MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

DEPARTMENT OF INFORMATION TECHNOLOGY

COMPILER DESIGN
160611/230601/240601

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVES

- To learn finite state machines and context free grammar.
- To learn, various phases of compiler
- To understand process of compiler implementation.

Unit-I

Overview of Translation Process: Introduction to Compiler, Translator, Interpreter and Assembler, Overview and use of Linker and Loader, Major Data Structures in Compiler, Other Issues in Compiler Structure, BOOT Strapping and Porting, Compiler Structure: Analysis-Synthesis Model of Compilation, Various Phases of a Compiler, Tool Based Approach to Compiler Construction.

Unit-II

Lexical Analysis: Input Buffering, Symbol Table, Token, Recognition of Tokens, Lexeme and Patterns, Difficulties in Lexical Analysis, Error Reporting and Implementation. Regular Grammar & Language Definition, Transition Diagrams, Design of a Typical Scanner usingLEX.

Unit-III

Syntax Analysis: Context Free Grammars (CFGs), Ambiguity, Basic Parsing Techniques: Top Down Parsing, Recursive Descent Parsing, Transformation on the Grammars, Predictive Parsing LL(1) Grammar, Bottom-UP Parsing, Operator Precedence Parsing, LR Parsers (SLR, CLR, LALR), Design of a Typical Parser Using YACC.

Unit-IV

Semantic Analysis: Compilation of Expression, Control, Structures, Conditional Statements, Various Intermediate Code Forms, Syntax Directed Translation, Memory Allocation and Symbol Table Organizations, Static and Dynamic Array Allocation, String Allocation, Structure Allocation etc., Error Detection Indication and Recovery, Routines or Printing Various Lexical, Syntax and Semantic Errors.

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Unit-V

Code Generation and Code Optimization: Issues, Basic Blocks and Flow Graphs, Register Allocation, Code Generation, DAG Representation of Programs, Code Generation from DAGS, Peep-hole Optimization, Code Generator Generators, Specification of Machine. Code Optimization: Source of Optimizations, Optimization of Basic Blocks, Loops, Global Data Flow Analysis, Solution to Iterative Data Flow Equations, Code Improving Transformations, Dealing with Aliases, Data Flow Analysis of Structured Flow Graphs.

RECOMMENDED BOOKS

- Compilers: Principles, Techniques and Tools, V. Aho, R. Sethi and J. D. Ullman, Pearson Education.
- Compiler Construction: Principles and Practice, K.C. Louden, Cengage Learning.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define the concepts of finite automata and context free grammar.

CO2. build the concept of working of compiler.

CO3. examine various parsing techniques and their comparison.

CO4. compare various code generation and code optimization techniques.

CO5. analyze different tools and techniques for designing a compiler.

CO6. design various phases of compiler.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DATA MINING & PATTERN WAREHOUSING
160612/230602/240602

L	T	P	Total Credits
3	-	2	4

COURSE OBJECTIVES

- To understand the significance of data mining in real-world perspective.
- To gain understanding of data mining techniques, algorithms and commonly used tools.
- To develop ability for applying data mining techniques and tools for solving real-world problems.

Unit - I

Introduction: Motivation, importance, Data type for Data Mining: Relational Databases, Data Ware-Houses. Transactional Databases, Advanced Database System and Its Applications, Data Mining Functionalities, Concept/Class Description, Association Analysis Classification & Prediction, Cluster Analysis, Outliner Analysis, Classification of Data Mining Systems, Major Issues in Data Mining.

Unit - II

Data Pre-processing: Data Cleaning, Data Integration and Transformation and Data Reduction. Discretization and Concept Hierarchy Generation. Data Mining Primitives Languages and System Architectures, Concept Description, Characterization and Comparison Analytical, Characterization.

Data Warehouse and OLTP Technology for Data Mining: Differences between Operational Database Systems & Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology.

Unit – III

Mining Association Rules in Large Databases: Association Rule Mining: Market Basket Analysis, Basic Concepts, Mining Single Dimensional Boolean Association Rules from Transactional Databases: The Apriori Algorithm, Generating Association Rules from Frequent Items, Improving the Efficiency of Apriori, other Algorithms & their Comparison, Mining Multilevel Association Rules, Multidimensional Association Rules, Constraint Based Association Rule Mining.

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DEPARTMENT OF INFORMATION TECHNOLOGY

Unit - IV

Classification & Prediction and Cluster Analysis: Issues Regarding Classification & Prediction, Different Classification Methods, Prediction, Cluster Analysis, Major Clustering Methods, Currently Available Tools.

Unit - V

Pattern Warehousing System: Pattern Warehouse, Process flow for Pattern Warehouse, Benefits of Pattern Warehousing, Difference between Pattern Warehousing and Data Warehousing, Architectural aspects of Pattern Warehousing, Types of Pattern Warehouses, Challenging Issues in Pattern Warehouse, Profitable Pattern Mining, Hesitation Mining, Case Study in Stock Market, Super Market.

RECOMMENDED BOOKS

- Data Mining: Concepts and Techniques, Han and Kamber, Morgan Kaufmann Publications.
- Data Mining Techniques, A. K. Pujari, Universities Press Pvt. Ltd.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1.   explain various basic concept of data mining and data warehousing.

CO2.   classify various database systems and data models / schemas of data warehouse.

CO3.   compare various methods for storing & retrieving data from different data sources/repository.

CO4.   apply data mining techniques for knowledge extraction from large amount of data .

CO5.   analyze data for knowledge discovery & prediction using appropriate algorithms.

CO6.   develop real world application using data mining techniques.

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DEPARTMENT OF INFORMATION TECHNOLOGY

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
160603/230603

L	T	P	Total Credits
3	-	2	4

COURSE OBJECTIVES:

- To provide the fundamental knowledge of Artificial Intelligence and Machine Learning.
- To present the basic representation and reasoning paradigms used in AI & ML.
- To understand the working of techniques used in AI & ML.

Unit I

Introducing Artificial Intelligence: Definition, Goals of AI, Task of AI, Computation, Psychology and Cognitive Science, Perception, Understanding and Action. Artificial Intelligence vs Machine Learning vs Deep Learning and other related fields. Applications of Artificial intelligence and Machine Learning in real world.

Unit II

Problem, Problem Space and Search:
Production System, Blind Search: BFS & DFS, Heuristic Search, Hill Climbing, Best First Search.

Introduction to Neural Networks:
History, Biological Neuron, Artificial Neural Network, Neural Network Architectures, Classification, & Clustering.

Unit III

Introduction to Machine Learning: Traditional Programming vs Machine Learning.
Key Elements of Machine Learning: Representation, Process (Data Collection, Data Preparation, Model Selection, Model Training, Model Evaluation and Prediction), Evaluation and Optimization. **Types of Learning:** Supervised, Unsupervised and Reinforcement Learning. Regression vs Classification Problems.

Unit IV

Supervised Machine Learning: Linear Regression: Implementation, Applications & Performance Parameters, Decision Tree Classifier, Terminology, Classification vs Regression Trees, Tree Creation with Gini Index and Information Gain, IDE3

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DEPARTMENT OF INFORMATION TECHNOLOGY

Algorithms, Applications and Performance Parameters. Random Forest Classifier, Case Study on Regression and Classification for solving real world problems.

Unit V

Unsupervised Machine Learning: Introduction, Types: Partitioning, Density Based, DBSCAN, Distribution Model-Based, Hierarchical, Agglomerative and Divisive, Common Distance Measures, K-Means Clustering Algorithms, Case Study on Clustering for solving real world problems.

RECOMMENDED BOOKS:

- Artificial Intelligence: A Modern Approach by Stuart J. Russell and Peter Norvig, Prentice Hall.
- Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-Graw Hill.
- Introduction to AI & Expert System: Dan W. Patterson, PHI.
- Pattern Recognition and Machine Learning, Christopher M. Bishop
- Introduction to Machine Learning using Python: Sarah Guido
- Machine Learning in Action: Peter Harrington

COURSE OUTCOMES

after completing the course, the student will be able to:

CO1.   define basic concepts of Artificial Intelligence & Machine Learning.

CO2.   illustrate various techniques for search and processing.

CO3.   identify various types of machine learning problems and techniques.

CO4.   analysis various techniques in Artificial Intelligence, ANN & Machine Learning.

CO5.   apply AI and ML techniques to solve real world problems.

CO6.   build AI enabled intelligent systems for solving real world problems.

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DEPARTMENT OF INFORMATION TECHNOLOGY

AI IN ROBOTICS
240603

L	T	P	Total Credits
3	-	2	4

COURSE OBJECTIVES

- To study the concepts of Artificial Intelligence in Robotics.

- To learn the methods of solving problems in Robotics using Artificial Intelligence.

- To learn about planning, strategies and algorithms.

Unit I

Artificial Intelligence Brief History, Thinking and acting humanly, Categorization of Intelligent Systems, AI Program Components, AI Foundations, Sub-areas of AI, Applications, Artificial Intelligence in Robotics, AI-Language development, Current AI Trends, Future potential of AI.

Unit II

Need for Image processing in AI, Image Sensing and Acquisition, Image Enhancement: Histogram processing, Smoothing and Sharpening Spatial Filtering, Noise removal, Image Restoration: Mean Filters, Wiener filtering, Image Segmentation: Edge detection, Thresholding, Region-based segmentation and Recognition: descriptor, classification.

Unit III

Intelligent Robot Control, Vision, Planning Approach, Algorithm for Intelligent Robot System, Continuous Path Control, Control System for Robot Joint, Control Actions, Feedback Device.

Unit IV

Planning with forward and backward state space search, Partial order planning, Planning graphs, Planning with propositional logic, Planning and acting in the real world.

Unit V

Uninformed Search Strategies: Breadth-First Search, Uniform Cost Search, Depth-First Search, Analysis of Search Methods, Informed Search Strategies: Heuristic Functions, Best-First Search, Greedy Search, A* Algorithm, Optimal Solution by AO* Algorithm, Applications of AI-based Robotic system.

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DEPARTMENT OF INFORMATION TECHNOLOGY

RECOMMENDED BOOKS

- Artificial Intelligence – A Modern Approach. Second Edition, Stuart Russel, Peter Norvig, PHI, Pearson Education.
- Artificial Intelligence – Structures and Strategies for Complex Problem Solving , George F Luger, Addison Wesley, Fifth Edition
- Artificial Intelligence, 3rd Edition, Patrick Henry Winston., Pearson Edition
- Saeed B. Niku, Introduction to Robotics Analysis, Application, Pearson Education Asia, 2001.
- Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing', Pearson, Third Edition, 2010.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1.   define different basic terms related to artificial intelligence.

CO2.   tell the fundamentals of the intelligent robot control system.

CO3.   infer the basics of image processing used in robotics.

CO4.   explain the basics of planning in robotics.

CO5.   apply the concept of an algorithm for an intelligent system.

CO6.   implement artificial intelligence in robotics.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DATA MINING & WAREHOUSING
910102 (OC-1)

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- To understand the significance of data mining in real-world perspective.
- To gain understanding of data mining techniques, algorithms and commonly used tools.
- To develop ability for applying data mining techniques and tools for solving real-world problems.

Unit - I

Introduction: Motivation, important, Data type for Data Mining: Relational Databases, Data Ware-Houses. Transactional Databases, Advanced Database System and Its Applications, Data Mining Functionalities Concept/Class Description, Association Analysis Classification & Prediction, Cluster Analysis, Outliner Analysis Classification of Data Mining Systems, Major Issues in Data Mining.

Unit - II

Data Warehouse and OLTP Technology for Data Mining: Differences between Operational Database Systems & Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology, Emerging Scenario of Pattern Warehousing System.

Unit - III

Data Pre-processing: Data Cleaning, Data Integration and Transformation, Data Reduction Discretization and Concept Hierarchy Generation. Data Mining Primitives Languages and System Architectures, Concept Description, Characterization and Comparison Analytical Characterization.

Unit - IV

Mining Association Rules in Large Databases: Association Rule Mining: Market Basket Analysis, Basic Concepts, Mining Single Dimensional Boolean Association Rules from Transactional Databases: The Apriori Algorithm, Generating Association Rules from Frequent Items, Improving the Efficiency of Apriori, other Algorithms & their Comparison, Mining Multilevel Association Rules, Multidimensional Association Rules, Constraint Based Association Rule Mining.

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DEPARTMENT OF INFORMATION TECHNOLOGY

Unit - V

Classification & Predication and Cluster Analysis: Issues Regarding Classification & Predication, Different Classification Methods, Predication, Cluster Analysis, Major Clustering Methods, Currently Available Tools, Case Study.

RECOMMENDED BOOKS

- Data Mining: Concepts and Techniques, Han and Kamber, Morgan Kaufmann Publications.
- Data Mining Techniques, A. K. Pujari, Universities Press Pvt. Ltd.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. explain various data mining tasks.

CO2. classify various databases systems and data models / schemas of data warehouse.

CO3. compare various methods for storing & retrieving data from different data sources/repository.

CO4. apply pre-processing techniques for construction of data warehouse.

CO5. analyze data for knowledge discovery & prediction using appropriate algorithms.

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DEPARTMENT OF INFORMATION TECHNOLOGY

SOFTWARE ENGINEERING
910103 (OC-1)

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- To understand the nature of software development and software life cycle process models, agile software development, scrum and other agile practices.

- To understand project management and risk management associated with various types of projects.

- To know basics of testing and understanding concept of software quality assurance and software configuration management process.

Unit - I

Introduction to Software Engineering: Definition, Software Engineering-Layered Technology, Software Characteristics and Components, Software Model: Software Development of Life Cycle Model (SDLC), Waterfall Model, Iterative Waterfall Model, Prototyping Model, Spiral Model, RAD Model. Selection Criteria of Model: Characteristics of Requirements, Status of Development Team, Users Participation, Type of Project and Associated Risk.

Unit - II

Requirement Engineering: Definition, Requirement Engineering Activity , Types of Requirement- Functional and Non-Functional Requirements, User and System Requirements, Requirement Elicitation Methods, Requirement Analysis Methods, Requirement Documentation (SRS), Requirement Validation, Requirement Management.

Unit - III

Design Concept, Principle and Methods: Design Fundamentals, Design Principles, Effective Modular Design, Design Representations, Architectural Design, Procedural Design, Data Directed Design, Real Time Design, Object Oriented Design, Coupling and Cohesion.

Unit - IV

Software Metrics, Project Management and Estimation: Metrics in Process and Project Domains, Software Measurement, Software Quality Metrics, Project Management- Basics-People, Product, Process, Project, Estimation- Software Project

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DEPARTMENT OF INFORMATION TECHNOLOGY

Estimation, Decomposition Techniques- Function Point Estimation, Line of Code (LOC) Based Estimation, Empirical Estimation, COCOMO Model, Project Scheduling Techniques.

Unit - V

Software Testing: Definitions, Software Testing Life Cycle (STLC), Test Case Design, Strategic Approach to Software Testing- Verification & Validation , Strategic Issues, Criteria for Completion of Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Black Box Testing Techniques, White Box Testing Techniques, Acceptance Testing.

RECOMMENDED BOOKS

- Software Engineering, Sommerville, Pearson.
- Software Engineering: A Practitioner's Approach, Roger S. Pressman, McGraw Hill.
- Software Engineering, K.K. Agrawal & Yogesh Singh, New Age Publication.
- Software Engineering, Rajib Mall, PHI.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. explain the various fundamental concepts of software engineering.

CO2. develop the concepts related to software design & analysis.

CO3. compare the techniques for software project management & cost estimation.

CO4. choose the appropriate model for real life software project.

CO5. design the software using modern tools and technologies.

CO6. test the software through different approaches.

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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPILER DESIGN LAB
160611/230601/240601

LIST OF PROGRAMS

1. Write a program to convert NFA to DFA.

2. Write a program to minimize DFA.

3. Develop a lexical analyzer to recognize a few patterns.

4. Write a program to parse using Brute force technique of Top down parsing.

5. Develop LL (1) parser (Construct parse table also).

6. Develop an operator precedence parser (Construct parse table also).

7. Develop a recursive descent parser.

8. Write a program for generating for various intermediate code forms.

    i.   Three address code

    ii. Polish notation

9. Write a program to simulate Heap storage allocation strategy.

10. Generate Lexical analyzer using LEX.

11. Generate YACC specification for a few syntactic categories.

12. Given any intermediate code form implement code optimization techniques.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DATA MINING & PATTERN WAREHOUSING
160612/230601/240601

<u>LIST OF PROGRAMS</u>

1. To perform basic operation for mining data (Preprocessing, Regression, Classification, Association, Clustering and Visualization) using WEKA simulator

2. Setting up a flow to load an ARFF file (batch mode) and perform a cross validation using J48 (WEKA's C4.5 implementation).

3. Draw multiple ROC curves in the same plot window for J48 and RandomForest as classifiers using Knowladge flow in weka.

4. Training and Testing of naive Bayes classifier incrementally using Knowladge flow in weka.

5. Write a program to count the occurrence frequency of items in the given data set

6. Write a program to generate frequent itemset from given data set

7. Write a program to generate Association rules from the generated frequent itemsets.

8. Write a program to implement of various Association Rule Mining algorithms such as Apriori, Eclat, FP growth and FP Tree.

9. Write a program to implement different type of clustering algoritms such as Kmean, Heirachical, DBScan and EM Clustering.

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DEPARTMENT OF INFORMATION TECHNOLOGY

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
160613/230603

LIST OF PROGRAMS

1. Study of PROLOG programming language and its functions.

2. Write simple fact for the statements using PROLOG

3. WAP to implement factorial, Fibonacci of a given number using PROLOG.

4. Write a program to solve the 4-Queen problem using PROLOG and Python both.

5. Explore numpy, Pandas, SciPy, Matplotlib and Scikit Learn libraries in Python

6. Study and implement various Dimensionality reduction, Feature selection and Normalization techniques in Python

7. Implement Linear Regression model in Python.

8. Implement Logistic Regression model in Python.

9. Implement decision tree Classification Model using C4.5 and CSRT algorithms in Python.

10. Implement K-means clustering technique.

11. Implement Fuzzy C-means clustering technique.

12. Study various performance parameters used for evaluating the performance of various regression, classification and clustering models.

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DEPARTMENT OF INFORMATION TECHNOLOGY

AI IN ROBOTICS
240603

<u>LIST OF PROGRAMS</u>

1. Study of Image Processing:
    a. Image Acquisition
    b. Image Enhancement
    c. Color image Processing
    d. Image resizing
2. Write a program for color detection.
3. Write a program for image Segmentation.
4. Write a program for object Detection.
5. Write a program for hand Gesture Recognition.
6. Write a program for object Tracking.
7. Write a program to track objects of a particular color.
8. Write a program to implement A* algorithm for robot path planning.
9. Write a program to implement AO* algorithm for robot path planning.

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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPILER DESIGN LAB
160611/230601/240601

SKILL BASED MINI PROJECTS

1. Design a Lexical scanner to recognize keyword, identifier and its total count presented in source program.

2. Design a Lexical scanner to identify operators, digits (0-9) and numbers (like integer, floating point, fractional and exponential) in source program.

3. Design a Lexical scanner to count no. of words, character, small characters, capital characters and capital words within source program.

4. Design a Lexical analyzer to ignore comments, redundant spaces, tabs and new lines form input source program.

5. Design a Lexical scanner to recognize and count the number of vowels and consonants in a sentence.

6. Design a YACC analyzer to implement a Calculator and recognize a valid Arithmetic expression.

7. Design a YACC analyzer to recognize string with grammar $\{a^n b^n \mid n >= 0\}$ and $\{a^n b \mid n >= 5\}$.

8. Design a YACC that accepts strings that starts and ends with Zero or One.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DATA MINING & PATTERN WAREHOUSING
160612/230601/240601

SKILL BASED MINI PROJECTS

1. Application in real estate industries to predict the house prices.

2. Detecting Phishing website using data mining techniques.

3. Intelligent Transport System.

4. Credit Card Fraud Detection System.

5. Opinion Mining for Social Networking Site.

6. Weather forecasting using Data mining Technique.

7. Stock Market Analysis and Prediction.

8. Online book recommendation system using Collaborative filtering.

9. Customer behavior prediction using web usage mining.

10. Secure E Learning Using Data Mining Techniques.

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DEPARTMENT OF INFORMATION TECHNOLOGY

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
160613/230603

SKILL BASED MINI PROJECTS

1. Design and implement Handwritten Digits Recognition system.

2. Design and implement a Spam classification system using Machine Learning algorithm.

3. Design and implement a Music Recommendation App.

4. Design and implement heart disease prediction using different classification algorithm and analyse the best over the dataset.

5. Design and implementation of Animal Kingdom Classification using CNN with the help of available libraries in python.

6. Apply the classification algorithms over the time series dataset by transforming the dataset into static values.

7. With the help of random forest classifier, classify any suitable dataset available over the trusted repository.

8. Design a program for Number Guessing using random number generator library. Make a play game with the defined library.

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DEPARTMENT OF INFORMATION TECHNOLOGY

AI IN ROBOTICS
240603

SKILL BASED MINI PROJECTS

1. **Remote-controlled Cam-Bot:** prepare a robot that can be controlled by you and can capture live pictures and videos of whatever it can see.

2. **Wi-Fi-controlled Robot:** prepare a robot that can be controlled with the help of a laptop and which uses raspberry pi as its operating brain.

3. Gesture-controlled robot: prepare a robot that can be controlled using gestures.

4. Obstacle detection robot: prepare a robot that can be controlled using different obstacles.

5. Obstacle avoidance robot: prepare a robot that can be controlled using different obstacles.