Pt. Ravishankar Shukla University Raipur

CURRICULUM & SYLLABI

(Based on CBCS & LOCF)

Diploma in Artificial Intelligence

(DAI)

Semester System

Session: 2025-26 & onwards

Approved by:	Board of Studies	Academic Council
Date:	05 MAY 2025	

SCHEME OF TEACHING AND EXAMINATIONS
D.A.I. (Diploma in Artificial Intelligence)

FIRST SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Examination Marks							
					Max. Marks				Min. Marks			
		L	T	P	Th	Ses	Pr	Total	Th	Ses	Pr	Total
DAI 101	Information Technology	2	1	_	80	20	_	100	20	13	_	33
DAI 102	Artificial Intelligence & Expert Systems	2	1	_	80	20	_	100	20	13	_	33
DAI 103	Python Programming	2	1	_	80	20	_	100	20	13	_	33
DAI 104	Practical based on DAI 101	_	_	2 x 2	_	_	100	100	_	_	40	40
DAI 105	Practical based on DAI 103	_	_	2 x 2	_	_	100	100	_	_	40	40
	TOTAL	**6**	**3**	**8**	**240**	**60**	**200**	**500**	**60**	**39**	**80**	**179**

SECOND SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Examination Marks							
					Max. Marks				Min. Marks			
		L	T	P	Th	Ses	Pr	Total	Th	Ses	Pr	Total
DAI 106	Advanced Artificial Intelligence Concepts	2	1	_	80	20	_	100	20	13	_	33
DAI 107	Data Science with AI Tools	2	1	_	80	20	_	100	20	13	_	33
DAI 108	Machine Learning & Simulation Tools	2	1	_	80	20	_	100	20	13	_	33
DAI 109	Practical based on DAI 107	_	_	2 x 2	_	_	100	100	_	_	40	40
DAI 110	Practical based on DAI 108	_	_	2 x 2	_	_	100	100	_	_	40	40
	TOTAL	**6**	**3**	**8**	**240**	**60**	**200**	**500**	**60**	**39**	**80**	**179**

05-05-2025
(Dr. Sanjay Kumar) (Dr. V.K. Patle) (Dr. A.K. Tiwari) (Dr. Vibha Dubey) (Dr. Pooja Rathi)

(Mr. Mannu Rawani) (Miss. Vartika Shrivastav) (Dr.Pranjali Dewangan) (Mr. Samik Bhattacharya)

FIRST SEMESTER
Information Technology (2024-25)
Subject Code – DAI 101

Max Marks : 100 **Min Marks : 25**

Course Outcomes

- Student will understand the basicS OF COMPUTER system its hardware components.
- Student will understand the workings & functions of Operating Systems.
- Student will know how to use MS Office
- Student will understand the basics of the working of the Internet.

Syllabus

UNIT – I: Computer Fundamentals

Characteristics and capabilities of computers. Computer Hardware and Software: Block Diagram of a Computer. Data Processing Concepts: Data, Data Processing System, Data Storage, and Data Retrieval. Types of Computers: Analog, Digital, Hybrid, General and Special Purpose. Overview of Computer Generations. Central Processing Unit: Microprocessor, Control Unit, ALU, Registers, Buses. Memory: RAM, ROM. Storage Devices: Primary vs. Secondary Storage, Hard Disks, Optical Disks (CD-ROM).

UNIT – II: Operating Systems

Introduction to Operating Systems: Functions and Uses. Booting Process and Types of Reboot. Overview of Popular Operating Systems: DOS, Windows, Linux. Open Source Software Concept and Evolution of Linux. Linux Basics: File System, Directory Structure. Basic Linux Commands: cd, ls, cp, mv, rm, mkdir, cat, grep.

UNIT – III: MS Office – Word Processing and Presentations

Introduction to MS Word: Document Creation, Editing, Formatting Text and Paragraphs. Working with Tables, Images, Header/Footer, and Styles. Introduction to MS PowerPoint: Creating Presentations, Using Themes, Inserting Media. Applying Animations and Transitions for Slideshows.

UNIT – IV: MS Office – Excel and Data Management

Introduction to MS Excel: Worksheet Creation, Data Entry, Formatting. Basic Formulas and Functions (SUM, AVERAGE, IF). Creating and Formatting Charts (Column, Pie, Line). Data Management: Sorting, Filtering, Data Validation. Protecting and Reviewing Worksheets.

UNIT – V: Internet and Its Applications

Evolution and Applications of the Internet. Basic Networking Concepts: TCP/IP, IP Addressing, Domains. Internet Connectivity Methods: Dial-up, Broadband, VSAT. Basics of Email Communication: SMTP, POP3, IMAP. Introduction to Web Browsers, Search Engines, and Cybersecurity Basics.

RECOMMENDED BOOKS:

1. Computer Fundamentals, P. K. Sinha, BPB Publications, Sixth Edition.
2. Introduction to Information Technology, V. Rajaraman, PHI, Second Edition.
3. Microsoft Office 2007 fundamentals, L Story, D Walls.
4. MS Office, S. S. Shrivastava, Firewall Media.
5. Internet, The Complete Reference Millennium Edition Margaret Levine Young, Doug Muder.

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FIRST SEMESTER
Artificial Intelligence & Expert Systems (2024-25)
Subject Code – DAI 102

Max Marks : 100 **Min Marks : 25**

Course Outcomes

- Student will be able to explain the concepts of AI, Intelligence and Agents
- Student will be able to understand the mathematics which provide the foundations to the fields of AI & Computer Science.
- Student will have ability to define the heuristics and apply them for solving complex problem with understanding of different heuristics-based search techniques.
- Student will have understanding of rule-based systems and expert systems with ability to apply them in intelligent solutions of complex problem.

Syllabus

UNIT – I

Introduction to AI: Foundations of AI, Philosophy and History; AI problems, AI technique; The Turing Test. **Intelligent Agents:** Agents and Environments, the Concept of Rationality, the Nature of Environments and the Structure of Agents.

UNIT – II: Mathematical Foundations of Artificial Intelligence: Boolean algebra and its properties, algebra of propositions as an example, De Morgan's Laws, partial order relations g.l.b., l.u.b. Algebra of electric circuits and its applications. Design of simple automatic control system. Arbitrary Cartesian product of sets. Equivalence relations, partition of sets, injective, surjective, bijective maps, binary operations, countable, uncountable sets.

UNIT – III: Rule Based Systems: Production Systems & their characteristics. **Expert Systems:** Introduction, Characteristics, History and Applications of expert systems; Expert System Shells; Rule Based Systems Architectures, Non-Production System Architectures; Knowledge Acquisition and Validation.

UNIT – IV: Problem solving & State Space Search: General problem solving: defining problems as State Space Search, Problem Characteristics. **Exhaustive Searches:** Generate and Test, Breadth First Search, Depth First Search and DFID, Branch and Bound technique

UNIT – V: Heuristic Search Techniques: Best first search; A* algorithm; Problem Reduction AND/OR Graphs and AO* algorithm. **Local Searches & Optimizations:** Hill climbing and its variants. **Constraint Satisfaction Problems:** Definition; Constraint Propagation and Backtracking. **Game Playing:** Mini-Max Search Procedure; Alpha-Beta Cutoffs; Additional Refinements.

BOOKS RECOMMENDED:

1. **Artificial Intelligence 3rd Edition**, *Rich E., Knight K. and Nair S. B.,* McGraw Hill Education
2. **Artificial Intelligence: A Modern Approach 3rd Edition,** *Russell S. J. and Norvig P.*, Pearson Education
3. **Introduction to Artificial Intelligence and Expert Systems**, *Patterson D. W.*, PHI
4. **Principles Of Artificial Intelligence**, *Nilson N. J.*, Narosa Publications
5. **Artificial Intelligence3rd Edition**, *Winston P. H.*, Pearson Education
6. **A First Course in Artificial Intelligence**, *Khemani D.*, McGraw Hill Education

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FIRST SEMESTER
Python Programming (2024-25)
Subject Code – DAI 103

Max Marks : 100 **Min Marks : 25**

Course Outcomes

At the end of course student will be able to:

- understand why Python is a useful scripting language for developers and learn how to design and program Python applications.
- use lists, tuples, dictionaries, indexing and slicing to access data in Python programs.
- define the structure and components, how to write loops, decision statements, functions and pass arguments of a Python program.
- build and package Python modules for reusability.

Syllabus

UNIT – I

Introduction to Python Programming: What is a Program, Formal and Natural Languages, Why use Python, Uses of python, Strengths & Drawbacks, The Python Interpreter, Running Python, The IDLE User Interface, The Interactive Prompt, Script Mode, Dynamic Typing, Debugging. Types, Operators, Expressions & Statements: Values and Types, Assignment Statement, Variable Names, Expressions & Statements, Order of Operations, String Operations, Comments.

UNIT – II

Conditionals: Boolean Expressions, Logical operators, Conditional & Alternative Execution, Chained and Nested Conditions. Iterations: Reassignment, Updating Variables, The "for" and "while" statements, break. Strings: String is a sequence, len, Traversal with a for loop, String Slices, Searching, Looping and Counting, String Methods, the "ín" operator, String Comparison.

UNIT – III

Lists: List is a Sequence, Traversing and other Operations, List Slices, List Methods, Map Filter and Reduce, Deleting Elements, Lists and Strings, Objects and Values, Aliasing, List Arguments. Dictionaries: A Mapping and as a Collection of Counters, Looping and Dictionaries, Reverse Lookup, Dictionaries and Lists, Memos, Global Variables. Tuples: Tuple Assignments, Tuples as Return Values, Variable Length Argument Tuples, Lists and Tuples, Dictionaries and Tuples, Sequence of Sequences.

UNIT – IV

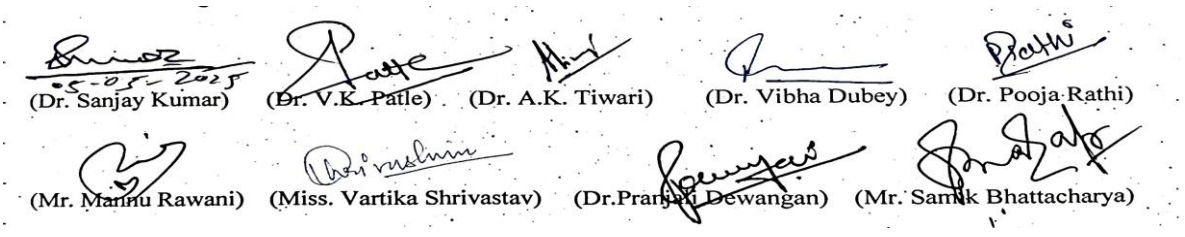
Functions: Function Calls, Math Functions, Composition, Adding New Functions, Definitions & Uses, Flow of Execution, Parameters and Arguments, Why Functions, Stack Diagrams, Void and Fruitful Functions, Return Values, Incremental Development, Composition, Boolean Functions, Checking Types. Recursion: Stack Diagram for Recursive Functions, Infinite Recursion, Taking Input from Keyboard, More Recursion. Catching Exceptions

UNIT – V

Files: Files & Persistence, Reading and Writing, Filenames and Paths. Object-Oriented Programming: Programmer defined Types, Attributes, Instances as Return Values, Classes and Functions, Classes and Methods, Inheritance and Polymorphism. **Graphics programming**: Drawing with turtle graphics, using turtle module, moving the turtle with any direction, moving turtle to any location, the color, bgcolor, circle and speed method of turtle, drawing with colors, drawing basic shapes using iterations.

BOOKS RECOMMENDED:

1. **Learning Python** 5th Edition, *Mark Lutz*, O'Reilly Publications
2. **Core Python Programming**, *R. NageshwaraRao*, Dreamtech Publications
3. **Think Python** 2nd Edition, *Allen B. Downey*, O'Reilly Publications
4. **Beginning Python: Using Python 2.6 and Python 3.1**, *James Payne*, Wiley
5. **Python Essentials Reference**, 4th Edition, *David M. Beazley*, Addison – Wesley
6. **Practical Programming: An Introduction to Computer Science Using Python 3**, *Paul Gries et al.*, Pragmatic Programmers



SECOND SEMESTER
Advanced Artificial Intelligence Concepts (2024-25)
Subject Code – DAI 106

Max Marks : 100 **Min Marks : 25**

Course Outcomes

- Student will have understanding of different knowledge structure and inference mechanism with ability to apply them in intelligent solutions of complex problem.
- Student will be able to understand and apply various types of Logics.
- Student will understand the existence of uncertainty in problem solving and how mathematical /statistical models are used to overcome these problems.
- Students will understand the basics of Evolutionary Computing

Syllabus

UNIT – I

Knowledge Representation: Types of Knowledge; Knowledge Representation Issues; **Slot and Filler Structures:** Semantic Networks; Frame Systems and value inheritance; Conceptual Dependency; Scripts. **Planning:** Overview; The Blocks Word; Component of a Planning System: Goal Stack Planning; Nonlinear Planning;

UNIT – II

Logic: History; Logical Arguments & Syllogisms, Logical Fallacies; **Propositional Logic:** Reasoning in Propositional Logic, Truth Tables, Deduction, **First order Predicate Logic:** Representation of facts in FOL; Inference in FOL; Resolution Principle, Clausal Form and Unification; **Inference Mechanisms:** Forward and Backward Chaining.

UNIT – III

Reasoning under Uncertainty: Non-monotonic Reasoning, Logics for Non-monotonic Reasoning, Default Reasoning, Minimalistic Reasoning, Implementation Issues, Truth Maintenance Systems; **Probabilistic Reasoning and Uncertainty:** Statistical Reasoning; Probability Theory; Bayes Theorem and Bayesian networks; Certainty Factor; Dempster-Shafer Theory.

UNIT – IV

Introduction to Fuzzy Logic System

Fuzzy Sets: Operation of Fuzzy Sets, Properties of Fuzzy Sets, Fuzzy Relations, Fuzzy Arithmetic, Membership Functions, Fuzzy to Crisp Conversion. **Fuzzy Logic**: Fuzzy Rule Based Systems, Fuzzy Decision Making, Fuzzy Database, Fuzzy Intelligent System.

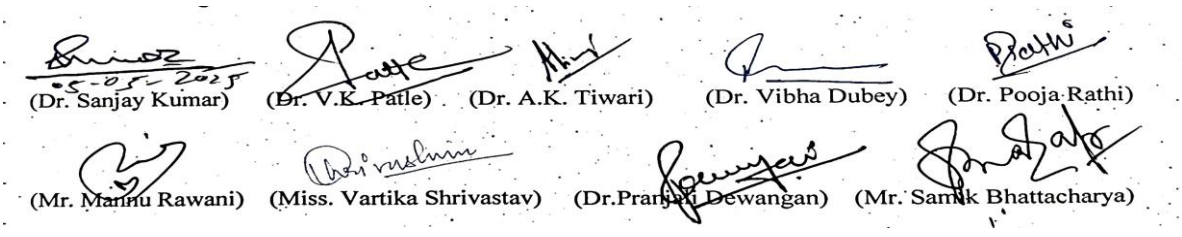
UNIT – V

Evolutionary Computing

Introduction, overview of evolutionary computing, Genetic algorithms and optimization; The schema theorem: the fundamental theorem of genetic algorithms, Genetic algorithm operators, Integration of genetic algorithms with neural networks, Integration of genetic algorithms with fuzzy logic, Known issues in GAs.

BOOKS RECOMMENDED:

1. **Artificial Intelligence 3rd Edition**, *Rich E., Knight K. and Nair S. B.,* McGraw Hill Education
2. **Artificial Intelligence: A Modern Approach 3rd Edition,** *Russell S. J. and Norvig P.*, Pearson Education
3. **Introduction to Artificial Intelligence and Expert Systems**, *Patterson D. W.*, PHI
4. **Principles Of Artificial Intelligence**, *Nilson N. J.*, Narosa Publications
5. **Artificial Intelligence3rd Edition**, *Winston P. H.*, Pearson Education
6. **A First Course in Artificial Intelligence**, *Khemani D.*, McGraw Hill Education



SECOND SEMESTER
Data Science with AI Tools (2024-25)
Subject Code – DAI 107

Max Marks : 100 **Min Marks : 25**

Course Outcomes

- Students will understand the Role of Data Science
- Apply Mathematical and Statistical Foundations
- Utilize Python for Data Science Tasks
- Perform Data Handling and Preprocessing
- Build and Implement Predictive Models
- Visualize and Communicate Results

Syllabus

UNIT - I: Data science in a big data world: Why Data Science, Benefits and uses of data science; Facets of data. The data science process: Setting up goal, retrieving data, data preparation, data exploration, data modelling, Presentation and automation.

UNIT – I: Mathematical Foundations: Linear Algebra: Vectors, Matrices; **Statistics**: Describing a Single Set of Data, Correlation, Simpson's Paradox, Correlation and Causation; **Probability**: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem; **Hypothesis and Inference:** Statistical Hypothesis Testing, Confidence Intervals, P-hacking, Bayesian Inference.

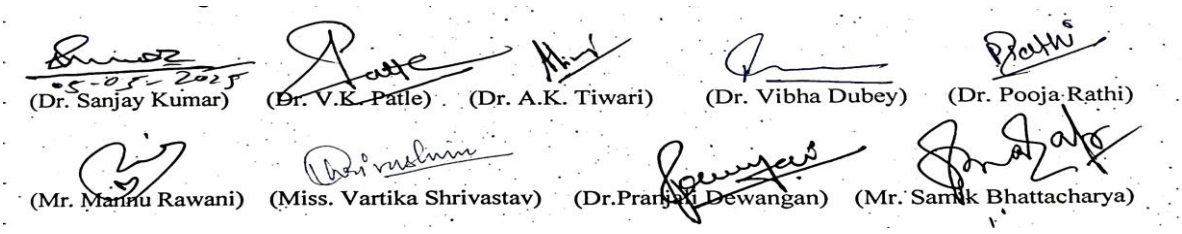
UNIT - III: Data science using Python: IDEs other than the default IDLE, **Tools for Data Science**- Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK 2.2 **Visualizing Data**: Bar Charts, Line Charts, Scatter plots.

UNIT - IV: Implementation with Python: Working with data - **Reading Files** - Panda data frame: Reading data: .txt, .xlxs, .csv files; indexing attributes of data, converting data types, Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction, Developing a model-using scikit library(classification: Use Naïve bayes, SVM;

UNIT - V: Prediction Model: logistic Regression; Clustering K-mean clustering, Analyze performance.

RECOMMENDED BOOKS:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media
2. Davy Cielen, Arno, D, B Meysmen, Mohamed Ali, "Introducing Data Science", Manning
3. Python Data Science Handbook: Essential Tools for Working with Data, by Jake VanderPlas, O'reilly Media, 2017
4. JainV.K. ,"Data Sciences",Khanna Publishing House, Delhi.
5. JainV.K., "Big Data and Hadoop",Khanna Publishing House, Delhi.



SECOND SEMESTER
Machine Learning & Simulation Tools (2024-25)
Subject Code – DAI 108

Max Marks : 100 **Min Marks : 25**

Course Outcomes

At the end of course student will understand

- Differentiate between types of learning and apply suitable methods for different problems.
- Implement various machine learning algorithms for classification, regression, and clustering tasks.
- Build, train, and evaluate artificial neural networks.
- Understand and develop basic simulation models using standard simulation tools.
- Integrate machine learning models with simulation systems for real-world problem solving.
- Analyse, experiment, and optimize systems using simulation techniques.

Syllabus

UNIT – I: Learning: Types of Learning – Supervised, Unsupervised; Reinforced Learning, Rote Learning; Learning by Taking Advise; Induction; Explanation based Learning; Discovery; Analogy.

UNIT – II: Machine Learning: Overview of Machine learning concepts – Overfitting and train/test splits, Introduction to Bayes Theorem, Linear Regression- model assumptions, regularization (lasso, ridge, elastic net), Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbours, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors, Rule Induction.

UNIT – III: Introduction to Artificial Neural Networks

Introduction to Artificial Neural Network, Artificial Neuron, Classification of Artificial Neural Network, Architecture of a Artificial Neural Network, Activation Function, Training an Artificial Neural Network, Application of Artificial Neural Network.

UNIT – IV: Introduction to Simulation

Definition, Need, and Applications. Overview of Simulation Software: AnyLogic, SimPy, MATLAB Simulink. Steps in Simulation Model Building, Design Considerations. Integration of Simulation and Machine Learning: Synthetic Data, Testing, and Decision-Making. Case Studies of Simulation in Healthcare, Logistics, and Manufacturing.

UNIT – V: Basic Simulation Models

Basic Simulation Models (Traffic Flow, Inventory Management, Queuing Systems). Embedding Machine Learning Models within Simulations. Experimentation Techniques: Parameter Variation, Sensitivity Analysis. Best Practices in Simulation Modelling: Validation, Verification, Managing Randomness. Capstone Project: Design and Develop a Simulation Integrated with a Machine Learning Model.

BOOKS RECOMMENDED:

1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniquesto Build Intelligent Systems", 1st Edition, O'Reilly Media
2. Jeeva Jose,“Machine Learning”,Khanna Publishing House, Delhi.
3. Chopra Rajiv,“Machine Learning”,Khanna Publishing House, Delhi.
4. S. Rajasekaran and G. A. Vijayalakshmi Pai, *Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications*, PHI Learning.
5. Ian Goodfellow, Yoshua Bengioand Aaron Courville, "DeepLearning",MITPress http://www.deeplearningbook.org

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