's model of oligopoly, Electoral Competition, War of Attrition Auctions, Accident Laws.

UNIT-III

Mixed Strategy Equilibrium: Introduction Strategic games in which players may randamize, Mixed strategy Nash equilibrium, Dominated Actions, Formation of Players' beliefs.

UNIT-IV

Extensive Games and Nash Equilibrium: Introduction to extensive games with perfect information, Strategies and outcomes, Nash equilibrium, Sub game perfect Nash equilibrium, Backward induction.

UNIT-V

Illustrations of Extensive Games and Nash Equilibrium: Introduction, the ultimatum game and the holdup game , stackelberg's models of duopoly, Buying votes.

TEXT BOOKS:

1. (IGT) Martin Osborne, An Introduction to Game Theory, Oxford University Press, 2003
2. (AT) Vijay Krishna, Auction Theory, Academic Press.

REFERENCE BOOKS:

1. Osborne, M.J. An Introduction to Game Theory, Oxford University Press, 2004
2. Mas-Colell, A., M.D. Whinston and J.R. Green Microeconomic Theory, Oxford University Press, 1995
3. Gibbons, R. A Primer in Game Theory, Pearson Education, 1992

COURSE OUTCOMES:

By the end of the course, students should be able to:

CO 1: acquire the idea of game theory
CO 2: apply nash equilibrium for accident laws
CO 3: realize the mixed strategy nash equilibrium
CO 4: implement the extensive games
CO 5: illustrate extensive games

III Year B.Tech. Sem-II

L	T	P	C
3	0	0	3

CRYPTOGRAPHY AND NETWORK SECURITY

PRE-REQUISITE:
A Course on "Computer Networks"

COURSE OBJECTIVE:

This course is intended to impart knowledge on network security issues, services, goals and mechanisms and security of communication systems, networks and protocols

SYLLABUS:

UNIT-I

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

UNIT-II

Conventional Encryption: Principles, Conventional encryption algorithms (DES, AES, RC4, and Blowfish), cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.

UNIT-III

Number Theory: Modular Arithmetic, Euclid's Algorithm, Fermat's and Euler's Theorem, Chinese Remainder Theorem, Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service.

UNIT-IV

Email privacy: Pretty Good Privacy (PGP) and S/MIME.

IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

UNIT-V

Web Security: Requirements, Secure Socket Layer (SSL) and Transport

Layer Security (TLS), Secure Electronic Transaction (SET).
Intruders, Viruses and related threats, Firewall Design principles, Trusted Systems, Intrusion Detection Systems.

TEXT BOOKS:

1. "Cryptography and Network Security" by William Stallings 3rd Edition, Pearson Education.
2. "Applied Cryptography" by Bruce Schneier.

REFERENCE BOOK:

1. Cryptography and Network Security by Behrouz A. Forouzan.

COURSE OUTCOMES:

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

CO1: Define cryptography and network security concepts

CO2: Explain security principles in system design

CO3: Choose and investigate vulnerabilities, security threats and mechanisms to counter them.

CO4: Describe Email privacy and IP Security

CO5: Explain Web Security and Secure Electronic Transaction

III Year B.Tech. Sem-II

L	T	P	C
3	0	0	3

INFORMATION RETRIEVAL SYSTEM

PRE-REQUISITE:

A course on "Computer Programming and Data Structures"

COURSE OBJECTIVES:

1. To learn the important concepts and algorithms in IRS
2. To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems

SYLLABUS:

UNIT - I

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

UNIT - II

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction

Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.

UNIT - III

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

UNIT - IV

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext

Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies

UNIT - V

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems, Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval

TEXT BOOKS:

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer

REFERENCE BOOKS:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms,Prentice Hall, 1992.
2. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval By Yates and Neto Pearson Education

COURSE OUTCOMES:

After completion of course, students would be able to:

CO1: Apply IR principles to locate relevant information large collections of data
CO2: Design different document clustering algorithms
CO3: Implement retrieval systems for web search tasks.
CO4: Design an Information Retrieval System for web search tasks
CO5: Design Text Search Algorithms

III Year B.Tech. Sem-II

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ARTIFICIAL INTELLIGENCE

PRE-REQUISITES:

1. A Course on "Object Oriented Programming through JAVA"
2. A Course on "Formal Languages & Automata Theory"

COURSE OBJECTIVE:

The aim of the course is to introduce the concepts of state space representation, heuristic search, statistical reasoning, planning and artificial neural networks.

SYLLABUS:

UNIT- I

What is Artificial Intelligence: The AI Problems, the underlying assumption, what is an AI technique, The Level of Model, Criteria for success. Problems, Problem Spaces and Search: Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the design of search program.

UNIT- II

Heuristic Search Techniques: Generate–and–Test, Hill Climbing-Simple Hill climbing, Steepest ascent Hill climbing, Simulated Annealing, Best–First Search-OR graphs, A* Algorithm, Problem Reduction-AND-OR graphs, AO* Algorithm, Constraint Satisfaction, Means-Ends Analysis. Knowledge Representation: Representation and Mapping, Approaches to Knowledge representations, Issues in Knowledge Representation and Mapping. Weak Slot Filler Structures: Semantic Nets, Frame. Strong Slot Filler Structures: Conceptual Dependency, Scripts, CYC.

Unit - III

Using Predicate Logic: Representing Simple Facts in Predicate Logic, Representing Instance and ISA Relations, Computable Functions and Predicates, Resolution, Natural deduction. Representing Knowledge Using Rules: Procedural Vs Declarative Knowledge, Forward Vs Backward Reasoning, Matching, Control Knowledge.

Unit – IV

Statistical Reasoning: Probability and Bayes Theorem, Certainty Factors and Rule-based Systems, Bayesian Networks. Game Playing: Overview, Mini Max Search procedures, adding Alpha–Beta Cutoffs. Planning System: Overview, An example domain: The Blocks World, Components of a Planning System, Goal Stack Planning.

Unit – V

Artificial Neural Networks: Introduction, Artificial Neural networks- The Neuron Model, Activation functions, Neural network architectures, Single layer feed forward neural network-Perceptron: Neuron Model, Learning Algorithms for Perceptron, Perceptron for OR function, limitation of Perceptron, Multi-Layer feed forward neural network-Back-Propagation Training algorithm for FFNN, Weight updated rule, Delta Rule(Least Means Square) for error minimization.

TEXT BOOKS:

1. Artificial Intelligence 3rd Edition, Elaine Rich and Kevin Knight, Shivashankar B. Nair, Tata McGraw Hill Publication.
2. Artificial Intelligence, Saroj Kaushik, Cengage Publication.

REFERENCE BOOKS:

1. Artificial Intelligence A Modern Approach, Second Edition, Stuart Russell, Peter Norvig, PHI/ Pearson Education.
2. Principles of Artificial Intelligence, Nils J. Nilson.
3. Artificial Intelligence, 3rd Edition, Patrick Henry Winston, Pearson Education.
4. Artificial Intelligence Illuminated, Ben Coppin, Narosa Publication.

COURSE OUTCOMES:

By the end of the course, students will be able to

CO 1: describe the concepts of artificial intelligence required to formulate an efficient problem space for a given problem

CO 2: apply heuristic search techniques, and possess the skill for representing knowledge using the appropriate technique

CO 3: comprehend the predicate logic and fundamentals of knowledge representation, inference and theorem proving

CO 4: demonstrate working of reasoning in the presence of incomplete and/or Uncertain information thus possess the awareness of game playing and planning

CO 5: distinguish the types of neural networks, apply the methods of training neural networks and application of artificial neural networks.

III Year B.Tech. Sem-II

L	T	P	C
3	0	0	3

INTRODUCTION TO NATURAL LANGUAGE PROCESSING

PRE-REQUISITES: NIL

COURSE OBJECTIVE:
This course is introduced to study the problems and solutions of NLP and their relation to linguistics and statistics

SYLLABUS:

UNIT-I

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches.

UNIT-II

Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues.

UNIT-III

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT-IV

Predicate-Argument Structure, Meaning Representation Systems, Discourse Context and World Knowledge.

UNIT-V

Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross lingual Language Modelling.

TEXT BOOK:

1. Multilingual natural Language Processing Applications: From Theory to Practice, Daniel M. Bikel and Imed Zitouni, Pearson Publication.

REFERENCE BOOKS:

1. Speech and Natural Language Processing, Daniel Jurafsky & James H Martin, Pearson Publications.
2. Natural Language Processing and Information Retrieval, Tanvier Siddiqui, U.S. Tiwary.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO 1: illustrate sensitivity to linguistic phenomena to model with formal grammars
CO 2: identify proper experimental methodology for evaluating empirical NLP systems
CO 3: estimate parameters using supervised and unsupervised training methods
CO 4: analyze natural language processing algorithms
CO 5: design different language modelling techniques

III Year B.Tech. Sem-II

L	T	P	C
3	0	0	0

FUNDAMENTALS OF CYBER SECURITY

PRE-REQUISITES: NIL

COURSE OBJECTIVE:
This course is introduced to familiarize the need for cyber security, various threats, counter measures and cyber laws.

SYLLABUS:

UNIT-I
Introduction to Cyber Security: Basic cyber security concepts, motive of attackers, active attacks, passive attacks, cyber crime and information security, computer criminals, classification of cyber crimes: E-Mail spoofing, spamming, cyber defamation, internet time threat, salami attack, data diddling, forgery, web jacking, newsgroup spam, industrial espionage, hacking, online frauds, software piracy, computer sabotage, email bombing, usenet newsgroup as the source of cybercrimes, computer network intrusions, password sniffing, identity theft, cyber threats-cyber warfare, CIA traid.

UNIT-II
Cybercrime: Mobile and Wireless Devices: Introduction, proliferation of mobile and wireless devices, trends in mobility, credit card frauds in mobile and wireless computing era, security challenges posed by mobile devices, authentication service security, attacks on mobile/cell phones. Tools and methods used in cyber crime: phishing, password cracking.

UNIT-III
Cyber Law – The Legal Perspectives: Introduction, Cybercrime and the Legal Landscape around the World, Why do we need cyberlaws: the indian context, the indian IT act.
Cyber Forensics: Introduction, historical background of cyber forensics, digital forensics science, the need for computer forensics, cyber forensics and digital evidence, digital forensics lifecycle, challenges in computer forensics.

UNIT-IV
Cyber Security - Organizational implications: Introduction, cost of cyber crimes and IPR issues, web threats for organizations, security and privacy implications from cloud computing, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes, the psychology, mindset and skills of hackers and other cyber criminals.

UNIT-V

Cyber Crime Examples: Introduction, Real-life Examples: Official website of Maharashtra Government hacked, E-Mail spoofing instances, Indian banks lose millions of rupees, Parliament attack, Pune city police bust Nigerian racket.

Mini-Cases: The Indian case of online gambling, an Indian case of intellectual property crime, illustrations of financial frauds in cyber domain.

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley.
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, "Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives", CRC Press.

REFERENCE BOOKS:

1. James Graham, Richard Howard and Ryan Otson, "Cyber Security Essentials", CRC Press.
2. Chwan-Hwa(john) Wu, J. David Irwin, "Introduction to Cyber Security", CRC Press.

COURSE OUTCOMES:

By the end of the course, students will be able to

CO 1: comprehend the basics of cyber security
CO 2: acquire knowledge on security for mobile and wireless devices
CO 3: realize the Indian and Global Act concerning cyber crimes
CO 4: identify the cyber etiquette and correlate to the organization
CO5: employ security and privacy methods in the development of modern applications

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)
SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)
COURSE STRUCTURE
(Applicable for the Batch admitted from 2020-2021)

III Year B.Tech. Sem-II

L	T	P	C
0	0	3	1.5

WEB TECHNOLOGIES LAB

CO-REQUISITE:

1. A course on "Web Technologies"

COURSE OBJECTIVE:

This lab aims to provide hands-on experience on web technologies and client-server application using web technologies and database, server side programming with Java Servlets and JSP

SYLLABUS:

LIST OF PROGRAMS:

1. Develop static pages (using only HTML) of a Bank. The website should contain the following pages.
    a. Home page
    b. Registration and User Login
    c. User Profile Page
    d. Transactions
2. Validate the Registration and User Login pages using JavaScript.
3. Using JavaScript:
    a. Implement Mouse Events
    b. Implement Keyboard Events
4. Create and save an XML document on the server, which contains 10 users information. Write a Java / JavaScript program, which takes User Id as an input and returns the user details by taking the user information from the XML document.
5. Bean Assignments
    a. Create a JavaBean which gives the exchange value of INR (Indian Rupees) into equivalent American/Canadian/Australian Dollar value.
    b. Create a simple Bean to display the count of number of clicks of a button.
    c. Create and implement Calculator containing numberpad
    d. Create Traffic Light simulation using buttons.
6. Install and configure TOMCAT web server. Write a Java Servlet program to verify the User credentials of the User Login page by connecting to the MySql database.

7. Redo the previous task using JSP. Follow the MVC architecture while doing the website.
8. Introduction to the UML diagrams and Model the case study of ATM System.
9. Model the case study of Hospital Management System

COURSE OUTCOMES:

Upon successful completion of this Lab, students will be able to:
CO 1: design and model the real time applications using UML diagrams
CO 2: design web pages using HTML, CSS, JavaScript and XML
CO3: apply client-server principles to develop scalable and enterprise web applications
CO 4: develop interactive and dynamic web applications
CO 5: build up the database connectivity among the applications

III Year B.Tech. Sem-II

L	T	P	C
0	0	3	1.5

MACHINE LEARNING LAB

CO-REQUISITE:

1. A course on "Machine Learning"

COURSE OBJECTIVE:

This lab course is intended to provide a hands-on experience using machine learning concepts, which gives a practical exposure of machine learning algorithms.

SOFTWARE REQUIRED: Python

SYLLABUS:

LIST OF PROGRAMS

1. Extract the data from database using python
2. Implement k-nearest neighbours classification using python
3. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of kmeans clustering with 3 means (i.e., 3 centroids)

VAR1	VAR2	CLASS
1.713	1.586	0
0.18	1.786	1
0.353	1.24	1
0.94	1.566	0
1.486	0.759	1
1.266	1.106	0
1.54	0.419	1
0.459	1.799	1
0.773	0.186	1

4. The following training examples map descriptions of individuals onto high, medium and low credit-worthiness.

medium skiing design single twenties no → highRisk
high golf trading married forties yes → lowRisk
low speedway transport married thirties yes → medRisk
medium football banking single thirties yes → lowRisk
high flying media married fifties yes → highRisk
low football security single twenties no → medRisk
medium golf media single thirties yes → medRisk
medium golf transport married forties yes → lowRisk
high skiing banking single thirties yes → highRisk

low golf unemployed married forties yes → highRisk

Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `medRisk' in the dataset?

5. Implement linear regression using python
6. Implement Naïve Bayes theorem to classify the English text
7. Implement an algorithm to demonstrate the significance of genetic algorithm
8. Implement the finite words classification system using Back-propagation algorithm

TEXT BOOKS:

1. Stephen Marsland, "Machine Learning –An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
2. Tom M Mitchell, "Machine Learning", First Edition, McGraw Hill Education, 2013.

REFERENCE BOOKS:

1. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", First Edition, Cambridge University Press, 2012.
2. Jason Bell, "Machine learning–Hands on for Developers and Technical Professionals", First Edition, Wiley, 2014
3. EthemAlpaydin, "Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)", Third Edition, MIT Press, 2014

COURSE OUTCOMES:

After completion of the course, students will be able to:

CO1: Understand the implementation procedure of all machine learning Algorithms.

CO2: Apply appropriate data sets to the Machine Learning algorithms.

CO3: Apply machine learning algorithms for classification

CO4: Design and develop machine learning algorithms for patterns analysis

CO5: Understand the implementation procedures for the machine Learning algorithms.