

**Autonomous Programme Structure of  
Third Year B Tech Information Technology  
Academic Year 2018-2019**

<b>Third Year B. Tech. Information Technology Semester – 5</b>										
<b>Course Code</b>	<b>Course Title</b>	<b>Teaching Scheme</b>			<b>Examination Scheme</b>				<b>Marks</b>	<b>Credit</b>
		<b>Hours /Week</b>								
		<b>Lecture</b>	<b>Tutorial</b>	<b>Practical</b>	<b>In Semester</b>	<b>End Semester</b>	<b>Oral</b>	<b>Practical</b>		
IT 3101	Database Management Systems	3	0	0	50	50	0	0	100	3
IT 3102	Theory of Computations	3	1	0	50	50	0	0	100	4
IT 3103	Machine Learning	3	1	0	50	50	0	0	100	4
OEHS 3101	Open Elective-I	3	0	0	50	50	0	0	100	3
PEIT 3101	Program Elective- I	3	0	0	50	50	0	0	100	3
IT 3104	Database Management Systems Laboratory	0	0	4	25	0	0	25	50	2
IT 3105	Machine Learning Laboratory	0	0	4	25	0	0	25	50	2
PEIT 3106	Program Elective I Laboratory	0	0	2	0	0	25	0	25	1
AC 3101	Audit Course	0	0	2	0	0	0	0	0	0
	<b>Total</b>	<b>15</b>	<b>2</b>	<b>12</b>	<b>300</b>	<b>250</b>	<b>25</b>	<b>50</b>	<b>625</b>	<b>22</b>
	<b>Grand Total</b>	<b>29</b>			<b>625</b>				<b>625</b>	<b>22</b>

**OEHS 3101 Elective 1**

1. Entrepreneurship Development
2. Introduction to Digital Marketing
3. Intellectual Property Rights
4. Project Management

**PEIT 3101 Program Elective-I**

1. Computer Graphics and Animation
2. Artificial Intelligence
3. Business Intelligence
4. Object Oriented Modeling and Design

AC 3101: Audit Course: Employability Skills Development

# IT 3101 Database Management Systems

## Teaching Scheme:

Lectures: 3 hrs/week

Tutorial: NIL

## Examination Scheme:

In-Semester: 50 marks

End-Semester: 50 marks

Credits: 3

**Prerequisites:** Data structures

## Course Objectives:

Familiarize students with

1. Concepts and applications of database management.
2. Different models and normalization used for database design.
3. Query languages in databases.
4. Basic issues of database design and utilization.

## Course Outcomes:

Students should be able to

1. Identify basic purpose and functions of database management system.
2. Build appropriate database schema for the given application.
3. Make use of query commands and concurrency control protocols.
4. Analyze database for given problem domain.

### Unit – I: Introduction to DBMS

(07)

Database Concepts, Database System Architecture, Data Models, entity, attributes, relationships, constraints, keys, E-R Model, conventions, EER Model, converting ER/EER diagram into tables. Relational Model, Attributes and Domains, Referential Integrities. Relational Algebra: Basic Operations

### Unit – II: Database Design and SQL

(07)

Database Design, Functional Dependency, Purpose of Normalization, Data Redundancy, Anomalies. Normal forms 1NF, 2NF, 3NF, BCNF, 4NF and 5NF. Introduction to SQL, SQL Data Types, DDL, DML and DCL queries, Views, Indexes, Null handling, Nested Queries. PLSQL. Query optimization

### Unit – III: Database Transactions

(07)

Basic concept of a Transaction, Transaction Management, Properties of Transactions, Concept of Schedule, Serial Schedule, Serializability, Conflict and View, Cascaded Aborts, Recoverable and Non recoverable Schedules.

**Unit – IV: Concurrency control and Advanced Database Architectures (07)**

**Architectures**

Concurrency Control, Locking Methods, Deadlocks, Protocols, Recovery Methods, Database Architectures, Centralized and Client-Server Architectures, 2 Tier and 3 Tier Architecture, Indexing and hashing, Parallel Databases, Distributed Databases.

**Unit – V: No SQL and semi structured Data Management (07)**

Introduction to Big Data, No SQL Databases, MongoDB, Map reduce. XML Databases, DTD, XML Schemas, XQuery, XPath. JSON

**Unit – VI: Data Warehousing and Data Mining (07)**

Data Warehousing, Architecture and features of Data Warehouse, ETL Process, OLAP. Data Mining, Knowledge Discovery, Data Mining techniques, Applications of data mining.

**Text Books:**

1. Silberschatz A., Korth H., Sudarshan S, Database System Concepts, McGraw Hill Publication, ISBN- 0-07-120413-X, Sixth Edition.
2. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Pearson Publication, ISBN-13: 978-0-136-08620-8

**Reference Books:**

1. S. K. Singh, Database Systems: Concepts, Design and Application, Pearson Publication, ISBN-978-81- 317-6092-5.
2. C J Date, An introduction to Database Systems, Addition-Wesley.
3. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill, 3rd Edition, 2003.
4. Reema Thareja, Data warehousing, Oxford University Press. ISBN 0195699610.

## IT 3102 Theory of Computations

### Teaching Scheme:

Lectures: 3 hrs/week

Tutorial: 1 hr/week

### Examination Scheme:

In-Semester: 50 marks

End-Semester: 50 marks

Credits: 4

### Prerequisites: Discrete structures

### Course Objectives:

Familiarize students with

1. Abstract computing models.
2. Types and applications of formal grammars
3. Application of Theory of Computer Science in System Programming

### Course Outcomes:

Students should be able to

1. Construct abstract computing models
2. Apply the concepts of formal grammars
3. Analyze Decidable Languages and Reducibility
4. Evaluate computing models.

### Unit – I Fundamentals (07)

Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non-deterministic finite automaton, transition diagrams and Language recognizers. NFA to DFA conversion

### Unit – II Finite Automata with application (07)

NFA with  $\epsilon$  transitions - Significance, acceptance of languages, Equivalence between NFA with and without  $\epsilon$  transitions, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Mealy machines.

**Lexical analyzer** as an application of Finite Automaton. Introduction to Lex tool

### Unit – III Regular Expression and Grammar Formalism (07)

**Regular expressions:** Identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets

**Introduction to Grammar:** derivation trees, sentential forms. Right most and leftmost derivation of strings, Chomsky hierarchy

**Unit – IV Regular Grammar with application (07)**

Regular grammars-right linear and left linear grammars, equivalence between regular grammar and FA, inter conversion, Parsing techniques, Top-down parsing, Bottom-up parsing

**Recursive descent parser** as an application of Regular Grammar. . Introduction to YACC tool

**Unit – V Context free grammars and Push down automata (07)**

Context Free Grammars-Ambiguity in context free grammars. Minimization of Context Free Grammars. Normal Forms Chomsky Normal Form, Greibach Normal Form, conversion to CNF and GNF

**Push down automata-** definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, inter conversion,

**Unit – VI Turing Machine (07)**

Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church's hypothesis, counter machine, types of Turing machines, Universal Turing Machine, decidability/un decidability of problems, Halting problem Correspondence problem, Turing reducibility

**Modularized programming concept** as an application of Turing machines

**Text Books**

1. Daniel I.A. Cohen, "Introduction to Computer Theory" Wiley-India, ISBN: 978-81-265-1334-5
2. Vivek Kulkarni, "Theory of Computation", Oxford University Press, ISBN-13: 978-0-19-808458-7.
3. D.M. Dhamdhere, "Systems Programming and Operating Systems", Tata McGraw-Hill, ISBN-13:978-0-07-463579-7

**Reference Books**

1. John C. Martin, "Introduction to language and theory of computation", Tata McGraw Hill, Third edition, ISBN 0-07-049939-X
2. Hopcroft Ulman, "Introduction To Automata Theory, Languages And Computations", Pearson Education Asia, 2nd Edition
3. E V Krishnamurthy, "Introduction to Theory of Computer Science", EWP Second 2nd Edition.
4. John J Donovan , "Systems Programming", Tata McGraw-Hill Edition 1991, ISBN 0-07-460482-1

## IT 3103 Machine Learning

### Teaching Scheme:

Lectures: 3 hrs/week

Tutorial: 1 hr/week

### Examination Scheme:

In-Semester: 50 marks

End-Semester: 50 marks

Credits: 4

**Prerequisites:** Linear Algebra and Calculus, Probability Basics

### Course Objectives:

Familiarize students with

1. Basic learning algorithms and techniques
2. Applications of machine learning
3. Usage of large data sets

### Course Outcomes:

Students should be able to

1. Identify different tasks in machine learning
2. Explain wide variety of learning algorithms and techniques
3. Apply proper learning algorithm to data depending on the task
4. Perform evaluation of learning algorithms

### Unit – I Introduction to Machine Learning (07)

**Introduction:** What is Machine Learning, Examples of Machine Learning applications, Training versus Testing, Positive and Negative Class, Cross validation

**Types of Learning:** Supervised, Unsupervised and Semi-Supervised Learning

**Features:** Types of features-Continuous, Discrete, Nominal, Ordinal. Extraction of Features from text document and image

### Unit – II Classification (07)

**Binary and Multiclass Classification:** Assessing Classification Performance, Performance of multi-class classification

**Linear and Non-linear Models:** Perceptron, Support Vector Machines (SVM), Soft Margin SVM, Kernel methods for non-linearity

### Unit – III Regression and Generalization (07)

**Regression:** Assessing performance of Regression – Error measures, Overfitting and Underfitting, Catalysts for Overfitting

**Linear Models:** Least Square method, Univariate Regression

**Theory of Generalization:** Bias and Variance Dilemma, Training and Testing Curves

**Case Study of Polynomial Curve Fitting**

### Unit – IV Distance Based Models (07)

Neighbors and Examples, Distance Measures: Euclidian, Manhattan, Minkowski, Hamming. Nearest Neighbor Classification (kNN), Distance based clustering algorithms - K-means, K-medoid, DBScan, Hierarchical Clustering: Single, Complete, Average and Centroid Linkage

**Unit – V Rule and Tree based Models****(07)**

**Rule Based Models:** Frequent Itemsets, Association rules mining – Apriori Algorithm, Confidence and Support parameters

**Tree Based Models:** Impurity Measures – Entropy, Gini Index, Information Gain. Decision Trees, ID3

**Unit – VI Probabilistic Models****(07)**

A brief overview of Probability Theory – Discrete Random Variable, Joint Probability, Conditional Probability, Joint Probability, Bayes' Theorem, Independence Assumption, Naïve Bayes Classification, Probabilistic Models with Hidden Variables: Expectation Maximization

**Text Books**

1. Ethem Alpaydin: Introduction to Machine Learning, PHI 2<sup>nd</sup> Edition-2013.
2. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.

**Reference Books**

1. C. M. Bishop: Pattern Recognition and Machine Learning, Springer 1<sup>st</sup> Edition-2013.
2. Ian H Witten, Eibe Frank, Mark A Hall: Data Mining, Practical Machine Learning Tools and Techniques, Elsevier, 3<sup>rd</sup> Edition.
3. Jiawei Han, Micheline Kamber: Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers, 3rd Edition, July 2011.
4. Kevin Murphy: Machine Learning – A Probabilistic Perspective, MIT Press, 2012.
5. Parag Kulkarni, Prachi Joshi: Artificial Intelligence: Building Intelligent Systems, Prentice Hall of India.

# PEIT 3101 Computer Graphics and Animation

**Teaching Scheme:**  
Lectures: 3 hrs/week

**Examination Scheme:**  
In-Semester: 50 marks  
End-Semester: 50 marks  
Credits: 3

**Prerequisites:** Basics of Programming, Essential mathematics in geometry and trigonometry, Vectors and Matrices

## Course Objectives:

Familiarize students with

1. Basic concepts of computer graphics
2. Basic primitives and objects in computer graphics
3. Various methods and techniques used in computer graphics
4. Applications of computer graphics in animation and gaming

## Course Outcomes:

Students should be able to

1. Identify geometrical formulas and algorithms to draw computer graphics primitives
2. Use mathematics to transform computer graphics objects
3. Apply various techniques to achieve desired image manipulation.
4. Design algorithmic logic to solve complex problem like gaming

## Unit – I Basic Concepts (07)

**Introduction:** Basics of graphics systems, Raster scan & Random scan displays, basic display processor. **Display Files:** display file structure, algorithms and display file interpreter. Primitive operations.

**Plotting Primitives:** Scan conversions, line segments, vectors, pixels and frame buffers, vector generation. **Introduction to OpenGL:** Basic OpenGL syntax, display-window management using GLUT, functions.

## Unit – II Drawing and Filling Graphics Primitives (07)

**Line and Circle drawing Algorithms:** DDA, Bresenham's, Midpoint.

**Character Generation:** Stroke Principle, Starburst Principle, Bit map method, aliasing and anti-aliasing

**Polygon:** Polygon and its types, inside test, polygon filling methods: Seed fill, Scan Line, Flood fill and Boundary fill

## Unit – III Geometric Transformations (07)

**2D Geometric Transformations:** Translation, scaling, rotation, reflection, shearing, matrix representation and homogeneous coordinate system, Composite transformations

**3D Geometric Transformations:** Translation, scaling, rotation, rotation about X, Y, Z and arbitrary axis reflection about XY, YZ, XZ and arbitrary plane.



**Unit – IV     Segments, Windowing and Clipping****(07)****Segment:** Introduction, Segment table, Segment creation, closing, deleting and renaming, Visibility**Windowing:** Concept of window and viewport, viewing transformations**Line Clipping:** Cohen Sutherland Method, Midpoint subdivision method**Polygon Clipping:** Sutherland Hodgman method for clipping convex and concave polygon**Unit – V     Shading and Animation****(07)****Shading:** Halftoning, Gouraud and Phong Shading**Computer Animation:** Design of Animation sequences, General Computer Animation functions, Computer Animation Languages, Key-frame Systems, Motion Specifications.**Unit – VI     Gaming****(07)****Gaming platforms:** Graphics Memory Pipeline, Block diagram of NVIDIA workstation and i860 Introduction to OpenGL ES**Interactive Graphics & usage of the tools of computer graphics:** 3D Studio and Maya**2D games :**Snake game**Text Books**

1. D. Hearn, M. Baker, “Computer Graphics with OpenGL”, 4th Edition, Pearson Education, 2014, ISBN 978-93-325-1871-1
2. S. Harrington, “Computer Graphics”, 2nd Edition, McGraw-Hill Publications, 1987, ISBN 0 – 07 – 100472 – 6.

**Reference Books**

1. D. Rogers, “Procedural Elements for Computer Graphics”, 2nd Edition, Tata McGraw-Hill Publication, 2001, ISBN 0 – 07 – 047371 – 4.
2. J. Foley, V. Dam, S. Feiner, J. Hughes, “Computer Graphics Principles and Practice”, 2nd Edition, Pearson Education, 2003, ISBN 81 – 7808 – 038 – 9.
3. D. Rogers, J. Adams, “Mathematical Elements for Computer Graphics”, 2nd Edition, Tata McGraw-Hill Publication, 2002, ISBN 0 – 07 – 048677 – 8.
4. Zhigang Xiang, Roy Plastock, “Computer Graphics”, Schaum’s Series outlines
5. F.S. Hill JR, “Computer Graphics Using Open GL”, Pearson Education
6. Samuel R. Buss, “3D Computer Graphics”, Cambridge University Press

## PEIT 3101 Artificial Intelligence

### Teaching Scheme:

Lectures: 3 hrs/week

### Examination Scheme:

In-Semester: 50 marks

End-Semester: 50 marks

**Credits: 3**

**Prerequisites:** Discrete mathematics, basic probability theory and statistics  
Knowledge of any programming language and data structures

### Course Objectives:

Familiarize students with

1. The basic principles and applications of Artificial Intelligence.
2. Concepts of problem solving and knowledge representation
3. Concepts of planning and learning

### Course Outcomes:

Students will be able to:

1. Assess underlying AI concepts and their usage.
2. Implement classical Artificial Intelligence techniques, such as search algorithms, minimax algorithm, and neural networks.
3. Represent knowledge using logic and infer new facts from it.
4. Apply Artificial Intelligence techniques for problem solving.

### Unit – I Artificial Intelligence (07)

Introduction -What is AI? The Foundations of Artificial Intelligence, Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

### Unit – II Problem Solving (07)

Problem Solving: Solving Problems by Searching, heuristic search techniques, constraint satisfaction problems: Constraint Propagation, Backtracking Search for CSPs, Game Playing: Minimax algorithm, alpha-beta pruning.

### Unit – III Knowledge Representation (07)

Logical Agents: Knowledge-Based Agents, Propositional logic, First-order Logic, Knowledge Representation: Ontological Engineering, Categories and Objects, Events, Reasoning Systems for Categories, Reasoning with Default Information

### Unit – IV Planning (07)

Planning: Definition of Classical Planning, Algorithm for Planning as State-Space Search, Planning Graphs, Other Classical Planning Approaches, Analysis of Planning Approaches  
Planning and Acting in the Real World: Time, Schedules, and Resources.

### Unit – V Reasoning and Learning (07)

Quantifying Uncertainty: Acting under Uncertainty, Basic Probability Notation, Reasoning: Probabilistic Reasoning, Making Simple Decisions: Decision Networks  
Learning: Forms of Learning, Supervised Learning, Learning Decision Trees, Ensemble Learning, Knowledge in Learning, Learning Probabilistic Models, Reinforcement Learning.

## **Unit – VI Artificial Neural Network**

**(07)**

Units in neural networks, Neural Network structures, Single layer feed-forward neural networks, Multilayer feed-forward neural networks, Learning in multilayer networks, Learning neural network structures.

### **Text Books**

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 3rd Edition, Prentice Hall.

### **Reference Books**

1. E. Rich and K.Knight, Artificial Intelligence, Tata McGraw Hill
2. Charniack and D. Mcdermott, Artificial Intelligence, Addison Wesley
3. George F. Luger , “Artificial Intelligence: Structures and Strategies for Complex Problem Solving”, Pearson
4. N.P. Padhy, “Artificial Intelligence And Intelligent Systems”, Oxford University Publishers
5. Parag Kulkarni, Prachi Joshi: Artificial Intelligence: Building Intelligent Systems, Prentice Hall of India.
6. Toby Segaran, Programming Collective Intelligence, O’Reilly

## PEIT 3101 Business Intelligence

**Teaching Scheme:**  
Lectures: 3 hrs/week

**Examination Scheme:**  
In-Semester: 50 marks  
End-Semester: 50 marks  
**Credits: 3**

**Prerequisites:** Linear algebra, probability basics

**Course Objectives:**

Familiarize students with

1. The role of Business Intelligence in various business applications
2. Methods of data processing and modeling
3. Importance of visualization and reporting in business
4. Decision making process using Business Intelligence

**Course Outcomes:**

Students will be able to:

1. Identify business problems to provide BI solutions
2. Use data transformation and modeling concepts for building data warehouse
3. Analyze and visualize dimensional models for reporting.
4. Comprehend different BI trends and their applications.

**Unit – I Introduction (07)**

Concepts of Data, Information, and Knowledge, Design and implementation aspect of OLTP and OLAP/Data Warehouse, Business Intelligence(BI) Concepts and definitions, BI architectural models (Top-down and bottom-Up), Business Applications of BI, Role of Data warehouse in BI, BI system components

**Unit – II Dimensional Modeling And Data Warehouse Design (07)**

Star schema, Snow flake schema, and Fact Constellation schema, Grain of dimensional model, transactions, Recurring Snapshots, Accumulating Snapshots, Dimensions (SCD types, conformed dimensions), Facts (additive, semi-additive, non-additive), Junk dimensions, conformed dimensions, Bridge tables

**Unit – III ETL (07)**

Data Quality, Data profiling, Data enrichment, data duplication, Data cleaning, ETL Architecture and what is ETL, Extraction concept and Change data capture, Transformation concept, Loading concept, Initial and Incremental loading, Full loading, late arriving facts, data staging, Data marts

**Unit – IV Reporting (07)**

Metadata Layer, Presentation Layer, Data Layer, Use of different layers and overall Reporting architecture, Various report elements such as Charts, Tables, Materialized views, Query rewrite, Ad-hoc reports, Security: report level, data level (row, column),Scheduling.

**Unit – V Analytics And Data Visualization (07)**

**Analytics:** Application of Analytics concepts in Business Intelligence, Clustering with K-Means, Classification with Decision tree, In-Memory Analytics and In-DB Analytics

**Data visualization:** Types of data visualization, Techniques for visual data representations, data Visualization tools- Tableau, Dashboards, **Case study:** Credit card fraud detection, click stream analysis

**Unit – VI Recent Trends**

**(07)**

Introduction to Big Data, DW appliances, Types of BI: Real time BI, Operational BI, Embedded BI, Agile BI, Smart change data capture using log based techniques

**Case Study:** BI for sales force management, Social BI systems

**Text Books**

3. Ralph Kimball, Joe Caserta, “The Data warehouse ETL Toolkit”, Publisher: Wiley
4. Jiawei Han, Micheline Kamber, Jian Pei “Data Mining: concepts and techniques”, 2nd Edition, Publisher: Elsevier/Morgan Kaufmann.

**Reference Books**

1. Ralph Kimball, Margy Ross, “The Data Warehouse Toolkit”, 3rd edition, Publisher: Wiley
2. Reema Thareja, “Data Warehouse”, Publisher: Oxford University Press.
3. William Inmon, “Building the Data Warehouse”, Wiley publication 4th edition.



**Text Books**

1. Grady Booch, "Object Oriented Analysis and Design using applications", 3<sup>rd</sup> Edition,
2. Russ Miles, "Learning UML 2.0 ", O'Reilly

**Reference Books**

1. Grady Booch, "UML 2.0 use Guide" OMG Group

## IT 3104 Database Management Systems Laboratory

### Teaching Scheme:

Practical: 4 hrs/week

### Examination Scheme:

In-Semester: 25 marks

Practical: 25 marks

Credits: 2

**Prerequisites:** Data structures

### Course Objectives:

Familiarize students with

1. Implementation of fundamental concepts of database management
2. Use of database management.
3. SQL database system and PLSQL.
4. NOSQL database system.

### Course Outcomes:

Students should be able to

1. Make use of database systems.
2. Design and use database schema for given application.
3. Develop a database application with suitable front end.
4. Implement SQL and NOSQL commands.

### Group A: Introduction to Databases (Study assignment- Any one)

1. Study and design a database with suitable example using following database systems:
  - a. Relational: SQL / PostgreSQL / MySQL
  - b. Columnar: Hbase
  - c. Document: MongoDB / CouchDB
  - d. Graph: Neo4J

Compare the different database systems based on points like efficiency, scalability, characteristics and performance.

2. Study the SQLite database and its uses. Also elaborate on building and installing of SQLite

### Group B: SQL and PL/SQL (Minimum 6)

1. Design any database with at least 3 entities and relationships between them. Apply DCL and DDL commands. Draw suitable ER/EER diagram for the system.
2. Execute DDL statements which demonstrate the use of views. Try to update the base table using its corresponding view. Also consider restrictions on updatable views and perform view creation from multiple tables.
3. Design and implement a database and apply at least 10 different DML queries for the following task. For a given input string display only those records which match the given pattern or a phrase in the search string.



4. Execute the aggregate functions like count, sum, avg etc. on the suitable database. Use group by and having clauses. Retrieve the data from the database based on time and date functions.
5. Implement nested sub queries. Perform a test for set membership (in, not in), set comparison (=some, >=some, <all etc.) and set cardinality (unique, not unique).
6. Write and execute suitable database triggers.
7. Write and execute PL/SQL stored procedure and cursor to perform a suitable task on the database.

### **Group C: NoSQL and Semi structured Databases (Minimum 3)**

1. Create a database with suitable example using MongoDB and implement
  - Inserting and saving document
  - Removing document
  - Updating document
2. Execute at least 15 different queries on any suitable MongoDB database that demonstrates following querying techniques:
  - find and findOne
  - Query criteria
  - Type-specific queries
  - \$ where queries
  - Create and drop different types of indexes
3. Implement Map reduce example using Mongo DB.
4. Design and implement XML/JSON database.

### **Group D: Mini Project / Database Application Development**

Student group preferably of size 4 students should decide the statement and scope of the project which will be refined and validated by the faculty.

Choose database as per the requirement of the mini project. Draw and normalize the design up to at ER Diagram with normalization in case of back end as RDBMS. Design front end using any open source technology and perform connectivity to the database. Implement suitable database operations along with business logic, validations, reports etc.

## IT 3105 Machine Learning Laboratory

### Teaching Scheme:

Practical: 4 hrs/week

### Examination Scheme:

In-Semester: 25 Marks

Practical: 25 marks

Credits: 2

**Prerequisites:** Linear Algebra and Calculus, Probability Basics

### Course Objectives:

Familiarize students with

1. Various tasks in Machine Learning
2. Different Machine Learning algorithms
3. Applications of machine learning algorithms for accomplishing given tasks

### Course Outcomes:

Students should be able to

1. Apply proper learning algorithm to data depending on the task
2. Compare different learning algorithms performing similar tasks
3. Use large data sets
4. Evaluate the models

### Implementation of programs to be done in Python

1. Classify data using Linear Support Vector Machine algorithm
2. Predict values using Linear Regression with one independent variable and one dependent variable
3. Cluster data using k-means algorithm for clustering
4. Identify frequent item item-sets using Apriori algorithm
5. Classify data using Naïve Bayes Classification algorithm
6. Build a small application using machine learning concepts.

### Text Books

1. Andreas Muller and Sarah Guido: Introduction to Machine Learning with Python, O'Reilly, 2017
2. Michael Bowles: Machine Learning in Python, Wiley, 2018

### Reference Books

1. Ian H Witten, Eibe Frank, Mark A Hall: Data Mining, Practical Machine Learning Tools and Techniques, Elsevier, 3<sup>rd</sup> Edition.
2. Jiawei Han, Micheline Kamber: Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers, 3rd Edition, July 2011.
3. C. M. Bishop: Pattern Recognition and Machine Learning, Springer 1<sup>st</sup> Edition-2013.
4. Ethem Alpaydin: Introduction to Machine Learning, PHI 2<sup>nd</sup> Edition-2013.
5. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.

## PEIT 3106 Computer Graphics Laboratory

**Teaching Scheme:**  
Practical: 2 hrs/week

**Examination Scheme:**  
Oral: 25 marks  
**Credits: 1**

**Prerequisites:** Basics of Programming, Data Structures, Algorithms, Geometry, Trigonometry, Vectors and Matrices

### Course Objectives:

Familiarize students with

1. Various methods and techniques used in computer graphics
2. Applications of computer graphics in animation and gaming

### Course Outcomes:

Students should be able to

1. Apply mathematics and algorithms to draw computer graphics primitives.
2. Apply graphics data manipulation in an application.
3. Implement programs using different computer graphics algorithm.
4. Make use of OPEN GL to implement programs

List of Assignments

- 1 Get Familiar with basic OpenGL environment, display-window management using GLUT, OpenGL functions.
- 2 Write a function in OpenGL on Linux Platform to draw a Line using DDA/ Bresenham's Line Drawing Algorithm. Call the Function to draw any pattern consisting at least 10 function calls.
- 3 Write a function in OpenGL on Linux Platform to draw a circle using Midpoint Circle Drawing Algorithm. Call this function at least 6 times to draw any pattern. User should only give centre coordinates and radius. Rest should be drawn automatically
- 4 Write a program in OpenGL on Linux Platform to draw chess board using any Line drawing algorithm and fill alternate blocks using flood fill algorithm
- 5 Write a program in OpenGL on Linux Platform to draw a flag using any Line drawing algorithm and fill it using scanline polygon filling algorithm.
- 6 Write a program in OpenGL on Linux Platform to for drawing a polygon and perform following 2DTransformations on Triangle.  
Translation,Scaling, Rotation
- 7 Write a program in OpenGL on Linux Platform to clip a Line using Cohen Sutherland Outcode Method.
- 8 Write a program in OpenGL on Linux Platform to clip a Polygon using SutherlandHodgman Polygon Clipping.
- 9 Write a program in OpenGL on Linux Platform to animate a scene for "Moving Car".
- 10 Write a program to design a game using computer graphics basic techniques and OpenGL

# PEIT 3106 Artificial Intelligence Laboratory

**Teaching Scheme:**  
Practical: 2 hrs/week

**Examination Scheme:**  
Oral: 25 marks  
Credits: 1

## **Course Objectives:**

### **Familiarize students with**

1. Basic implementation of AI concepts.
2. Current Trends in AI.

## **Course Outcomes:**

### **Students will be able to**

1. Implement AI core concepts using AI algorithms.
2. Identify appropriate AI techniques for development of applications.
3. Apply basic principles of AI towards problem solving, knowledge representation and learning.
4. Gain basic understanding of various AI applications in intelligent and expert systems, artificial neural networks and other machine learning techniques.

## **List of Assignments (Any 5)**

1. Implement A\* algorithm for any of the following problems: a) 8 puzzle b) Missionaries and Cannibals c) Blocks World Problem
2. Solve 8-queens problem using backtracking.
3. Implement a program to solve constraint satisfaction problem using any searching technique.
4. Implement minimax algorithm using alpha-beta pruning.
5. Implement the code for decision tree learning.
6. Implement Truth Maintenance System.
7. Implement Neural network to understand backpropagation.

## **Group Assignment**

1. Develop application such as but not limited to
  - a) Chatbot
  - b) Interactive Sudoku solver
  - c) Stock market predictor (offline past data)
  - d) Face Recognition
  - e) Captcha breakers
  - f) Auto tagging of friends on social media
  - g) Pac-Man

## PEIT 3106 Business Intelligence Laboratory

### Teaching Scheme:

Practical: 2 hrs/week

### Examination Scheme:

Oral: 25 marks

Credits: 1

**Prerequisites:** Linear Algebra and Calculus, Probability Basics, database concepts

### Course Objectives:

Familiarize students with

1. BI tools and technologies
2. Data transformation techniques and modeling
3. Implementation aspects of business analytics and reporting

### Course Outcomes:

Students should be able to

1. Identify the business problem and design BI solution
2. Analyze the model
3. Visualize large datasets
4. Implement BI application

### Suggested list of laboratory assignments:

Given a Business Problem as Case Study design and build BI solution using BI concepts:

1. Perform dimension modeling and Execute ETL process for building data warehouse
2. Implement OLAP operations on given data set.
3. Visualize data using various charts in Tableau
4. Develop any one application

### Text Books

1. Big Data, Black Book, DT Editorial services, 2015 edition
2. Jiawei Han, Micheline Kamber, Jian Pei “Data Mining: concepts and techniques”, 2nd Edition, Publisher: Elsevier/Morgan Kaufmann

### Reference Books

1. Ralph Kimball, Joe Caserta, “The Data warehouse ETL Toolkit”, Publisher: Wiley

## **PEIT 3106 Object Oriented Modeling and Design Laboratory**

### **Teaching Scheme:**

Practical: 2 hrs/week

### **Examination Scheme:**

Oral : 25 marks

Credits: 1

**Prerequisites:** Object Oriented Programming

### **Course Objectives:**

Familiarize students with

1. Modeling a complex system from various views
2. UML diagrams of conveying the model which in programming language independent

### **Course Outcomes:**

Students should be able to

1. Identify the classes, attributes for a moderately complex systems
2. Co-relate the classes with has-a or is-a relationship
3. Refine the relationships to remove the redundancy
4. Represent the design using UML diagrams

### **List of Laboratory Assignments**

Based on a system description given to a group of four students, they will be systematically analyzing and designing the system and drawing UML diagram to show the thought process via following assignments

1. Use Case Identification and Use case diagram
2. Activity diagram to show the business process
3. Class Diagram with advanced features
4. Sequence diagrams of each use case
5. State diagram
6. Package diagram and component diagram
7. Deployment diagram