Year:III **Semester:II**

Course Code	Course Title	Credits	Lecture (Hrs.)	Tutorial (Hrs.)	Laboratory (Hrs.)	Total (Hrs.)
BIT351CO	ArtificialIntelligence	3	3	1	2	6
BIT352CO	Management Information System	3	3	1		4
BIT353CO	DatawarehousingandDataMining	3	3	1	2	6
BIT354CO	Simulationand Modeling	3	3	1	2	6
BIT355CO	Software Engineering	3	3	1		4
BIT356CO	Project-VI	2	-	-	3	3
	Total	17	15	5	9	29

Artificial Intelligence
BIT351CO

Year III **Semester: II**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
			Theory	Practical*	Theory**	Practical	
3	**1**	**2**	**20**	**50**	**80**	-	**150**

Course Objectives:

- To provide basic knowledge of Artificial Intelligence
- To proved the knowledge of Machine Learning, Natural Language, Expert Systems and Neural Network
- To develop entrepreneurship skills and leadership in practical fields

Course Contents:

Unit 1: Introduction **[2 Hrs]**

1.1 Definitions
1.2 Goals of AI
1.3 Challenges of AI
1.4 AI approaches
1.5 AI techniques
1.6 Applications of AI

Unit2 2: Agents **[5 Hrs]**

2.1 Introduction to agents
2.2 Agent's performance
2.3 Example of Agents
2.4 Rationality and omniscience
2.5 Types of agent environment
2.6 Agent architecture
2.7 PEAS (vaccum cleaner agent, human agent, robotic agent, taxi driving agent, 8-queen problem etc)
2.8 Types of agent (simple reflex, goal based, model based, utility agent, learning agent)

Unit 3: Problem solving using searching **[8 Hrs]**

3.1 Uninformed Search
  3.1.1 Problem solving agents
  3.1.2 Problem types

3.1.3 Problem formulation
3.1.4 Example problems
3.1.5 Basic search algorithms (BFS, DFS, Depth limited search, uniform cost search, iterative deepening, bidirectional search)
3.1.6 Comparative study of all uninformed search strategies (completeness, optimality, time complexity and space complexity)

3.2 Informed Search
3.2.1 Best first (greedy) search
3.2.2 A* Search
3.2.3 Heuristic function
3.2.4 Hill Climbing and problems
3.2.5 Comparative Study of each type of searching
3.2.6 Simulated annealing
3.2.7 Genetic Algorithm

Unit 4: Adversial Search and Constraint satisfaction problem [5 Hrs]

4.1 Games
4.2 Perfect games
4.3 Game tree and formal definition
4.4 Min Max problem
4.5 Alpha beta pruning algorithm
4.6 CSP Problem and examples
4.7 Crypto arithmetic problems and solutions

Unit 5: Knowledge Representations [8 Hrs]

5.1 Knowledge and its types
5.2 Logic
5.3 Semantic Nets
5.4 Propositional logic vs FOPL
5.5 Resolution in FOPL
5.6 Frames

Unit 6: Learning System [4 Hrs]

6.1 Rote learning
6.2 Learning from example: inductive learning methods
6.3 Decision trees
6.4 Explanation based learning
6.5 Reinforcement learning

Unit 7: Reasoning [4 Hrs]

7.1 Monotonic Reasoning
7.2 Statistical Reasoning (Bayesian Network)
7.3 Uncertainty in reasoning
7.4 Case based reasoning

Unit 8: Expert System **[4 Hrs]**

8.1 Human Expert vs expert system
8.2 Expert System Structure
8.3 Expert system example
8.4 Characteristics of expert system
8.5 Knowledge acquisition
8.6 Knowledge base
8.7 Inference engine
8.8 Forward chaining and backward chaining
8.9 Design of expert system

Unit 9: Artificial Neural Networks **[3 hrs]**

9.1 Research history
9.2 Model of artificial neuron
9.3 Neural networks architectures
9.4 Learning methods in neural networks
9.5 Perceptron Network, Multi-layered feed forward network, Hopfield networks
9.6 Application of neural networks

Unit 10: Natural language processing **[2 Hrs]**

10.1 Introduction
10.2 Components of natural language processing
10.3 Natural language understanding
10.4 Natural language generation
10.5Steps in Natural language processing.

Laboratory work:

There shall be following labs using prolog or LISP

- solving family relation problem
- GCD
- Tower of Hanoi
- Using prolog or LISP to understand (variable, rules, input output, arithematic operations, recursion)
  Students must do case study on expert system or natural language processing.

References:

1. E. Rich & K. Knight, "*Artificial Intelligence"*, McGraw-Hill, 1991
2. Haykin "Neural Networks: *A Comprehensive Fundamentals"*, Macmillan, 1994
3. E. Turban, "*Decision Support and Expert Systems"* , Macmillan, 1993
4. R. Shingal, "*Formal Concepts in Artificial Intelligence"* , Chapman & Hall, 1992
5. G. Gazadar& C. Mellish, "*Natural Language Processing in Prolog: and introduction to computational linguistics"*, Addison-Wesley, 1989
6. D. Crookes, "*Introduction to Programming in Prolog"*, Prentice Hall, 1988.
7. P. H. Winston, "*Artificial Intelligence "*, Addison-Wesley, 1984
9. Hecht-Neilson "*Neurocomputing"*, Addison-Wesley, 1990
10. G. F. Luger & W. A Stubblefield, "*Artificial Intelligence"* , Benjamin Cummings, 1993

Management Information System
BIT352CO

Year: III **Semester: II**

Teaching schedule Hours/Week			Examination Scheme				
Theory	**Tutorial**	**Practical**	**Internal Assessment**		**Final**		**Total**
			Theory	**Practical**	**Theory**	**Practical**	
3	**1**	**-**	**20**	**-**	**80**	**-**	**100**

Course Objective:

The course aims at providing students with the knowledge of different types of Computer information systems and primarily focuses on how to use computer information systems and information technologies to revitalize business processes, improve managerial decision making, and help organizations gain a competitive edge in business.

Course Contents:

Unit 1: Information systems in Global business today [6 Hrs]
Definition of Information system, Definition of Management Information System, Role of Information systems in business today, Globalization Challenges and opportunities, Strategic business objectives of Information systems, Business perspective of information system.

Unit 2: Global E-Business and Collaboration [6Hrs]
Business processes and Information Systems, Types of Information Systems, Systems for linking the enterprise systems for collaboration and team work. The information systems function in business.

Unit 3: Information Systems Organization and Strategy [6 Hrs]
Organizations and Information systems, Impacts of information systems on organizations and business firms, Using information systems to achieve competitive advantage, Business value chain model.

Unit 4: Information Technology Infrastructure [5 Hrs]
IT infrastructure, Infrastructure components, Contemporary hardware platform trends, Contemporary software platform trends.

Unit 5: Foundation of Business Intelligence [2 hrs]
Using databases to improve business performance and decision making, Case study.

Unit 6: Decision Support system and Executive Information System [4 hrs]
Definition of Decision Support Systems, Components of DSS, Applications of DSS, Functions of DSS, Definition of EIS, Characteristics of EIS

Unit 7: Business Information Systems **[3 Hrs]**
Functional Information Systems, Marketing Information Systems, Manufacturing Information Systems, Finance and Accounting Information Systems, Quality information system.

Unit 8: Security of Information Systems **[2 Hrs]**
System vulnerability and abuse, Technologies and tools for protecting information resources.

Unit 9: Achieving Operational Excellence and customer intimacy **[4 Hrs]**
Enterprise Systems, Supply Chain Management Systems, Customer relationship management systems, Enterprise applications.

Unit 10: Strategic Information Systems [**2 Hrs]**
Definition of Strategic Information System, Strategic Information System Plan, Strategy for developing Strategic information system.

Unit 11. Case Studies related to Unit 3, Unit 5, Unit 9, and Unit 10. **[5 Hrs]**

Reference Books:

1. Kenneth C. Loudon/ Jane P. Laudon,"Management Information Systems, Managing the Digital Firm", Twelfth Edition, Pearson.
2. Uma G. Gupta,"ManagementInformationn Systems, A Managerial Perspective", Tenth Edition, West Publishing Company.

Data Warehousing and Mining
BIT353CO

Year:IV **Semester:II**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	**Tutorial**	**Practical**	**Internal**		**Final**		**Total**
3	**1**	**2**	**Theory**	**Practical**	**Theory**	**Practical**	**150**
			20	**50**	**80**	**-**	

Course Objectives:

This course aims at introducing advance aspects of data warehousing and data mining, encompassing the principles, research results and commercial application of the current technologies. It also provides knowledge to introduce students to the basic concepts and techniques of data mining, using recent data mining software for solving practical problems.

Course Contents:

Unit 1 **[4 Hrs]**

Introduction to data mining: Motivation, importance, definition of data mining, kinds of data mining, kinds of patterns, data mining technologies, kinds of applications targeted, major issues in data mining; Introduction to Data warehousing: Importance, uses and applications

Unit 2 **[9 Hrs]**

Data Warehouse and OLAP Technology, Data Warehouse Architecture, Stepsfor the Design and Construction of Data Warehouses, A Three-Tier Data WarehouseArchitecture, OLAP, OLAP queries, metadata repository, Data Preprocessing – Data Integration and Transformation, Data Reduction, Data Mining Primitives: What Defines a Data Mining Task? Task-Relevant Data, The Kind of Knowledge to be Mined, KDD.

Unit 3 **[9 Hrs]**

Mining Association Rules in Large Databases, Association Rule Mining, Market Basket Analysis: Mining A Road Map, The Apriori Algorithm: Finding Frequent Itemsets Using Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiently of Apriori, Mining Frequent Itemsets without Candidate Generation, Multilevel Association Rules, Approaches to Mining Multilevel Association Rules Mining

Unit 4 **[6 Hrs]**

Multidimensional Association Rules for Relational Database and Data Warehouses, Multidimensional Association Rules, Mining Quantitative Association Rules, Mining Distance-Based Association Rules, From Association Mining to Correlation Analysis

Unit 5 **[9 Hrs]**

What is Classification? What Is Prediction? Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Bayes Theorem, Naïve Bayesian Classification, Classification by Backpropagation, A Multilayer Feed-Forward Neural Network, defining a Network Topology, Classification Based of Concepts from Association Rule Mining, Other Classification Methods, k-Nearest Neighbor Classifiers, Genetic Algorithms, Rough Set Approach, Fuzzy Set approaches.

Unit 6 **[8Hrs]**

What Is Cluster Analysis? Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Classical Partitioning Methods: k-Meansand k-Medoids, Partitioning Methods in Large Databases: From k-Medoids to CLARANS, Hierarchical Methods.

Laboratory works:

The student must do the project work using data mining and data warehousing concept. Topics should be given by the course instructor and at the end of the semester student should present their project work.

Reference Books:

1. Morgan Kaufmann J. Han, M Kamber, "*Data Mining Concepts and Techniques,* Second edition
2. Sam Anahory, Dennis Murray, "*Data Warehousing in the Real World*", Pearson Education
3. P. and D. Zatinge, "*Data Mining*", Adriaans, Addison Wesley, 1996
4. Kimball, R., "*The Data Warehouse Toolkit*", Wiley 1996
5. W. H. Inmon, "*Building The Data Warehouse*", 3rd Edition, Wiley, 2003
6. Margaret H. Dunham, "*Data Mining: Introductory and Advance Topics*", Pearson Education 2004

Simulation and Modeling
BIT354CO

Year:IV **Semester:II**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	**Tutorial**	**Practical**	**Internal**		**Final**		**Total**
3	**1**	**2**	**Theory**	**Practical**	**Theory**	**Practical**	**150**
			20	**50**	**80**	**-**	

Course Objectives:

The objectives of this course are to introduce students to simulation and Modeling techniques and to provide opportunities to develop basic simulation and modeling skills with respect to carrying out projects using any simulation method on the computer.

1. Concepts of Simulation **[6 Hrs]**

1.1. Introduction
1.2. The system
1.3. Continuous and discrete systems
1.4. System simulation
1.5. Real time simulation
1.6. When to use Simulation
1.7. Types of Simulation Models
1.8. Steps in simulation Study
1.9. Phases of a simulation study
1.10. Advantages of simulation
1.11. Limitations of the Simulation Technique
1.12. Areas of applications

2. Monte Carlo Method **[4 Hrs]**

2.1. Monte Carlo Method
2.2. Normally distributed random number
2.3. Monte Carlo Method V/S Stochastic Simulation

3. Simulation of Continuous Systems **[5 hours]**

3.1. **Manual Simulation**
3.2. A pure Pursuit Problem
3.3. Queuing system
3.4. Markov chains
3.5. Differential and partial differential equations

4. Random Numbers [10 hours]

4.1. Random Numbers
4.2. Random Number Tables
4.3. Pseudo Random Numbers
4.4. Generation of Random Numbers
4.5. Mid square Random Number generator
4.6. Qualities of an efficient Random Number Generator
4.7. Testing Numbers for Randomness
4.8. Uniformity Test
4.9. Chi-square test
4.10. Testing for auto correlation
4.11. Poker Test

5. Analysis of simulation output [10 hours]

5.1. Estimation methods
5.2. Simulation run statistics
5.3. Replication of runs
5.4. Elimination of internal bias

6. Simulation languages [10 hours]

6.1. Basic concept of Simulation tool
6.2. Discrete systems modeling and simulation
6.3. Continuous systems modeling and simulation
6.4. Structural, data and control statements, hybrid simulation
6.5. Feedback systems: typical applications

Laboratory works:

There shall be laboratory exercises using any simulation and modeling packages. At the end of this course studentsmust do a project on simulation.

References books:

1. G. Gorden, " System Simulation", Prentice Hall of India
2. M. Law and R.F. Perry, " Simulation : A problem-solving approach", Addison Wesley publishing company.
3. M. Law and W.D. Kelton, " Simulation Modeling and analysis", McGraw Hill, 1991.

Software Engineering
BIT355CO

Year III **Semester II**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
			Theory	Practical	Theory	Practical	
3	**1**	-	**20**	-	**80**	-	**100**

Course Objectives:

This course is intended to provide an introduction to SE concepts and practices focusing on industrial software development characteristics and processes, development models, and the software life cycle for mid-scale system.

- Provide students a comprehensive introduction to software engineering.
- provide the students the kinds of activities that are necessary for developing a software system
- Study the important phases of software development

Course Contents:

Unit 1:Introduction to Software Engineering: **[4 Hrs]**

1.1 Definition of software engineering
1.2 The evolving role of software
1.3 Changing nature of software
1.4 Characteristics of software
1.5 A generic view of software engineering
1.6 Software engineering-layered technology

Unit 2:Process Models **[5 Hrs]**

2.1 The Waterfall model
2.2 Prototyping model
2.3 RAD model
2.4 Spiral model
2.5 Agile Software Model.

Unit 3: Software Project Management **[8 Hrs]**

3.1 Meaning of 4Ps in software project management
3.2 Activities of project planning
3.3 Projectestimation techniques
3.4 COCOMOmodel
3.5 Risk Management
3.6 ProjectScheduling

3.7 Staffing
3.8 Software Configuration Management (SCM)

Unit 4: Software Requirements and Specification [7 Hrs]

4.1 Functional and non-functional requirements, requirements engineering process **(**feasibility studies, requirements elicitation and analysis, requirements validation, requirements management)
4.2 Data Modeling and flow diagram
4.3 Software prototyping techniques
4.4 Requirement definition and specifications

Unit 5:Software Design [7 Hrs]

5.1 Introduction to software design
5.2 Characteristics of a good software design
5.3 Design principle
5.4 Design concepts
5.5 Design strategy
5.6 Design process and design quality
5.7 Software architecture and its types

Unit 6:Software Testing [7 Hrs]

6.1 Software testing process
6.2 Principal of testing
6.3 Test case design
6.4 Black-box testing (Boundary-value analysis, Equivalence class partitioning)
6.5 White-box testing (Statement coverage, Path coverage, Cyclomatic complexity)
6.6 Software verification and validation

Unit 7:Metrics for Process and Products [4 Hrs]

7.1 Software measurement
7.2 Metrics for software quality
7.3 Software quality assurance
7.4 Software reliability
7.5 The ISO 9000 quality standards

Unit 8: Software Engineering Trends and Technology [3 Hrs]

8.1 Agile development
8.2 Extreme programming
8.3 Cloud computing and grid computing
8.4 Enterprise mobility
8.5 Business intelligent and approaches
    8.5.1 ERP, Supply chain management, Service-oriented architecture and web services
    8.5.2 Enterprise portals and Content management
8.6 Introduction to OOSE

Case Study: Students are encouraged to perform the case study to implement concepts of above-mentioned topics.

Reference Books:

1. Sommerville, "*Software Engineering*", Pearson Education
2. RajibMalla, "*Fundamentals of Software Engineering*"
3. Pankaj Jalote, "*Software Engineering – A Precise Approach*"
4. Udit Agrawal, "*Software Engineering*
5. Roger S. Pressman, "*Software Engineering - A Practitioner's Approach*", 6th Ed., McGrawHill International Edition

Project-VI
BIT356CO

Year: III Semester: II

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
			Theory	Practical	Theory	Practical	
-	-	3	-	60	-	40	100

Course Objective:
After finishing this project, students will be able to develop web-based application using server-side scripting.

Course Contents:
A total of 45 lab hours will be assigned to every student. Every group of students (upto 3) will be assigned a project work related to either Artificial Intelligence or Data Mining. Students must develop the assigned application, submit written report, and give oral presentation.

Project Evaluation Criteria:
The practical marks allotted for the project should be evaluated based on the following criteria:

- Title Presentation — 10 Marks
- Mid-term Presentation — 15 Marks
- Pre-final Submission and Presentation — 35 Marks