

**Semester- VI (Third Year)****CS/IT321****Artificial Intelligence**

L	P	C
3	0	3

**Course Objectives:**

The main objectives of this course are to:

1. Introduce fundamental concepts of artificial intelligence.
2. Impart knowledge on problem solving using uninformed, informed, local and adversarial search strategies.
3. Create awareness on formalization of knowledge and reasoning.

**Course Outcomes:**

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

1. Explain the fundamental concepts of artificial intelligence
2. Apply search strategies for solving real world problems
3. Utilize game playing strategies for solving problems
4. Infer knowledge using propositional and predicate logic
5. Discuss knowledge representation of the real world using Ontologies
6. Summarize the algorithms for classical planning

**Course Content:****UNIT I****CO1, CO2****10 Periods**

**Introduction to AI:** What Is AI?, The Foundations of AI, The History of AI, The State of the Art. **Intelligent Agents:** Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

**Problem Solving by Search:** Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.

**UNIT II****CO2, CO3****14 Periods**

**Beyond Classical Search:** Local Search Algorithms and Optimization Problems, Searching with Non-Deterministic Actions.

**Adversarial Search:** Games, Optimal Decisions in Games, Alpha–Beta Pruning.

**Constraint Satisfaction Problems:** Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

**UNIT III****CO4****12 Periods**

**Logical Agents:** Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Effective Propositional Model Checking, Agents Based on Propositional Logic.

**First-Order Logic:** Representation Revisited, Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic.

**Inference in First-Order Logic:** Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

**UNIT IV**

**C05,C06**

**14 Periods**

**Knowledge Representation:** Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

**Automated Planning:** Definition of Classical Planning, Algorithms for Classical Planning

**Planning and Acting in the RealWorld:** Time, Schedules and Resources, Hierarchical Planning.

**Learning Resources:**

**Text Books:**

1. Artificial Intelligence - A Modern Approach, Stuart Russell and Peter Norvig, Fourth Edition, Pearson Education

**References:**

1. Artificial Intelligence, E. Rich and K. Knight, 3rd Edn., (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, 3rd Edn., Pearson Education.
3. A First Course in Artificial Intelligence, Deepak Khemani, Tata Mc-Grah Hill.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.
5. Artificial Intelligence, SarojKaushik, CENGAGE Learning

CS/IT322

Cryptography &amp; Network Security

<b>L</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

The main objectives of this course are to:

1. Describe the architecture of network security.
2. Explain design principles of symmetric and asymmetric encryption techniques.
3. Discuss various authentication protocols. Describe the web security and network security applications.

**Course Outcomes**

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

1. Explain the network security vulnerabilities/attacks and symmetric encryption schemes.
2. Describe public key encryption techniques and mathematical foundations for cryptography.
3. Explain authentication and digital signature protocols.
4. Discuss the authentication applications, web and E-mail security mechanisms.

**Course Content:****UNIT I****CO1****13 Periods**

**Introduction:** Computer Security Concepts, The OSI security architecture, Security Attacks, Security Services, Security Mechanisms, A model for Network Security.

**Number Theory:** Prime Numbers, Fermat's and Euler's theorem, testing for primality, The Chinese remainder theorem, Discrete logarithms.

**Classical Encryption techniques:** Symmetric cipher model, Substitution techniques, Transposition techniques, Steganography.

**UNIT II****CO1, CO2****13 Periods**

**Block Ciphers & Data Encryption Standard:** Traditional Block Cipher Structure, Data Encryption Standard, Strength of DES, Block Cipher Design Principles.

**Advanced Encryption Standard (AES):** AES structure, AES Transformation functions, AES key expansion.

**Block Cipher operations:**

**Public key cryptography and RSA:** Principles of public key crypto-systems, The RSA Algorithm. **Other Public Key Crypto Systems:** Diffie Hellman Key exchange, ElGamal Cryptographic System.

**UNIT III****CO2, CO3****12 Periods**

**Cryptographic Hash Functions:** Applications of cryptographic hash functions, Hash function based on cipher block chaining, SHA-1, SHA-2, SHA-3.

**Message Authentication codes:** Message Authentication requirements, Message Authentication functions, MAC Based on Hash functions: HMAC

**Digital signatures:** Digital Signatures, ElGamal Digital Signature Scheme.

**Key management and Distribution:** Symmetric key distribution using Symmetric Encryption, Symmetric key distribution using asymmetric encryption, Distribution of public keys, X.509 Certificates.

#### UNIT IV

#### CO4

#### 12 Periods

**User authentication:** Kerberos.

**Transport Level Security:** Web security Considerations, Transport Layer Security(TLS), Secure Shell(SSH).

**E-Mail Security:** S/MIME, Pretty Good Privacy (PGP).

**IP Security:** Overview, IP Security Policy, Encapsulating Security Payload.

#### Learning Resources:

##### Text Book:

- 1 Cryptography and Network Security Principles and Practice  
William Stallings, 7th Edition, Pearson Education.

##### Reference Books:

- 1 Behrouz A. Ferouzan, "Cryptography & Network Security", Tata McGraw Hill, 2007.
- 2 Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.
- 3 Charles Pfleeger, "Security in Computing", 4th Edition, Prentice Hall of India, 2006.
- 4 Ulysess Black, "Internet Security Protocols", Pearson Education Asia, 2000.

**CS/IT323****Machine Learning**

<b>L</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

The main objectives of this course are to:

1. Basic concepts and applications of machine learning.
2. Supervised learning and its applications
3. Unsupervised learning and its applications
4. Multilayer perceptions and kernel tricks

**Course Outcomes:**

After successful completion of the course, the students are able to:

1. Explain the scope of machine learning concepts in solving real life problems
2. Solve problems using supervised learning techniques.
3. Use rule sets and reinforcement learning to solve real world problems
4. Discuss various dimensionality reduction techniques.
5. Explain the working of unsupervised learning algorithms.

**Course Content:****UNIT I****CO1****12Periods**

**Introduction:** Well posed learning problems, Designing a Learning System, Perspectives and Issues in machine learning.

**Concept Learning and general to specific ordering:** concept learning Task , Concept learning as a search, Finding a Maximally Specific Hypothesis , Version Spaces and Candidate Elimination Algorithm, Remarks on Version space and candidate elimination. **Bayesian Learning:** Bayes Theorem, Maximum Likelihood and Least Square Error Hypotheses, Bayes Optimal Classifier, Naïve-Bayes Classifier, Bayesian Belief Network.

**UNIT II****CO2****12 Periods**

**Decision Tree Learning :** Decision Tree Representation, appropriate problems for decision tree, the basic decision tree Algorithm, Issues in decision tree learning.

**Artificial**

**Neural Networks:** Introduction, Neural Network Representation, appropriate problems for neural network, Perceptrons , Multilayer Networks and the Back Propagation Algorithm.

**Instance Based Learning:** Introduction, KNN Learning, Locally Weighted Regression , Radial Bias Functions, Case-Based Reasoning.

**UNIT III****CO3****12 Periods**

**Learning Sets of Rules:** Sequential Covering Algorithm , Learning Rule Sets: summary , Learning First Order Rules, Learning set of first order rules: FOIL.

**Reinforcement**

**Learning:** Introduction, the Learning Task , Q Learning , Non Deterministic Rewards and Actions ,Temporal Difference Learning , Generalizing from Examples , Relationship to Dynamic Programming.

**UNIT IV****CO4****12 Periods**

**Dimensionality Reduction :** Introduction, subset selection, Principal component analysis, Feature Embedding, Factor analysis, Singular Value Decomposition and Matrix factorization, Multidimensional Scaling, Linear Discriminant analysis, Canonical correlation analysis.  
**Clustering:** Introduction, Mixture Densities, K-Means Clustering, Expectation-Maximization Algorithm, Mixtures of Latent Variable Models, Supervised Learning after Clustering, Spectral Clustering, Hierarchical Clustering, Choosing the Number of Clusters.

**Learning Resources:****Text Books:**

1. Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013. (UNIT I , UNIT II, and UNIT III)
2. Ethem Alpaydin, Introduction to Machine Learning , MIT Press, Prentice Hall of India, Third Edition 2014. (UNIT IV)

**Reference Books:**

1. Stephen Marsland, —Machine learning: An Algorithmic Perspective, CRC Press, 2009
2. Machine Learning: a Probabilistic Perspective, Kevin P. Murphy, MIT Press, 2012
3. Foundations of Machine Learning, Mehryar Mohri, Afshin Rostamizadeh and Ameet Talwalkar, MIT Press, 2012.
4. Machine Learning -The Art and Science of Algorithms that Make Sense of Data, Peter Flach, Cambridge

<b>CSEL06</b>	<b>Principles Of Cloud Computing</b>	<b>L</b>	<b>P</b>	<b>C</b>
	<b>CS324 (CSEL06) Elective - II</b>	<b>3</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

The main objectives of this course are to:

1. To Explain different Cloud Deploy Models & Service Models in an enterprise cloud environment.
2. To teach Cloud Virtual Machines Migration and cloud enhancing service.
3. To create awareness Cloud Data security issues, workflow engines and SLA management for clouds.

**Course Outcomes:**

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

1. Explain the concepts of enterprise cloud environments, Cloud Deployment & Service Models.
2. Discuss the use of Cloud Virtual Machines and cloud enhancing services.
3. Describe the Secure Distributed Data Storage and workflow engines for clouds.
4. Explain Data security and SLA Management.

**Course Content:****UNIT I****12 Periods**

**Introduction to cloud computing:** Cloud Computing, in a Nutshell, roots of Cloud Computing, Layers and Types of Clouds, Desired Features of Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers.

**Migration into a Cloud:** Introduction, Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud.

**Enriching the 'Integration as a Service' Paradigm for the Cloud Era:** An Introduction, The Onset of Knowledge Era, The Evolution of SaaS, The challenges of SaaS paradigm, New integration scenarios, The integration methodologies, SaaS integration products and platforms, SaaS Integration Services, Business to Business Integration (B2Bi) Services, A Framework of Sensor-Cloud Integration.

**UNIT II****12 Periods**

**The Enterprise Cloud Computing Paradigm:** Relevant deployment models for enterprise cloud computing, Issues for Enterprise Applications on the Cloud, Transition Challenges, Business Driver toward a Marketplace for Enterprise Cloud Computing, The Cloud Supply Chain.

**Virtual Machines Provisioning and Migration Services:** Virtualization Technology overview, Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services, VM Provisioning and Migration in Action, Provisioning in the Cloud Context.

**Enhancing Cloud Computing Environments Using a Cluster as a Service:** Introduction, Related Work, RVWS Design, Cluster as a Service: The Logical Design, Proof of Concept.

### UNIT III

12 Periods

**Secure Distributed Data Storage in Cloud Computing:** Introduction, Cloud Storage: from LANs TO WANs, Technologies for Data Security in Cloud Computing Open Questions and Challenges.

**Workflow Engine for Clouds:** Introduction, Workflow Management Systems and Clouds, Architecture of Workflow Management Systems, Utilizing Clouds for Workflow Execution.

### UNIT IV

12 Periods

**SLA Management in Cloud Computing:** Traditional Approaches to SLO Management, Types of SLA, Life Cycle of SLA, SLA Management in Cloud, Automated Policy-based Management.

**Data Security in the Cloud:** An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud, Homo Sapiens and Digital Information, Cloud Computing and Data Security Risk, Cloud Computing and Identity, The Cloud, Digital Identity, and Data Security, Content Level Security—Pros and Cons.

### Learning Resources:

#### Text Book:

1. Rajkumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing Principles and Paradigms, Wiley Publications.

#### Reference Books:

1. Michael Miller, Cloud Computing – Web-Based Application That Change the Way You Work
2. and Collaborate Online Pearson Publications.
3. Thomas Erl, Zaigham Mahmood, & Ricardo Puttini, Cloud Computing- Concepts, Technology &
4. Architecture Pearson Publications.
5. Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff,
6. Cambridge University Press, 2010.
7. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010.
8. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, R.
9. Kai Hwang, Geoffrey C. Fox. Jack J. Dongarra, Distributed and Cloud Computing – From
10. Parallel Processing to the Internet of Things, ELSEVIER Publications.



**JOEL02****Full Stack Development****Course Objectives:**

The main objectives of this course are to:

1. To Explore the Node.js-to-Angular Stack.
2. To make the students understand the MongoDB databases
3. To Develop Dynamic custom web applications using Mean Full Stack Web Framework

**Course Outcomes:**

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

1. Discuss Node.js-to-Angular Stack Components
2. Design Front-end Applications using Angular JS Framework components
3. Implement Applications using Node.js components such as packages, events, listeners, etc.
4. Develop backend scripts using MongoDB.

**Course Content:****UNIT I****(CO – 1)****12 periods**

**Introducing the Node.js-to-Angular Stack:** Understanding the Basic Web

Development Framework, Understanding the Node.js-to-Angular Stack Components

**Getting Started with Node.js:** Understanding Node.js, Installing Node.js, Working with Node Packages, Creating a Node.js Application, Writing Data to the Console

**Angular.js:** Getting Started with Angular, Why Angular?, Understanding Angular, Separation of Responsibilities, Adding Angular to Your Environment, Using the Angular CLI, Creating a Basic Angular Application, Understanding and Using NgModule,

**UNIT II****(CO – 2)****13 periods**

**Angular Components:** Component Configuration, Building a Template, Using Constructors, Using External Templates, Injecting Directives.

**Expressions:** Using Expressions, Using Pipes.

**Data Binding:** Understanding Data Binding.

**Built-in Directives:** Understanding Directives, Using Built-in Directives

**UNIT III****(CO – 3)****13 periods**

**Using Events, Listeners, Timers, and Callbacks in Node.js:** Node.js Event Model, Adding Work to the Event Queue, Implementing Callbacks

**Implementing HTTP Services in Node.js:** Processing URLs, Understanding Request, Response, and Server Objects, Implementing HTTP Clients and Servers in Node.js, Implementing HTTPS Servers and Clients

**Implementing Express in Node.js:** Getting Started with Express, Configuring Routes, Using Request/Responses Objects

#### UNIT IV

(CO – 4)

12 periods

**Understanding No SQL and MongoDB:** Why No SQL?, Understanding MongoDB, MongoDB Data Types;

**Getting Started with MongoDB and Node.js:** Adding the MongoDB Driver to Node.js, Connecting to MongoDB from Node.js, the Objects Used in the MongoDB Node.js Driver, Accessing and Manipulating Databases.

#### Learning

##### Resources: Text

##### Book(s):

1. **Node.js, MongoDB and Angular Web Development** (Second Edition), Brad Dayley, Brendan Dayley, Caleb Dayley, by Pearson Education, Inc. (**Chapters 1, 3, 21-25, 4, 7, 11-12, 18**)

##### References:

1. Getting MEAN with Mongo, Express, Angular, and Node, Manning Publications, by Simon Holmes, Clive Herber, ISBN-10 : 1617294756,
2. Beginning Node.js, Express & MongoDB Development, by Greg Lim (Author) , ISBN-10 : 9811480281,
3. Beginning Node.js, Basarat Syed, APress, ISBN-10: 9781484201886

#### List of Lab Programs:

##### Lab 01.

Create a Node.JS environment with node and npm utilities commands and to check and test the node environment with Node.js Console module.

- steps for installation of Node.js environment Node
- Test through the node REPL shell commands
- Also install prompt-sync module using npm utility.