

Course Name: Cyber Law & Professional Ethics (3 Cr.)

Course Code: CACS401

Year/Semester: IV/VII

Class Load: 4 Hrs. / Week (Theory: 3Hrs. Tutorial: 1 Hrs.)

Course Description:

This course presents different concepts of cyber law, cybersecurity, and ethics for IT professionals and IT Organizations. This course also presents different concepts related to intellectual properties and their protections, privacy, and social networking issues.

Course Objectives:

The primary objective of this course is to provide knowledge of cyber law, cybersecurity, privacy protection, intellectual property protection, and ethics for IT professionals and IT organizations.

Course Contents:

Unit 1: An Overview of Ethics, Ethics for IT Workers and IT Users (10 Hrs.)

Ethics, Ethics in the Business World; Corporate Social Responsibility; Fostering Corporate Social Responsibility and Good Business Ethics; Improving Business Ethics; Ethical Considerations in Decision Making; Ethics in Information Technology; Managing IT Worker Relationship; Encouraging Professionalism of IT Workers – Professional Codes of Ethics, Professional Organizations, Certifications and Licensing ; Encouraging Ethical Use of IT Resources among Users

Unit 2: Cyberattacks, Cybersecurity, and Cyber Law (12 Hrs.)

Threat Landscape – Computer Incidents, Types of Exploits; CIA Security Triad – Confidentiality, Integrity, Availability, Implementing CIA at Organizational, Network, Application, and End-User Level; Response to Cyberattack - Incident Notification Protection of Evidence and Activity Logs Incident Containment Eradication Incident Follow-Up Using an MSSP, and Computer Forensics; Cyber Law; Provision of Cyber Law and Electronic Transaction Act of Nepal

Unit 3: Privacy and Freedom of Expression (10 Hrs.)

Privacy Protection and the Law - Information Privacy, Privacy Laws, Applications, and Court Rulings; Key Privacy and Anonymity Issues - Consumer Profiling, Electronic Discovery, Workplace Monitoring, Surveillance; First Amendment Rights; Freedom Expressions: Key Issues; Social Networking Ethical Issues

Unit 4: Intellectual Property (8 Hrs.)

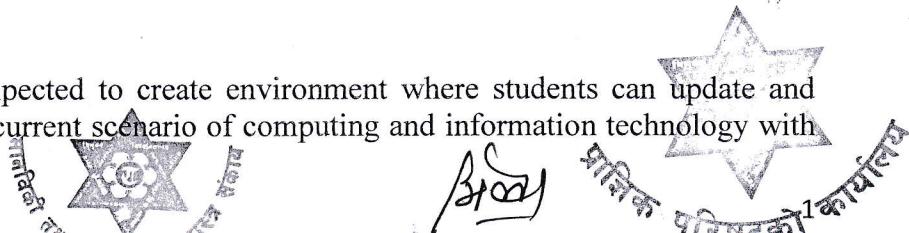
Intellectual Property, Copyright; Patent; Trade Secrets; Intellectual Property Issues: Plagiarism, Reverse Engineering, Open Source Code, Competitive Intelligence, Trademark Infringement, and Cybersquatting

Unit 5: Ethical Decision in Software Development and Ethics of IT Organizations (8 Hrs.)

Software Quality and its Importance; Strategies for Developing Quality Software; Use of Contingent Workers; H-1B Workers; Outsourcing; Whistle-Blowing; Green Computing

Teaching Methods

The teaching faculties are expected to create environment where students can update and upgrade themselves with the current scenario of computing and information technology with



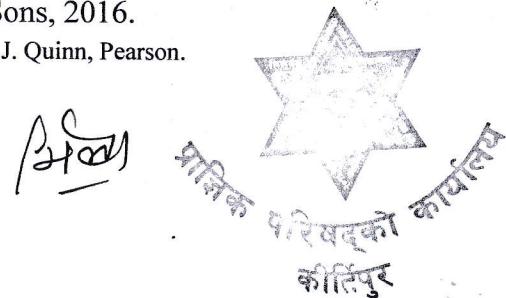
the help of topics listed in the syllabus. The general teaching pedagogy that can be followed by teaching faculties for this course includes class lectures, laboratory activity, group discussions, case studies, guest lectures, research work, project work, assignments (Theoretical and Practical), and written and verbal examinations.

Evaluation

Examination Scheme					
Internal Assessment		External Assessment		Total	
Theory	Practical	Theory	Practical		
40		60	-		

Recommended Books:

1. Ethics in Information Technology, Sixth Edition, George W. Reynolds.
2. Ethics and Technology: Controversies, Questions, and Strategies for Ethical Computing, Fifth Edition, Herman T. Tavani, John Wiley and Sons, 2016.
3. Ethics for Information Age, Eighth Edition, Michael J. Quinn, Pearson.



- **Course Title: Cloud Computing (3 Cr.)**
- Course Code: CACS402**
- Year/Semester: IV/VII**
- Class Load: 6 Hrs. / Week (Theory: 3Hrs. Practical: 3 Hrs.)**

Course Description

This course offers detailed concept, applications, principles and implementation of cloud computing. It includes introduction, Cloud Computing Architecture, Cloud Virtualization, Cloud Programming Models, Cloud security and applications. It does not entirely focus on theoretical concept but also strongly focuses on practical skill based learning.

Course objectives

The general objectives of this course are to provide theoretical as well as practical knowledge of cloud computing to make students capable of designing, implementing and managing the issues of cloud computing in their personal as well professional life.

Course Contents

- **Unit 1: Introduction to Cloud Computing [6 Hrs.]**

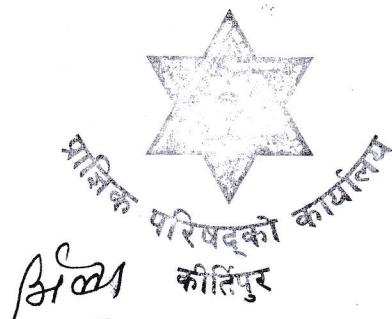
- 1.1 Overview of Cloud Computing
- 1.2 Evolution of Cloud Computing
- 1.3 Characteristics of Cloud Computing
- 1.4 Types of cloud and its Cloud services
- 1.5 Benefits and challenges of cloud computing
- 1.6 Applications cloud computing
- 1.7 Cloud Storage
- 1.8 Cloud services requirements,
- 1.9 cloud and dynamic infrastructure
- 1.10 Cloud adoption

- **Unit 2: Cloud Computing Architecture [6 Hrs]**

- 2.1 Cloud reference model
- 2.1.1 Platform as service
- 2.1.2 Software as a service
- 2.1.3 Infrastructure as service
- 2.2 Cloud deployment models
- 2.2.1 Public clouds
- 2.2.2 Private clouds
- 2.2.3 Community cloud
- 2.2.4 Hybrid clouds
- 2.3 Cloud design and implementation using SOA,
- 2.4 security, trust and privacy

- **Unit 3: Cloud Virtualization technology [10 Hrs]**

- 3.1 Overview of Virtualization techniques
- 3.2 Types of Virtualization
- 3.3 Implementation Levels of Virtualization Structures
- 3.4 virtualization benefits



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- 3.5 server virtualization
- 3.6 hypervisor management software
- 3.7 virtual infrastructure requirements

Unit 4: MapReduce(8 Hrs)

- 4.1 Introduction to parallel computing
- 4.2 Map-reduce model
- 4.3 Applications of map reduce
- 4.4 Parallel efficiency of Map-Reduce
- 4.5. MapReduce infrastructure

Unit 5: Cloud security [6 Hrs]

- 5.1 Introduction to Security,
- 5.2 Cloud Security challenges and Risks,
- 5.3 Software-as-a-Service Security
- 5.4 Security Monitoring
- 5.5 Security Architecture Design
- 5.6 Data Security
- 5.7 Application Security
- 5.8 Virtual Machine Security
- 5.9 Identity Management and Access Control

Unit 6: Cloud platforms and applications [12 Hrs]

- 6.1 Web services
- 6.2 AppEngine
- 6.3 Azures Platform
- 6.4 Aneka
- 6.4 Open challenges
- 6.5 Scientific applications
- 6.6 Business and Consumer applications

Practical Works

1. The practical work consists of all features of cloud computing and field visit.
2. Visit the cloud service provider (cloud industries) nearby you and prepare a report based on organizational structure and technology implemented consulting with your subject teacher.

Teaching Methods

- The teaching faculties are expected to create environment where students can update and upgrade themselves with the current scenario of computing and information technology with the help of topics listed in the syllabus. The general teaching pedagogy that can be followed by teaching faculties for this course includes class lectures, laboratory activity, group discussions, case studies, guest lectures, research work, project work, assignments (Theoretical and Practical), and written and verbal examinations.



Evaluation

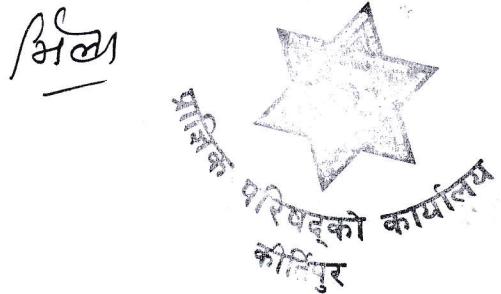
Examination Scheme					
Internal Assessment		External Assessment		Total	
Theory	Practical	Theory	Practical		
20	20 (3 Hrs.)	60 (3 Hrs.)	-		

Text Books

1. Dr. Kumar Saurabh, Cloud Computing
2. Raj Kumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing

Reference Books

1. David S. Linthicum, Cloud Computing and SOA Convergence in your enterprise
2. Barrie Sosinsky, Cloud Computing Bible
3. Saurabh, K. (2011). Cloud Computing – Insights into New -Era Infrastructure, Wiley India.



Course Title: Internship (3 Cr.)

Course Code: CAIN403

Year/Semester: IV/VII

Class Load:

Course Description: The internship course is practical industry experiencing course. This course is expected to provide opportunity for career exploration and development in industry. It includes applying theoretical and practical knowledge for solving real world problems while working in industry.

Course Objectives: The objective of this course is to expose and penetrate final year students into market space industry so as to acquire experience. It gives students the opportunity to enter the real world industry so that students will be pragmatic and able to start their professional career.

Course Details:

Nature of Internship:

The internship work should be related to computer applications and information technologies. The nature of work during internship should impart practical knowledge in computer system and its applications development, administration and management. The internship period should be minimum of 8 (Eight) weeks. Students should start their internship within 3 to 4 weeks of start of seventh semester. The internship can be practiced at government, non-government organizations having appropriate computer system applications and information technology usages. Generally, the internship is an individual activity however can be practiced together in groups in the host organization. However, each student must prepare and submit individual internship report on the basis of his/her work done during the internship period. Students working in group at the same organization should be able to distinguish their nature of work. Each student should be facilitated with a mentor and supervisor. Mentor from the intern providing company is assigned to guide each student during internship in the company. Supervisor from college/campus is assigned to supervise each student during internship.

Phases of Internship:

The following are the phases of internship evaluation:

1. **Proposal Submission:** Students must submit and present project proposal after 2nd week of start of the internship.
2. **Mid-Term:** Students must submit progress report and defend midterm progress of their internship work in the 12th week of the seventh semester.
3. **Final Submission:** Students must submit and orally defend the internship work during last week of the seventh semester but before final board examination. Students must have to submit the internship final report to their respective department before at least ten days of final defence date. The report should be submitted in standard format as prescribed. The hard/soft copy of report should be made available to the external expert before a week of presentation date. A viva voice will be conducted by evaluation committee.

Provision of Supervision:



There should be a regular faculty of campus/college assigned as a supervisor. The role of supervisor is to guide the students throughout the internship and provide constructive suggestions. A supervisor can supervise at most five internship students in a class section.

Provision of Mentorship:

There should be a regular employee in the intern providing organization assigned as a mentor. The role of mentor is to guide the students throughout the internship period at the organization.

Evaluation Scheme:

1. **Proposal Defense** of 5% of total marks based on internship proposal and its presentation.
2. **Midterm** of 75% of total marks based on the progress of the work of internship.
3. **Final Defense** of 20% of total marks based on presentation of internship work and viva-voice.

The 5 marks of the proposal defense will be evaluated by the research committee formed by HOD/Coordinator/Supervisor as a part of proposal defense. The 75 marks of the midterm will be evaluated by the HOD/Coordinator, Supervisor and Mentor as a part of midterm defense. Out of the 75 marks, the HOD/Coordinator will evaluate for 5 marks, the supervisor will evaluate for 35 marks and the mentor examiner will evaluate for 35 marks. The marks from the mentor should be provided to the corresponding campus/college in confidential manner. The remaining 20 marks of final defense will be evaluated by the external examiner from the university.

Out of 100 marks, the 80 marks (Proposal + Midterm Evaluation) will be considered as internal assessment while the 20 marks (Final Defense) will be considered as external assessment. Each student in the internship should get passed in each of the internal and external assessments individually. Any student failing to pass each of the assessments will be considered as fail.

The evaluation committee and evaluation criteria should be as follow;

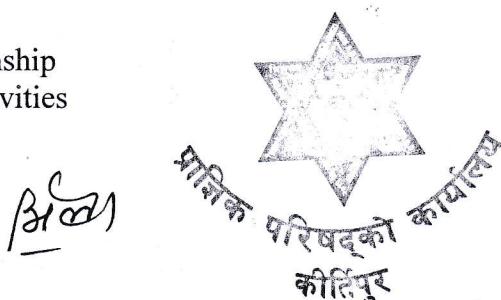
a. Evaluation committee

- Internship Supervisor
- Mentor from Intern Company
- HOD/Coordinator
- External Examiner

b. Focus of the evaluation

- Presentation skills
- Level of work done during internship
- Understanding of internship activities
- Internship report
- Viva/Question answer

Report Contents:



1. Prescribed content flow for the internship proposal

1. Introduction
2. Problem Statement
3. Objectives
4. Description of Internship Work/Project (Expected)
5. Internship Plan (Expected)
6. Expected Outcome of Internship Activities
7. References

2. Prescribed content flow for the internship report

1. Cover & Title Page
2. Certificate Page
 - i. Mentors' Recommendation from Company
 - ii. Supervisors' Recommendation
 - iii. Examiners' Approval Letter
3. Acknowledgement
4. Abstract Page / Executive Summary
5. Table of Contents
6. List of Abbreviations, List of Figures, List of Tables, List of Abbreviations
7. Main Report
8. References
9. Bibliography (if any)
10. Appendices (Screen Shots/ Source Codes)

3. Prescribed chapters in the main report

1. Chapter 1: Introduction

- 1.1. Introduction (Introduce the project/ work done during internship)
- 1.2. Problem Statement
- 1.3. Objectives
- 1.4. Scope and Limitation
- 1.5. Report Organization

2. Chapter 2: Introduction to Organization

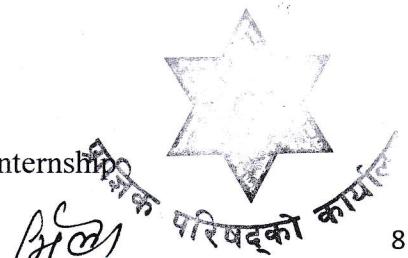
- 2.1. Organization Details
- 2.2. Organizational Hierarchy
- 2.3. Working Domains of Organization
- 2.4. Description of Intern Department/Unit

3. Chapter 3: Background Study and Literature Review / Related Works

- 3.1. Background Study (Description of fundamental theories, general concepts and terminologies related to the internship project)
- 3.2. Literature Review (Review of the similar projects during internship, theories and results similar the projects during internship)

4. Chapter 4: Internship Activities

- 4.1. Roles and Responsibilities
- 4.2. Weekly log (Technical Details of Activities)
- 4.3. Description of the Project(s) Involved During Internship



4.4. Tasks / Activities Performed

5. Chapter 5: Conclusion and Learning Outcomes

5.1. Conclusion

5.2. Learning Outcome

While writing above chapters students should avoid basic definitions. They should relate and contextualize the above mentioned concepts with their project work done during internship at the host organization.

Citation and Referencing

The listing of references should be listed in the references section. The references contain the list of articles, books, urls that are cited in the document. The books, articles, and others that are studied during the study but are not cited in the document can be listed in the bibliography section.

The citation and referencing standard should be APA referencing standard. The text inside the document should be cited accordingly. The APA referencing standard can be found in the web at <https://apastyle.apa.org/>

Report Format Standards

A. Page Number

The pages from certificate page to the list of tables/figures/abbreviations/approvals should be numbered in roman starting from i. The pages from chapter 1 onwards should be numbered in numeric starting from 1. The page number should be inserted at bottom, aligned center.

B. Page Size and Margin

- The paper size must be a page size corresponding to A4. The margins must be set as Top = 1; Bottom = 1; Right = 1; Left 1.25

C. Paragraph Style

- All paragraphs must be justified and have spacing of 1.5.

D. Text Font of Document

- The contents in the document should be in Times New Roman font
- The font size in the paragraphs of document should be 12

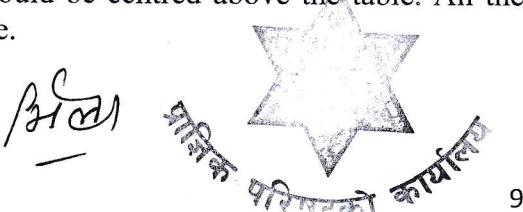
E. Section Headings

- Font size for the headings should be 16 for chapter headings, 14 for section headings, 12 for sub-section headings. All the headings should be bold faced.

F. Figures and Tables

- Position of figures and tables should be aligned center. The figure caption should be centred below the figure and table captions should be centred above the table. All the captions should be of bold face with 12 font size.

Final Report Binding and Submission:



No of Copies: 3 (College Library + Self + Dean Office)

Look and Feel: Golden Embracing with Black Binding

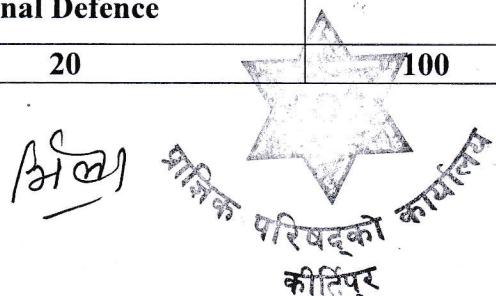
A final approved signed copy of the report should be submitted to the Dean Office, Exam Section, FOHSS.

Teaching Methods:

The major teaching methods that can be followed for this course includes industry practice, class lectures, group discussions, presentations, and demonstrations.

Evaluation

Examination Scheme			
Internal Assessment		External Assessment	Total
Proposal Defence	Midterm Defence	Final Defence	
5	75	20	100



Course Title: E-Governance (3 Cr.)

Course Code: CACS409

Year/Semester: IV/VII

Class Load: 4Hrs. /Week (Theory: 3 Hrs. Tutorial: 1 Hrs)

Course Description:

This course familiarizes students with different concepts of E-Governance, different E-Governance models and infrastructure development, use of data warehousing and data mining for e-governance, and different case studies of different countries.

Course Objectives:

- To develop knowledge of e-governance
- To know different e-governance models and infrastructure development
- To know to use concepts of data warehousing and mining in e-governance

Course Contents:

Unit 1: Introduction (6 Hrs.)

E-Governance – An Overview; Why E-Governance; Issues in E-Governance Applications and the Digital Divide; Evolution of E-Governance, its Scope and Content; Present Global Trends of Growth in E-Governance; E-Governance Applications; E-Governance Initiatives in Nepal

Unit 2: E-Governance Models (12 Hrs.)

Introduction; Models of Digital Governance – Broadcasting/Wider Dissemination Model, Critical Flow Model, Comparative Analysis Model, Mobilization and Lobbying Model, Interactive Service Model/Government-to-Citizen-to-Government Model (G2C2G); Evolution in E-Governance and Maturity Models – Five Maturity Levels; Characteristics of Maturity Levels; Key Focus Areas; Towards Good Governance through E-Governance Models

Unit 3: E-Governance Infrastructure, Stages in Evaluation and Strategies for Success (8 Hrs.)

E-readiness - Data System Infrastructure, Legal Infrastructural Preparedness, Institutional Infrastructural Preparedness, Human Infrastructural Preparedness, Technological Infrastructural Preparedness; Evolutionary Stages in E-Governance

Unit 4: Applications of Data Warehousing and Data Mining in Government (6 Hrs.)

Introduction; National Data Warehouses - Census Data, Prices of Essential Commodities; Other Areas for Data Warehousing and Data Mining – Agriculture, Rural Development, Health, Planning, Education, Commerce and Trade, Other Sectors

Unit 5: CASE Studies (16 Hrs.)

Nepal (E-Governance Master Plan of Nepal; E-Governance in Local Government of Nepal; Nagarik App)

India (NICNET – Role of Nationwide Networking in E-Governance; Collectorate 2000; Computer-aided Administration of Registration Department (CARD); Smart Nagarpalika – Computerization of Urban Local Bodies (Municipalities); National Reservoir Level and Capacity Monitoring System; Computerization in Andhra Pradesh State Trading Corporation; Ekal Seva Kendra; Sachivalaya Vahini or E-Governance Secretariat; Bhoomi; IT in Indian Judiciary; E-Khazana for Government Treasury, Andhra Pradesh; E-Governance in the Offices of Director General for Foreign Trade (DGFT); PRAJA – Rural e-Seva; E-Seva, A New

Paradigm in Citizen Services; E-Panchayat (Electronic Knowledge Based Panchayat); General Information Services of National Informatics Centre)

Other Countries (E-Governance initiative in USA; E-Governance Case Study in China – Beijing Business E-Park; Brazil's Poupatempo or 'Time Saver' Centres; Sri Lanka – Kothamale Community Radio Internet Project)

Recommended Books:

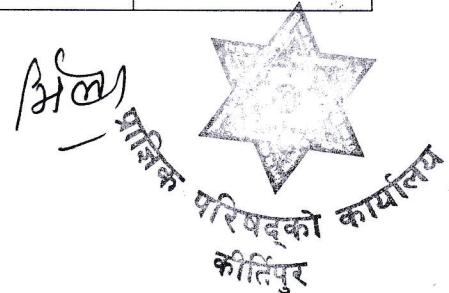
4. E-Governance: Concepts and Case Studies, C.S.R. Prabhu, Second Edition, PHI Learning, 2012.
5. Strategic Planning and Implementation of E-Governance, P.K.Suri and Sushil, Springer, 2019.
6. A Study of the Practice of E-governance in the Developing Countries: A Qualitative Approach In Measuring The Maturity of E-government, Kazi Hassan Robin and Md. Mahmudul Hasan Rafee, 2012.
7. Implementing and managing e-Government, Richard Heeks, 2006.

Teaching Methods:

The teaching faculties are expected to create environment where students can update and upgrade themselves with the current scenario of computing and information technology with the help of topics listed in the syllabus. The general teaching pedagogy that can be followed by teaching faculties for this course includes class lectures, tutorials, group discussions, case studies, guest lectures, research work, project work, assignments (Theoretical and Practical), and written and verbal examinations.

Evaluation

Examination Scheme					
Internal Assessment		External Assessment		Total	
Theory	Practical	Theory	Practical		
20	20 (3 Hrs.)	60 (3 Hrs.)	-		



Course Name: Artificial Intelligence (3 Cr.)

Course Code: CACS410

Year/Semester: IV/VII

Class Load: 5 Hrs. / Week (Theory: 3Hrs. Practical: 2 Hrs.)

Course Description: The course introduces basics of artificial intelligent. It covers fundamental concepts artificial intelligence, problem solving, knowledge representation, neural networks, machine learning, natural language processing, machine vision and expert systems.

Objective:

The objective of this course is to introduce the basic principles, techniques, and applications of Artificial Intelligence. Upon the completion students will be able to:

- Gain fundamental concepts of principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
- Investigate applications of AI techniques in expert systems, artificial neural networks and other machine learning models.

Course Contents:

UNIT 1: INTRODUCTION

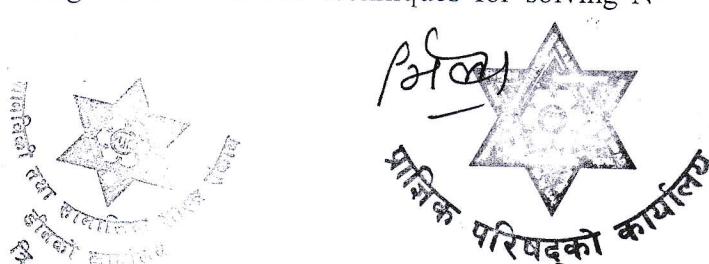
[6 Hrs.]

- 1.1 Intelligence, Intelligent behavior, Artificial Intelligence, Understanding AI based on thought process and behavior, Hard vs. Strong AI, Soft vs. Weak AI
- 1.2 Foundations of AI
- 1.3 Applications of AI
- 1.4 Intelligent Agents: Introduction of agents, Structure of Intelligent agent, Properties of Intelligent Agents, PEAS description of Agents, Types of Agents: Simple Reflexive, Model Based, Goal Based, Utility Based, Learning agent, Environment Types: Deterministic, Stochastic, Static, Dynamic, Observable, Semi-observable, Single Agent, Multi Agent

UNIT 2: PROBLEM SOLVING METHODS

[12Hrs.]

- 2.1 Definition of a Problem, Problem as a state space representation, Problem formulation, Well-defined problems, Constraint satisfaction problem, Water jug problem, N-Queen problem, Cryptarithmetic problem, Graph coloring problem
- 2.2 Problem solving by searching, types of searching, Measuring problem solving performance, General State Space Search
- 2.3 Uninformed: Breadth-First Search, Depth-First Search, Depth-Limited Search, Iterative Deepening depth first Search, Bidirectional Search, Using uninformed search techniques for solving N-Queens Problem, Puzzle problem etc.
- 2.4 Informed search: Greedy Best-First Search, A* Search, Optimality of A*, Local search: Hill Climbing, Simulated Annealing, Using informed search techniques for solving N-Queens Problem, Puzzle problem etc.



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- 2.5 Game Playing, Optimal Decisions in Games, Alpha – Beta Pruning, Minimax Algorithm, Tic-Tac –Toe Problem, Stochastic Games

UNIT 3: KNOWLEDGE REPRESENTATION AND REASONING[15Hrs.]

- 3.1 Definition and importance of Knowledge, Issues in Knowledge Representation, Knowledge Representation Systems, Properties of Knowledge Representation Systems, Types of Knowledge, The Role of Knowledge
- 3.2 Knowledge representation techniques: Rule Based, Semantic Nets, Frames, Logic based
- 3.3 Propositional Logic, Syntax and Semantic of propositional logic, Proof by Resolution, Conjunctive Normal Form (CNF), Resolution Algorithm, Limitations of Propositional Logic, Forward and Backward Chaining
- 3.4 Predicate Logic, FOPL, Syntax, Semantics, Quantification, horn clauses, Inference with FOPL: By converting into PL (Existential and universal instantiation), Rules of inference, Unification and lifting, CNF for FOPL, Inference using resolution, Resolution Refutation System (RRS)
- 3.5 Handling Uncertain Knowledge, Radom Variables, Prior and Posterior Probability, Inference using Full Joint Distribution, Bayes' Rule and its use, Bayesian Networks, Reasoning in Bayesian Networks

UNIT 4: LEARNING

[4 Hrs.]

- 4.1 Concepts of machine learning
- 4.2 Rote learning, learning by analogy, inductive learning, Explanation based learning, Supervised and unsupervised learning, learning by evolution (genetic algorithm)

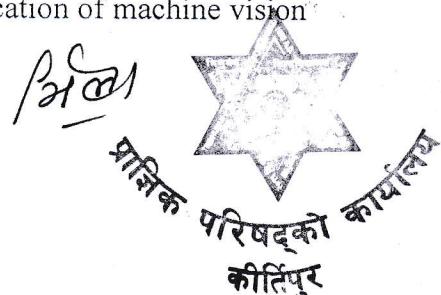
UNIT 5: NEURAL NETWORKS AND NATURAL LANGUAGE PROCESSING [7Hrs.]

- 5.1 Introduction to artificial neural network, Mathematical model of neural network, types of neural network: feed-forward, feed-back, Gate realization using neural network, Learning in neural networks: Back propagation algorithm, Hopfield network, Boltzmann machines
- 5.2 Concepts of natural language understanding and natural language generation, Steps in natural language processing, Syntax analysis, Semantic analysis, Pragmatic analysis

UNIT 6: EXPERT SYSTEM AND MACHINE VISION

[4 Hrs.]

- 6.1 Expert System, Architecture of an expert system, Stages of expert systems development.
- 6.2 Concept of Machine Vision. Steps of machine vision, application of machine vision



Laboratory work:

Laboratory exercises can be conducted in LISP, PROLOG or any other high level programming language. Laboratory exercises must cover the concepts of rule based intelligent agents, inference and reasoning, search techniques, neural networks, etc. for solving practical problems.

Reference Books:

1. Stuart Russel and Peter Norvig, Artificial Intelligence A Modern Approach, Pearson
2. E. Rich, K. Knight, Shivashankar B. Nair, Artificial Intelligence, Tata McGraw Hill.
3. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Benjamin/Cummings Publication
4. D. W. Patterson, Artificial Intelligence and Expert Systems, Prentice Hall.
5. P. H. Winston, Artificial Intelligence, Addison Wesley.

