Tribhuvan University
Faculty of Management
Office of the Dean

Course detail of
BIM (Bachelor of Information Management) 5th Semester

April 2024

IT 228: Artificial Intelligence

(BIM 5th Sem)

Credits: 3
Lecture Hours: 48

Course Description: This course is designed to provide an in-depth exploration of recent advances and emerging trends in Artificial Intelligence (AI). Students will delve into cutting-edge topics, applications, and research areas within the field of AI, gaining a comprehensive understanding of the latest developments.

Course Objectives:
Upon successful completion of this course, students will be able to:

➢ Understand Recent Advances: Comprehend the recent breakthroughs and advancements in AI technology.
➢ Apply Advanced AI Techniques: Apply advanced AI techniques to solve real-world problems and challenges.
➢ Evaluate Emerging Technologies: Evaluate the impact and potential applications of emerging AI technologies.
➢ Stay Updated: Develop skills to stay updated on the fast-evolving landscape of AI research and development.
➢ Critical Thinking: Develop critical thinking skills in analyzing and synthesizing recent AI research papers and articles.

Course Details

Unit 1: Introduction   3 LHs

Intelligence, Artificial Intelligence (AI), AI Perspectives: acting and thinking humanly, acting and thinking rationally, History of AI, Foundations of AI: Philosophy, Economics, Psychology, Sociology, Linguistics, Neuroscience, Mathematics, Computer Science, Control Theory, AI Ethics and Responsible AI: Bias and Fairness in AI, Transparency and Accountability, AI Regulations and Policies, Applications of AI.

Unit 2: Intelligent Agents   4 LHs

Introduction of agents, Structure of Intelligent agent, Properties of Intelligent Agents, Configuration of Agents, PEAS description of Agents, PAGE, 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 3: Problem Solving by Searching   9LHs

Definition, Problem as a state space search, Problem formulation, Well-defined problems, Solving Problems by Searching, Search Strategies, Performance evaluation of search techniques, Uninformed Search: Depth First Search, Breadth First Search, Depth Limited Search, Iterative Deepening Search, Bidirectional Search, Informed Search: Greedy Best first search, A* search, Hill Climbing, Simulated Annealing, Game playing, Adversarial search techniques, Mini-max Search, Alpha-Beta Pruning, Constraint Satisfaction Problems.

Unit 4. Knowledge Representation   **14 LHs.**

Definition and importance of Knowledge, Issues in Knowledge Representation, Knowledge Representation Systems, Properties of Knowledge Representation Systems, Types of Knowledge Representation Systems: Semantic Nets, Frames, Conceptual Dependencies, Scripts, Rule Based Systems(Production System), Propositional Logic, Predicate Logic, Propositional Logic(PL): Syntax, Semantics, Formal logic-connectives, truth tables, tautology, validity, well-formed-formula, Inference using Resolution, Backward Chaining and Forward Chaining, Predicate Logic: FOPL, Syntax, Semantics, Quantification, Inference with FOPL: By converting into PL (existential and universal instantiation), Unification and lifting, Inference using resolution, Handling Uncertain Knowledge, Radom Variables, Prior and Posterior Probability, Inference using Full Joint Distribution, Bayes' Rule and its use, Bayesian Networks, Reasoning in Belief Networks, Fuzzy Logic: Fuzzy Sets, Membership in Fuzzy Set, Fuzzy Rule base Systems.

Unit 5. Machine Learning   **12 LHs**

Introduction to Machine Learning , Concepts of Learning, Supervised, Unsupervised and Reinforcement Learning, Statistical-based Learning: Naive Bayes Model, Learning by Genetic Algorithms: Operators in Genetic Algorithm: Selection, Mutation, Crossover, Fitness Function, Genetic Algorithm, Learning with Neural Networks: Introduction, Biological Neural Networks Vs. Artificial Neural Networks (ANN), Mathematical Model of ANN, Activation Functions: Linear, Step Sigmoid, Types of ANN: Feed-forward, Recurrent, Single Layered, Multi-Layered, Application of Artificial Neural Networks, Learning by Training ANN, Hebbian Learning, Perceptron Learning, Back-propagation Learning, Overview of Deep Learning Architectures : Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), Generative Adversarial Networks (GANs).

Unit 6. Applications of AI   **6 LHs**

Expert Systems, Components of Expert System: Knowledge base, inference engine, user interface, working memory, Development of Expert Systems, Natural Language Processing: Natural Language Understanding and Natural Language Generation, Steps of Natural Language Processing: Lexical Analysis(Segmentation, Morphological Analysis), Syntactic Analysis, Semantic Analysis, Pragmatic Analysis, Machine Translation, Machine Vision Concepts: Machine vision and its applications, Components of Machine Vision System, Object Detection and Recognition, Image Segmentation, Explainable AI in Computer Vision, AI in Healthcare and Bioinformatics, Applications of AI in Medicine, Predictive Modeling in Healthcare.

Laboratory Works:

Student should write programs and prepare lab sheet for most of the units in the syllabus. Majorly, students should practice design and implementation of intelligent agents, knowledge representation systems and machine learning techniques. Students are also advised to implement Neural Networks for solving practical problems of AI. Students are advised to use LISP, PROLOG, and any other high-level language like C, C++, Java, python etc.

Suggested Readings:

Stuart Russel and Peter Norvig, Artificial Intelligence A Modern Approach, Fourth Edition 2020, Pearson.
George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Benjamin/Cummings Publication.
E. Rich, K. Knight, Shivashankar B. Nair, Artificial Intelligence, Tata McGraw Hill.
D. W. Patterson, Artificial Intelligence and Expert Systems, Prentice Hall.
P. H. Winston, Artificial Intelligence, Addison Wesley.

IT 242: Software Design and Development
(BIM 5th Sem)

Course Description:
This course covers different concepts of software design and development including SDLC and different phases, development methodologies, software project management, and some concepts of object-oriented development.

Course Objectives:
The main objective of this course is to provide knowledge of different concepts of software development to students. After completing this course, students will be able to

- Understand importance of software and its systematic development,
- Understand SDLC and its phases,
- Use each SDLC phase to develop software,
- Use project management activities for software development projects,
- Use different methodologies in software development,
- Apply object-oriented development concepts in software development.

Course Details

Unit 1: Systems Development Environment   **6 LHs**

Introduction; Modern Approach to Systems Analysis and Design; Developing Information Systems and Systems Development Life Cycle; Heart of Systems Development Process; Waterfall SDLC; Prototyping; Spiral Development; Agile Methodologies.

Unit 2: Project Management   **4 LHs**

Project Management and Project Management Activities; Gantt Chart and Network Diagram; Representing and Scheduling Project Plans; Using Project Management Software.

Unit 4: Planning   **5 LHs**

Identifying and Selecting Systems Development Projects; Corporate and Information Systems Planning; Initiating and Planning Systems Development Projects; Project Feasibility; Building and Reviewing the Baseline Project Plan.

Unit 5: Analysis   **12 LHs**

Performing Requirements Determination; Traditional, Contemporary, and Radical Methods for Requirements Determination; Process Modeling; Data Flow Diagramming Mechanics; Guidelines for Drawing DFDs; Modeling Logic with Decision Tables; Conceptual Data Modeling; Gathering Information for Conceptual Data Modeling; Introduction to E-R Modeling; Conceptual Data Modeling and the E-R Model; Representing Supertypes and Subtypes; Business Rules; Packaged Conceptual Data Models.

Unit 6: Design   **8 LHs**

Database Design; Normalization; Transforming E-R Diagrams into Relations; Merging Relations; Physical File and Database Design; Designing Forms and Reports; Formatting Forms and Reports**;** Designing Interfaces and Dialogues; Interaction Methods and Devices; Designing Interfaces; Designing Dialogues; Designing Interfaces and Dialogues in Graphical Environments.

Unit 7: Implementation and Maintenance   **5 LHs**

System Implementation; Software Application Testing; Installation; Documenting the System; Training and Supporting Users; Organizational Issues in Systems Implementation; Maintaining Information Systems; Conducting Systems Maintenance.

Unit 8: Object-Oriented Development   **8 LHs**

Introduction to Object-Oriented Development; Unified Modeling Language; Functional, Structural and Behavioral Models.

Laboratory Works:

The laboratory work includes using project management software to represent and schedule project plans and using drawing tool to create different models used in software development. Students should also prepare a report that includes at least analysis and design phases of software development considering any appropriate organization.

Suggested Reading

Joseph S. Valacich and Joey F. George, Modern Systems Analysis and Design, 9th Edition, Pearson

Alan Dennis, Barbara Haley Wixom, and David Tegarden, Systems Analysis and Design – An Object-Oriented Approach with UML, 5th Edition, Wiley

Ian Sommerville, Software Engineering, 10th Edition, Pearson

Alan Dennis, Barbara Haley Wixom, and Roberta M. Roth, Systems Analysis and Design, 7th Edition, Wiley

IT 243: Programming with Python
(BIM 5th Sem)

Credits: 3
Lecture Hours: 48

Course Objectives
The main objective of this course is to provide students both theoretical and practical knowledge of different concepts of Python programming language. After completing this course, students will be able to

- Learn importance of Python programming,
- Learn basic programming concepts of Python programming language,
- Use object-oriented concepts,
- Learn file handling concepts,
- Use some common Python libraries such as Numpy, Pandas, and Matplotlib,
- Use GUI features, database handling,
- Use basic concepts of Python web development.

Course Description
This course covers different concepts of Python programming language including basic language features, operators, built-in data types, control statements, functions, object-oriented programming, exception handling, file handling, modules and packages, common libraries (NumPy, Pandas, and Matplotlib), GUI programming, database handling, and some concepts of web development.

Course Details
Unit 1: Introduction   3 LHs
Python Introduction; Why Python? Installing and Running Python using Interactive Shell and Console; Using IDLE and IDE; Installing Third Party Libraries; Working with Virtual Environment; Writing Comments; Indentation; Tokens; Identifiers; Keywords; Literals; Variables and Constants; The id() function; Operators.

Unit 2: Control Statements   4 LHs
Introduction; Selection Statements (if statements and match-case statement); Using if-else as Ternary Operator; Looping Statements (for and while Loops); The else Clause after for or while Loops; The break and continue Statements; The pass Statement.

Unit 3: Built-In Data Types   8 LHs
Introduction; Numeric Types – Integers, Floating Point Numbers and Complex Numbers; String – Indexing and Slicing, String Formatting, Escape Sequences; Boolean; List – Indexing and Slicing, Changing Items, Adding and Removing Items, Looping, Copying, List Comprehension, Sorting, Copying, and Joining; Tuple – Updating, Indexing and Slicing, Unpacking, Looping, Joining; Set – Accessing, Adding and Removing Items, Set Operations; Frozenset; Range; Dictionary; Binary Types; None Type.

Unit 4: Functions   3 LHs

Introduction; Benefits of using Functions; Creating and Calling Functions; Passing Arguments; Packing and Unpacking Arguments using Tuples and Dictionaries; Return Values and Returning Multiple Values; Recursive Function; Lambda Function.

Unit 5: Object-oriented Programming 9 LHs

Introduction; Object-Oriented Principles – Classes and Objects, Encapsulation; Inheritance, Polymorphism, Abstraction; Defining a Class – Adding Instance Variables, Adding Instance Methods, Adding Class Variables, Adding Class Methods, Adding Static Methods; Constructors; Method Overloading; Inheritance and its Types; Method Overriding; Access Modifiers; Abstract Class; Operator Overloading; Magic Methods; Exception Handling; Modules and Packages; Enumeration.

Unit 6: File Handling 3 LHs

Introduction; File Opening Models; Reading and Writing Files; The os Module and Common Functions; The with Statement.

Unit 7: Common Python Libraries 8 LHs

Numpy: Introduction; Array Creating; Dimensions; Data Types, Array Attributes, Indexing and Slicing; Array Copy and View; Creating Array from Numerical Range; Array Broadcasting; Iterating Over Array; Sorting and Searching; Statistical Functions

Pandas: Series and DataFrames; Creating DataFrames; The head and tail Functions; Attributes; Working with Missing Data; Indexing, Slicing, and Subsetting; Merging and Joining DataFrames; Working with CSV Files

Matplotlib: Introduction; Marker; Line; Color; Label; Grid Lines; Subplot; Scatter Plot; Bra Graph; Histogram, pie chart and Box plot.

Unit 8: Advanced Topics 10 LHs

Working with Database and Using SQL Statements; Basics of GUI Programming, Basics of Web Development.

Laboratory Work:
The laboratory work includes writing programs using Python programming language covering all the concepts studied in each unit of the course.

References:
1. Fabrizio Romano and Heinrich Kruger, Learn Python Programming – An in-depth Introduction to the fundamentals of Python, Third Edition, Packt Publishing, 2021
2. Kenneth A Lampart, Fundamental of python, Cengage Learning Publishing.
3. Cody Jackson (2018): Learn programming in Python with cody Jackson, Packt Publishing, Wesley.
4. Mark Summerfield: "Programming in Python 3: A Complete Introduction to the Python Language", Addison-Wesley Professional.

IT 244: Information Security

(BIM 5th Sem)

Course Objectives:

The objective of this course is to familiarize the students with the theoretical and practical concepts of information security, different security measures, policies and security mechanisms, security audits so that students will be able to design, implement and manage the secure computer system.

Course Description:

This course introduces the basic concepts of computer and information security. This course prepares the students to meet the new challenges in the world of increasing threats to computer security by providing them with an understanding of the various threats and countermeasures. This course includes cryptographic algorithms, authentication systems, intrusion detection and prevention, malicious logics, network security and security audits.

Course Details

Unit 1: Introduction   5 LHs

Computer Security Concepts, Threats, Attacks and Assets, Security Functional Requirements, Security Design Principles, Attack Surfaces and Attack Trees, Computer Security Strategy, Access Control Principles, Subjects, Objects and Access Rights, Discretionary Access Control, Role Based Access Control, Attribute Based Access Control, Identity, Credential and Access Management, Trust Frameworks, Overview of the Bell-LaPadula Model and Biba integrity model.

Unit 2: Symmetric and Asymmetric Cryptographic Algorithms   13 LHs

Classical Cryptosystems: Substitution and Transposition Ciphers, Block Cipher Vs Stream Ciphers, Symmetric Encryption Principles, Fiestel Cipher Structure, Data Encryption Standards (DES), Basic concepts of fields, Modular Arithmetic, Galois Fields, Polynomial Arithmetic, Advanced Encryption Standards (AES), Prime Numbers, Fermat's Theorem, Primality Testing: Miller-Rabin Algorithm, Euclidean Algorithm, Extended Euclidean Algorithm, Euler Totient Function, Asymmetric Encryption, Diffie-Hellman Protocol, RSA Algorithm

Unit 3: Message Authentication and Hash Functions   6 LHs

Message Authentication, Hash Functions, Message Digests: MD4 and MD5, Secure Hash Algorithms: SHA-1, SHA-2, Hash Based MAC (HMAC), Digital Signature

Unit 4: User Authentication   **5 LHs**

    User Authentication Principles, Password-Based Authentication, Token-Based Authentication, Biometric Authentication, Two Factor Authentication, Kerberos Protocol, Kerberos 5, Security Issues for User Authentication.

Unit 5: Intrusion Detection and Prevention   **5 LHs**

    Intruders, Intrusion Detection, Intrusion Detection Analysis Approaches, Host-Based Intrusion Detection, Network-Based Intrusion Detection, Hybrid Intrusion Detection, Intrusion Detection Exchange Format, Honeypots, Intrusion Prevention System

Unit 6: Malicious Software   **4 LHs**

    Malicious Software, Types of Malicious Software, Advanced Persistent Threat, Virus, Worms, Spam E-mail, Trojans, System Corruption, Zombie, Bots, Key loggers, Phishing, Spyware, Backdoors, Rootkits, Countermeasures for Malwares

Unit 7: Network Security   **5 LHs**

    Overview of Network Security, Digital Certificates and X.509 certificates, Certificate Life Cycle Management, PKI trust models, PKIX, Secure Socket Layer (SSL), Transport Layer Security (TLS), IP Security, Email Security, PGP and its Services, Firewalls its applications and types, VPN.

Unit 8: IT Security Management, Risk Assessment and Security Auditing   **5 LHs**

    IT Security Management, Organizational Context and Security Policy, Security Risk Assessment, Security Risk Analysis, Security Auditing Architecture, Security Audit Trails, Implementing Logging Function, Audit Trail Analysis

Laboratory work

The laboratory work covers implementing programs for following; - Classical ciphers like Caeser, Railfence - DES, AES - Primality Testing, Euclidean Algorithms, Deffie-Hellman RSA - MD5, SHA-1, SHA-2 - Authentication systems like password based, token based, two factor authentication etc.

Suggested Readings:
William Stallings, cryptography and network security principles and practice eighth edition, 2023, Pearson
William Stallings and Lawrie Brown, Computer Security: Principles and Practice, fifth edition, Pearson

Mark Stamp, Information Security: Principles and Practices, Wiley

Matt Bishop, Introduction to Computer Security, Addison Wesley

Matt Bishop, Computer Security, Art and Science, Addison Wesley

MKT 201: Fundamentals of Marketing
BIM 5th Semester

Full Marks: 100   *Credits: 3*
Pass Marks: 50   *Lecture Hours: 48*

Course Objectives
The main objective of this course is to equip students with knowledge and skills of marketing.

Course Description
This course on marketing deals on the operation of the marketing functions in a dynamic and competitive environment. It deals comprehensively on issues of emerging marketing practices and challenges. The course includes topics that help students to understand marketing process and environment, information systems and buyer behavior, segmentation, targeting, and positioning strategies, and strategies related to marketing mix variables.

Course Details
Unit 1: Introduction   **6 LHs**
> Meaning of marketing. Core concepts of marketing. Marketing process. Marketing management orientation - production, product, selling, marketing, and societal marketing concepts. Meaning and components of the marketing mix for products and services.

Unit 2: Understanding Marketing Environment   **6 LHs**
> Meaning of marketing environment; Micro environment: The company, suppliers, competitors, marketing intermediaries, publics, customers. Macro environment: demographic, economic, natural, technological, political, social, cultural environment; Responding to the marketing environment: Reactive and proactive marketing. Marketing environment in Nepal.

Unit 3: Marketing Information System   **4 LHs**
> Concept of marketing information system. Components of the marketing information system. Marketing research process and areas of marketing research

Unit 4: Buyer Behavior   **6 LHs**
> Meaning of buying behavior, model of consumer behavior, consumer buying process, factors influencing consumer behavior. Business buyer behavior: major types of buying situation, business buyer decision process, factors influencing business buyer behavior.

Unit 5: Segmentation, Targeting and Positioning Strategies   **5 LHs**
> Concept, process, requirements of market segmentation. Bases for segmenting consumer and organizational markets. Segment evaluation, and selection. Concept and types of positioning; product positioning process.

Unit 6: Product Decisions   **LH 8**
> Concept and levels of the product. Product classifications and marketing considerations. Product life cycle stages: features and strategies. New product development process. Branding strategies – branding objectives, types of brand, and concept of brand equity. Packaging: functions and levels of packaging; essentials of a good package. Product line and mix strategies. Service product strategies

Unit 7: Pricing Decisions   **4 LHs**

Concept of price and pricing. Factors affecting pricing decisions: Internal and external price factors. Pricing approaches-cost-based, value-based and competition- based approaches. New product pricing decisions. Initiating and responding to price changes. Pricing practices in Nepal.

Unit 8: Distribution Decisions   **4 LHs**

Concept and objectives of distribution, channel designs for consumer and industrial products. Channel selection factors. Concept and components of marketing logistics: transportation, warehousing, inventory management, order processing, and customer services decisions. Distribution practices in Nepal.

Unit 9: Promotion Decisions   **5 LHs**

Concept and objectives of promotion. Promotion mix components. Factors affecting determination of promotion mix. Advertising: Nature and objectives. Nature and process of personal selling. Nature and objectives of sales promotions. Sales promotion tools and techniques. Nature, and tools of public relations. Concept , and methods of direct marketing. Promotion practices in Nepal.

Suggested Readings

Kotler and Armstrong, **Principles of Marketing,** Prentice Hall of India, New Delhi, India.

Stanton, Etzel and Walker, **Fundamentals of Marketing**, McGraw Hill, New Delhi, India