# COURSE HANDOUT–S5 CU

# 101009/IT500A SOFTWARE DESIGN WITH UML

## COURSE INFORMATION SHEET

| | |
|---|---|
| PROGRAMME: **COMPUTER SCIENCE AND BUSINESS SYSTEMS** | DEGREE**: BTECH** |
| COURSE: **SOFTWARE DESIGN WITH UML** | SEMESTER: **V** CREDITS: **3** |
| COURSE CODE: **101009/IT500A**<br>REGULATION: **2021** | COURSE TYPE: **CORE** |
| COURSE AREA/DOMAIN: **SYSTEM SOFTWARE** | CONTACT HOURS: **2+1(Tutorial) hours/Week.** |
| CORRESPONDING LAB COURSE CODE (IF ANY): **NO** | LAB COURSE NAME: **NA** |

**SYLLABUS:**

| UNIT | DETAILS | HOURS |
|---|---|---|
| I | **Introduction to on Object Oriented Technologies and the UML Method.** Software development process: The Waterfall Model vs. The Spiral Model, The Software Crisis, description of the real world using the Objects Model, Classes, inheritance and multiple configurations, Quality software characteristics, Description of the ObjectOriented Analysis process vs. the Structure Analysis Model. | 8 |
| II | **Introduction to the UML Language**<br>Standards, Elements of the language, General description of various models, The process of Object-Oriented software development. Description of Design Patterns. Technological Description of Distributed Systems.<br><br>**Requirements Analysis Using Case Modeling**<br>Analysis of system requirements. Actor definitions, writing a case goal, Use Case Diagrams, Use Case Relationships | 13 |
| III | **Transfer from Analysis to Design in the Characterization Stage: Interaction Diagrams.**<br>Description of goal, Defining UML Method, Operation, Object Interface, Class. Sequence Diagram. Finding objects from Flow of Events. Describing the process of finding objects using a Sequence Diagram. Describing the process of finding objects using a Collaboration Diagram. | 13 |

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|---|---|---|
| V | **The Logical View Design Stage: The Static Structure Diagrams.**<br>The Class Diagram Model, Attributes descriptions, Operations descriptions, Connections descriptions in the Static Model, Association, Generalization, Aggregation, Dependency, Interfacing, Multiplicity.<br><br>**Package Diagram Model.**<br>Description of the model, White box, black box, Connections between packagers, Interfaces., Create Package Diagram, Drill Down<br><br>**Dynamic Model: State Diagram / Activity Diagram.**<br>Description of the State Diagram, Events, Handling, Description of the Activity Diagram, Exercise in State Machines. | 16 |
| V | **Component Diagram Model.**<br>Physical Aspect. Logical Aspect, Connections and Dependencies, User face Initial DB design in a UML environment.<br><br>**Deployment Model.**<br>Processors, Connections, Components ,Tasks, Threads, Signals and Events. | 10 |
| | **TOTAL HOURS** | 60 |

**TEXT/REFERENCE BOOKS:**

| T/R | BOOK TITLE/AUTHORS/PUBLICATION |
|---|---|
| T1 | Grady Booch, James Rumbaugh, Ivar Jacobson, The Unified Modelling Language User Guide,Pearson Education. |
| T2 | Bernd Bruegge and Allen H. Dutoit,Object-Oriented Software Engineering using UML, Patterns, and Java |
| R1 | Erich Gamma, Richard Helm, Ralph Johnson, and John M. Vlissides,Design Patterns: Elements of Reusable Object-Oriented Software |

**COURSE PRE-REQUISITES:**

| C.CODE | COURSE NAME | DESCRIPTION | SEM |
|---|---|---|---|
| 101009/IT400C | Software Engineering | Functionalities of software and various designing concepts | S3 |

**COURSE OUTCOMES:**

Students will be able to

| | | |
|---|---|---|
| 101009/IT500A.1 | Understand the concepts and principles of object-oriented programming concepts and the software development process models. | Cognitive Knowledge Level: Understand |
| 101009/IT500A.2 | Interpret the contemporary issues and dis about analysis and coding standards. | Cognitive Knowledge Level: Understand |
| 101009/IT500A.3 | Describe the basic resource management responsibilities of dynamic diagrams of the UM | Cognitive Knowledge Level: Understand |
| 101009/IT500A.4 | Analyze the design methods and modeling techniques. | Cognitive Knowledge Level: Analyze |
| 101009/IT500A.5 | Design UML diagrams for real time problems. | Cognitive Knowledge Level: Create |

**CO-PO AND CO-PSO MAPPING**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 101009/IT500A.1 | 3 | 2 | 2 | 2 | 2 | - | - | - | 1 | 1 | 1 | 1 | 1 | - | - |
| 101009/IT500A.2 | 3 | 2 | 3 | 2 | 2 | - | - | - | 2 | 1 | 1 | 1 | 1 | 2 | - |
| 101009/IT500A.3 | 3 | 2 | 3 | 2 | 2 | - | - | - | - | - | - | 2 | - | - | - |
| 101009/IT500A.4 | 3 | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 2 | - |
| 101009/IT500A.5 | 3 | 2 | 3 | 2 | 2 | - | - | - | 1 | 1 | 1 | 2 | - | 2 | - |

**1-LOW, 2-MEDIUM, 3-HIGH**

**JUSTIFICATIONS FOR CO-PO MAPPING**

| Mapping | LOW/MEDIUM/HIGH | Justification |
|---|---|---|

| | | |
|---|---|---|
| 101009/IT500A.1-PO1 | HIGH | Students get the knowledge about the concepts, principles of object-oriented programming concepts and the software development process models |
| 101009/IT500A.1- PO2 | MEDIUM | Students will be able to identify and analyze the concepts, principles of object-oriented programming concepts and the software development process models |
| 101009/IT500A.1- PO3 | MEDIUM | Students will be able to design and develop concepts, principles of object-oriented programming concepts and the software development process models |
| 101009/IT500A.1- PO4 | MEDIUM | Students will acquire to conduct the analysis of develop concepts, principles of object-oriented programming concepts and the software development process models |
| 101009/IT500A.1- PO5 | MEDIUM | Student could apply the methods and the corresponding tools to develop the software development models |
| 101009/IT500A.1- PO9 | LOW | Students will be able to works as an individual or a team to analyse and develop the software development process models |
| 101009/IT500A.1- PO10 | LOW | Students will be able to communicate effectively on complex object-oriented programming concepts and the software development process models |
| 101009/IT500A.1- PO11 | LOW | Students could demonstrate knowledge and understanding the analysis of develop concepts, principles of object-oriented programming concepts and the software development process models |
| 101009/IT500A.1- PO12 | LOW | Students could understand and recognize the need of software development process models and the basic concepts |
| 101009/IT500A.1-PSO1 | LOW | Students will be able to acquire skills to anlayse and develop concepts and principles of object-oriented programming concepts and the software development process models. |
| 101009/IT500A.2-PO1 | HIGH | Students get the knowledge to interpret the contemporary issues and discuss about analysis and coding standards. |
| 101009/IT500A.2-PO2 | MEDIUM | Students will able to identify and analyze the problems of coding standards |
| 101009/IT500A.2-PO3 | HIGH | Students gain the ability to design and develop the solutions for contemporary issues and analyse the coding standards |
| 101009/IT5 | MEDIUM | Information acquired from the investigations of complex |

| | | |
|---|---|---|
| 00A.2-PO4 | | problems and discuss about analysis and coding standards |
| 101009/IT500A.2-PO5 | MEDIUM | Able to apply the modern tools to design, analyze and solve the contemporary issues and coding standards |
| 101009/IT500A.2-PO9 | MEDIUM | Students will be able to works as an individual or a team to design, analyze and solve the contemporary issues and coding standards |
| 101009/IT500A.2-PO10 | LOW | Students will be able to communicate effectively to design, analyze and solve the contemporary issues and coding standards |
| 101009/IT500A.2-PO11 | LOW | Students could demonstrate knowledge and the solve the contemporary issues and coding standards |
| 101009/IT500A.2-PO12 | LOW | Students could understand and recognize the needs of coding standards analysis |
| 101009/IT500A.2-PSO1 | LOW | Students will be able to acquire skills to Interpret the contemporary issues and discuss about analysis and coding standards |
| 101009/IT500A.2-PSO2 | LOW | Students will be able to acquire skills to Interpret the contemporary issues and discuss about analysis and coding standards |
| 101009/IT500A.3-PO1 | HIGH | Students get the knowledge about the basic resource management responsibilities of dynamic diagrams of the UML. |
| 101009/IT500A.3-PO2 | MEDIUM | Students will able to identify and analyze the basic resource management responsibilities of dynamic diagrams of the UML |
| 101009/IT500A.3-PO3 | HIGH | Students gain the ability to design and develop the basic resource management responsibilities of dynamic diagrams of the UML |
| 101009/IT500A.3-PO4 | MEDIUM | Information acquired from the investigations of complex problems and discusses about the basic resource management responsibilities of dynamic diagrams of the UML |
| 101009/IT500A.3-PO5 | MEDIUM | Able to apply the modern tools to design, analyze and solve the contemporary issues in the resource management responsibilities |
| 101009/IT500A.3-P012 | LOW | Students could understand and recognize the needs of resource management responsibilities of dynamic diagrams of the UML |

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| 101009/IT500A.4-PO1 | HIGH | Students get the knowledge about analyze of design methods and modeling techniques |
| 101009/IT500A.4-PO2 | MEDIUM | Students will able to identify and analyze of design methods and modeling techniques |
| 101009/IT500A.4-PO3 | HIGH | Students gain the ability to design and develop the design methods and modeling techniques |
| 101009/IT500A.4-PO4 | MEDIUM | Information acquired from the investigations of complex problems and discusses about analyze of design methods and modeling techniques |
| 101009/IT500A.4-PO5 | MEDIUM | Able to apply the modern tools to analyze design methods and modeling techniques |
| 101009/IT500A.4-PSO2 | MEDIUM | Students will be able to acquire skills to interpret the contemporary issues in the designing methods and modeling techniques |
| 101009/IT500A.5-PO1 | HIGH | Students get the knowledge about the designing of UML diagrams for real time problems |
| 101009/IT500A.5-PO2 | MEDIUM | Students will able to identify and analyze of design of UML diagrams for real time problems |
| 101009/IT500A.5-PO3 | HIGH | Students gain the ability to design and develop the design of UML diagrams for real time problems |
| 101009/IT500A.5-PO4 | MEDIUM | Information acquired from the investigations of complex problems and discusses about the designing of UML diagrams for real time problems |
| 101009/IT500A.5-PO5 | MEDIUM | Able to apply the modern tools to design UML diagrams for real time problems |
| 101009/IT500A.5-PO9 | LOW | Students will be able to works as an individual or a team to design to design UML diagrams for real time problems |
| 101009/IT500A.5-PO10 | LOW | Students will be able to communicate effectively to design UML diagrams for real time problems |
| 101009/IT500A.5-PO11 | LOW | Students could demonstrate knowledge and the solve the contemporary issues in design phase of UML diagrams |
| 101009/IT500A.5-PO12 | MEDIUM | Students could understand and recognize the needs of UML designing diagrams for real time problems |
| 101009/IT5 | MEDIUM | Students will be able to acquire skills to Interpret the |

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|---|---|---|
| 00A.5-PSO2 | | contemporary issues in the designing of UML diagrams for real time problems |

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:**

| Sl.No | Description | PO mapping | Proposed Actions |
|---|---|---|---|
| 1 | Service-Oriented Architecture | PO1,PO3,PSO1,POS2 | Learning Materials provided |

**WEB SOURCE REFERENCES:**

| | |
|---|---|
| 1 | https://www.lucidchart.com/pages |
| 2 | https://www.javatpoint.com/uml-diagrams |
| 3 | https://www.geeksforgeeks.org/introduction-to-uml-diagrams/ |

**DELIVERY/INSTRUCTIONAL METHODOLOGIES:**

| | | |
|---|---|---|
| CHALK & TALK | STUD. ASSIGNMENT | WEB RESOURCES |
| LCD/SMART BOARDS | STUD. SEMINARS | ☐ ADD-ON COURSES |

**ASSESSMENT METHODOLOGIES-DIRECT**

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|---|---|---|---|
| ASSIGNMENTS | STUD. SEMINARS | TESTS/MODEL EXAMS | UNIV. EXAMINATION |
| ☐ STUD. LAB PRACTICES | STUD. VIVA | MINI/MAJOR PROJECTS | ☐ CERTIFICATIONS |
| ☐ ADD-ON COURSES | ☐ OTHERS | | |

**ASSESSMENT METHODOLOGIES-INDIRECT**

| | |
|---|---|
| ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE) | STUDENT FEEDBACK ON FACULTY (ONCE) |
| ☐ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS | ☐ OTHERS |

**Prepared by** **Approved by**

**Vidhya Vijayan** **Dr. Neeba E A (HOD)**

# Course plan

| Sl.No | Planned | Hours |
|---|---|---|
| 1. | Software development process: The Waterfall Modelvs. The Spiral Model | 2 |
| 2. | UML -Introduction, Basic Elements inUML | 2 |
| 3. | Software Crisis, description of thereal world using the Objects Model | 3 |
| 4. | Software qualityCharacteristics | 4 |
| 5. | Classes, inheritance andmultiple configurations | 2 |
| 6. | Quality softwarecharacteristics, Description of theObject-Oriented | 4 |
| 7. | Analysis processvs. the StructureAnalysis Model | 1 |
| 8. | Standards, Elements of the language, Generaldescription of various models | 1 |
| 9. | Description of Design Patterns | 1 |
| 10. | General description of various models | 1 |
| 11. | The process of Object-Orientedsoftware development | 1 |
| 12. | Description of Design Patterns.Technological Description of Distributed Systems. | 1 |
| 13. | Writing a casegoal, Use CaseDiagrams, UseCase Relationships. | 1 |
| 14. | Transfer fromAnalysis to Design in the Characterization Stage: InteractionDiagrams.<br>Description ofgoal, | 2 |
| 15. | Defining UMLMethod, Operation, ObjectInterface, Class. | 1 |
| 16. | Sequence Diagram. Findingobjects from Flowof Events. Describing the process of findingobjects using a Sequence Diagram. | 2 |
| 17. | Describing the process of findingobjects using a CollaborationDiagram. | 2 |
| 18. | Introduction -Interaction diagram | 4 |
| 19. | Describing the process of findingobjects using a Sequence Diagram | 2 |

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| 20. | Signals andEvents | 1 |
| 21. | Describing the process of findingobjects using a Collaboration Diagram. | 1 |
| 22. | The Logical ViewDesign Stage: TheStatic Structure Diagrams. | 1 |
| 23. | The Class Diagram Model,Attributes descriptions | 3 |
| 24. | Operations descriptions, Connections descriptions in the Static Model | 1 |
| 25. | Association, Generalization,Aggregation | 2 |
| 26. | Dependency,Interfacing, Multiplicity | 2 |
| 27. | Package DiagramModel. Description of themodel | 3 |
| 28. | White box, blackbox, Connectionsbetween packagers | 1 |
| 29. | Connections between packagers, Interfaces., CreatePackage Diagram,Drill Down | 1 |
| 30. | Description of theState Diagram, Events, Handling | 3 |
| 31. | Description of theActivity Diagram,Exercise in State Machines. | 3 |
| 32. | Component Diagram Model.Physical Aspect.Logical Aspect, Connections and Dependencies | 3 |
| 33. | User face InitialDB design in a UML environment. | 1 |
| 34. | DeploymentModel. | 3 |
| 35. | Processors, Connections | 1 |
| 36. | Components ,Tasks, Threads | 1 |

**Assignment topics with submission dates**

1. Differentiate between Analysis processvs. the StructureAnalysis Model. – 16th October 2023.
2. Implement a Deployment diagram Hotel management system. – 16th December 2023.

# 101009/IT500B
# COMPILER DESIGN

# COURSE INFORMATION SHEET

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|---|---|
| PROGRAMME: **COMPUTER SCIENCE & BUSINESS SYSTEM** | DEGREE: **B TECH** |
| COURSE: **COMPILER DESIGN** | SEMESTER: **5** CREDITS: **3** |
| COURSE CODE: **101009/IT500B** REGULATION: **2021** | COURSE TYPE: **CORE** |
| COURSE AREA/DOMAIN: **SYSTEM SOFTWARE CONCEPTS** | CONTACT HOURS: **3 hours/Week.** |
| CORRESPONDING LAB COURSE CODE (IF ANY): **101009/IT522G** | LAB COURSE NAME: **COMPILER DESIGN LAB (LEX & YACC)** |

## SYLLABUS:

| UNIT | DETAILS | HOURS |
|---|---|---|
| I | Introduction to compilers – Analysis of the source program, Phases of a compiler, grouping of phases, compiler writing tools.<br>Lexical Analysis (Scanner): The role of Lexical Analyzer, Input Buffering, Specification of Tokens using Regular Expressions, Review of Finite Automata, Recognition of Tokens | 7 |
| II | Context-free languages and grammars, push-down automata, LL(1) grammars and top-down parsing, operator grammars, LR(O), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator. | 10 |
| III | Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree.<br>Symbol Table: Basic structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, scope. | 11 |
| IV | Intermediate Code Generation: Translation of different language features, different types of intermediate forms.<br>Code Improvement (optimization): control-flow, data-flow dependence etc.; local optimization, global optimization, loop optimization, peep-hole optimization etc. | 10 |
| V | Architecture dependent code improvement: instruction scheduling (for pipeline), loop optimization (for cache memory) etc. Register allocation and target code generation.<br>Advanced topics: Type systems, data abstraction, compilation of Object-Oriented features and non-imperative programming languages. | 8 |
| | TOTAL HOURS | 46 |

## TEXT/REFERENCE BOOKS:

| T/R | BOOK TITLE/AUTHORS/PUBLICATION |
|---|---|
| T1 | V. Aho, R. Sethi and J. Ullman, Compilers: Principles, Techniques and Tools, 2nd Edition, Addison Wesley, 2006. |
| T2 | Levine R. John, Tony Mason and Doug Brown, Lex & Yacc, 2nd Edition, O'Reilly Media, Inc., 1992. |
| R1 | Bjarne Stroustrup, The Design and Evolution of C++, 1st Edition, Addison-Wesley Professional, 1994. |
| R2 | Kenneth C. Louden, Compiler Construction – Principles and Practice, Cengage Learning Indian Edition, 2006. |
| R3 | Tremblay and Sorenson, The Theory and Practice of Compiler Writing, Tata McGraw Hill & Company,1984. |
| R4 | Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures: A Dependence-based Approach, Morgan Kaufmann Publishers, 2008. |
| R5 | Steven S. Muchnick, Advanced Compiler Design and Implementation, Morgan Kaufmann Publishers – Elsevier Science, India, Indian Reprint 2008. |

## COURSE PRE-REQUISITES:

Basic Programming in Python, Data Structures

## COURSE OBJECTIVES:

This course studies programming language translation and compiler design concepts; language recognition symbol table management, semantic analysis, code optimization and code generation.

## COURSE OUTCOMES:

After the completion of the course the student will be able to

CO1: Explain the concepts and different phases of compilation with compile time error handling and represent language tokens using regular expressions, context free grammar and finite automata and design lexical analyzer for a language.

CO2: Compare top down with bottom-up parsers and develop appropriate parser to produce parse tree representation of the input.

CO3: Design syntax directed translation schemes for a given context free grammar.

CO4: Generate intermediate code for statements in high level language and apply optimization techniques to intermediate code and generate machine code for high level language program.

CO5: Explain the concepts of architecture dependent code improvement and compilation of object-oriented programming languages.

## CO-PO MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 2 | 2 | | | | 1 | 1 | 1 | 1 |
| **CO2** | 3 | 2 | 3 | 2 | 2 | | | | 2 | 1 | 1 | 1 |
| **CO3** | 3 | 2 | 3 | 2 | 2 | | | | | | | 2 |
| **CO4** | 3 | 2 | 3 | 2 | 2 | | | | | | | |
| **CO5** | 3 | 2 | 3 | 2 | 2 | | | | 1 | 1 | 1 | 2 |

## JUSTIFICATIONS FOR CO-PO MAPPING

| MAPPING | LOW/MEDIUM/HIGH | JUSTIFICATION |
|---|---|---|
| CO1-PO1 | H | Students will acquire knowledge about phases of compilation |
| CO1-PO3 | L | Students will be able to understand the role of Lexical Analyzer in Compilation Process |
| CO1-PO12 | H | Information acquired from the compilation phases provides lifelong learning in the context of Compiler Construction. |
| CO1-PSO2 | M | Having the knowledge about the compiler construction tools helps in the study and design of compiler. |
| CO2-PO2 | H | Knowledge of Ambiguities in the context free Grammar helps students in problem analysis. |
| CO2-PO3 | M | Students gain the ability to design syntax analyzer tool used for compilation process. |
| CO2-PO4 | H | Studies about the various parsing techniques helps the students to understand about Parsing Process. |
| CO2-PO12 | H | Students will be able to analyze different parsing techniques used for Compilation |
| CO3-PO2 | H | Studies about the type checking process helps in the semantic analysis phase of compilation. |
| CO3-PO3 | H | Understanding the various storage al location strategies helps in organization of information in the Run Time Environment of Compilation. |

| | | |
|---|---|---|
| CO3-PO12 | L | Information acquired from bottom up and top down evaluation provides lifelong learning in the compilation |
| CO3-PSO3 | H | Students could apply the knowledge of Overloaded and Polymorphic function used in semantic Analysis Phase of Compiler. |
| CO4-PO1 | H | Students gain the ability to learn about the Intermediate code generation in compilation process. |
| CO4-PO2 | H | Students will understand the need of intermediate representation for the generation of target code . |
| CO4-PO12 | M | The students could understand and implement different types Intermediate Representation of code used for generating target code. |
| CO4-PSO2 | M | Information acquired from the fundamentals of intermediate representation leads to implementation of target code |
| CO5-PO1 | H | Students will be obtain basic knowledge of code optimization |
| CO5-PO2 | H | Information acquired from the sources of optimization helps in implementation of target code |
| CO5-PO12 | M | Students could apply the knowledge of code optimization in Compiler Construction |
| CO5-PSO2 | M | Students will be acquiring knowledge about code improving transformation. |
| CO6-PO1 | H | Students will be acquiring knowledge about Instruction Scheduling |
| CO6-PO4 | M | Students will be acquiring knowledge about Register Allocation |
| CO6-PO12 | H | Students will be acquiring knowledge about Instruction Level Optimization |
| CO6-PSO3 | M | Students will be acquiring knowledge about Design issues in Code Generation for a Target Processor |

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:**

| S. NO | TOPIC | PO MAPPING |
|---|---|---|
| 1 | ANTLR | 4 |
| 2 | JAVACC | 4 |

**WEB SOURCE REFERENCES:**

| | |
|---|---|
| 1 | https://onlinecourses.nptel.ac.in/noc21_cs07/preview |
| 2 | https://www.javatpoint.com/compiler-tutorial |
| 3 | http://www.diku.dk/~torbenm/Basics/basics_lulu2.pdf |
| 4 | https://www.cse.iitd.ac.in/~sak/courses/cdp/slides.pdf |
| 5 | http://javacc.java.net/ |
| 6 | http://www.engr.mun.ca/~theo/JavaCC-Tutorial/javacc-tutorial.pdf |

**DELIVERY/INSTRUCTIONAL METHODOLOGIES:**

| | | |
|---|---|---|
| ☑ CHALK & TALK | ☑ STUD. ASSIGNMENT | ☑ WEB RESOURCES |
| ☐ LCD/SMART BOARDS | ☐ STUD. SEMINARS | ☐ ADD-ON COURSES |

**ASSESSMENT METHODOLOGIES-DIRECT**

| | | | |
|---|---|---|---|
| ☑ ASSIGNMENTS | ☐ STUD. SEMINARS | ☑ TESTS/MODEL EXAMS | ☑ UNIV. EXAMINATION |
| ☑ STUD. LAB PRACTICES | ☐ STUD. VIVA | ☐ MINI/MAJOR PROJECTS | ☐ CERTIFICATIONS |
| ☐ ADD-ON COURSES | ☐ OTHERS | | |

**ASSESSMENT METHODOLOGIES-INDIRECT**

| | |
|---|---|
| ☑ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE) | ☑ STUDENT FEEDBACK ON FACULTY (ONCE) |
| ☐ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS | ☐ OTHERS |

**Prepared by** **Approved by**
**Mr. Tinku Soman Jacob** **(HOD)**

**COURSE PLAN**

| No | Topic | No. of Lectures |
|---|---|---|
| **1** | **Module 1: INTRODUCTION** | |
| 1.1 | Introduction to compilers – Analysis of the source program, Phases of a compiler, grouping of phases, compiler writing tools. | 3 Hours |
| 1.2 | Lexical Analysis: The role of Lexical Analyzer, Input Buffering, Specification of Tokens using Regular Expressions, Review of Finite Automata, Recognition of Tokens. | 4 Hours |
| **2** | **Module 2: SYNTAX ANALYSIS** | |
| 2.1 | Syntax Analysis: Review of Context-Free Grammars – Derivation trees and Parse Trees, Ambiguity. | 2 Hours |
| 2.2 | Top-Down Parsing: Recursive Descent parsing, Predictive parsing, LL(1) Grammars. | 3 Hours |
| 2.3 | Bottom-Up Parsing: Shift Reduce parsing – Operator precedence parsing (Concepts only)<br>LR parsing – Constructing SLR parsing tables, Constructing, Canonical LR parsing tables and Constructing LALR parsing tables. | 5 Hours |
| **3** | **Module 3: Semantic Analysis** | |
| 3.1 | Syntax directed definitions, Bottom- up evaluation of S-attributed definitions, L- attributed definitions | 3 Hours |
| 3.2 | Top-down translation, Bottom-up evaluation of inherited attributes | 3 Hours |
| 3.3 | Symbol Table: Basic structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, scope**.** | 5 Hours |
| **4** | **Module 4: Intermediate Code Generation and Code Optimization** | |
| 4.1 | Intermediate Code Generation (ICG): Intermediate languages – Graphical representations, Three-Address code, Quadruples, Triples | 2 Hours |
| 4.2 | Translation of declarations, assignments, intermediate code generation for control flow, Boolean expressions and procedure calls | 4 Hours |
| 4.3 | Code Improvement (optimization): control-flow, data-flow dependence etc.; local optimization, global optimization, loop optimization, peep-hole optimization etc. | 4 Hours |

| | | |
|---|---|---|
| **5** | **Module 5: Architecture dependent code improvement** | |
| 5.1 | Architecture dependent code improvement: instruction scheduling (for pipeline), loop optimization (for cache memory) etc. Register allocation and target code generation. | 4 Hours |
| 5.2 | Advanced topics: Type systems, data abstraction, compilation of Object-Oriented features and non-imperative programming languages. | 4 Hours |

## ASSIGNMENT

1. Submission Date 27/10/23

1. Write the difference between NFA & DFA.
2. Explain incremental and cross compiler.
3. What is LEX? Explain the structure of LEX program.
4. Consider E -> E or T | T
   T -> T and F | F
   F -> not F | (E) | true | false
   Remove left recursion from grammar. Construct a predictive parsing table.
5. Write a note on FA.
6. Is the grammar S->S(S)S/ Ɛ ambiguous? Justify your answer.
7. Apply bootstrapping to develop a compiler for a new high level language P on machine N.
8. Demonstrate the identification of handles in operator precedence parsing?
9. Design a recursive descent parser for the grammar
   E->E + T | T
   T->T*F | F
   F->(E) | id
10. With the aid of diagrams discuss the structure of a compiler in detail for a source language statement a = b * c -2, where a, b and c are float variables, * and – represents multiplication and subtraction on same data types through each phase.

2. Submission Date 18/12/23

1. Explain instruction scheduling (for pipeline), loop optimization (for cache memory)
2. Explain the compilation of Object-Oriented features and non-imperative programming languages.

# 101009/MS500C FUNDAMENTALS OF MANAGEMENT

| COURSE CODE | COURSE NAME | L | T | P | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|
| 101009/MS500C | FUNDAMENTALS OF MANAGEMENT | 2 | 0 | 0 | 2 | 2021 |

## 1. Preamble

This course introduces the basic concepts of the subject Management, as a necessary complement to Engineering studies in order that the students may understand organisations and function appropriately in their future roles as employees and managers.

## 2. Prerequisite

Basic awareness that is expected of plus two level.

## 3. Syllabus

**Module 1 : Management Theories**

Concept and Foundations of Management - Evolution of Management Thoughts [Pre-Scientific Management Era (before 1880) - Classical management Era (1880-1930 - Neo-classical Management Era (1930-1950) - Modern Management era (1950-on word) - Contribution of Management Thinkers: Taylor, Fayol, Elton Mayo etc.

**Module 2 : Functions of Management**

Planning, Organizing, Staffing, Directing, Controlling.

**Module 3 : Organization Behavior**

Introduction, Personality – Perception - Learning and Reinforcement – Motivation - Group Dynamics - Power & Influence - Work Stress and Stress Management - Decision Making - Problems in Decision Making - Decision Making - Organizational Culture - Managing Cultural Diversity. Leadership: Concept – Nature – Importance - Attributes of a leader - developing leaders across the organization - Leadership Grid.

**Module 4 : Organizational Design**

Classical - Neoclassical and Contingency approaches to organizational design - Organizational theory and design - Organizational structure (Simple Structure, Functional Structure, Divisional Structure, Matrix Structure)

**Module 5 : Managerial Ethics**

Ethics and Business - Ethics of Marketing & advertising - Ethics of Finance & Accounting - Decision–making frameworks - Business and Social Responsibility - International Standards - Corporate Governance - Corporate Citizenship - Corporate Social Responsibility.

## 4. Text Books

1. Richard L. Daft, *Understanding the Theory and Design of Organizations*, South-Western, 2013.

## 5. Reference Books

1. Stephen P. Robbins, Timothy A. Judge, Neharika Vohra, *Organizational Behavior*, Eighteenth Edition, Pearson Education,2018.

## 6. Course Outcomes

**After the completion of the course the student will be able to**

CO1: Understand the different perspectives / schools of thought of the subject 'Management'.

CO2: Explain the functions of 'Management'.

CO3: Explain the basics of 'Organisational Behaviour'.

CO4: Explain the different organisational structures

CO5: Explain the importance of ethics in Business.

## 7. Mapping of Course Outcomes with Program Outcomes

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | - | - | 1 | 2 | - | 3 | - |
| CO2 | - | - | - | - | - | - | - | - | 2 | - | 3 | - |
| CO3 | - | - | - | - | - | - | - | 1 | 3 | 2 | 1 | - |
| CO4 | - | - | - | - | - | - | - | - | 2 | 1 | 2 | - |
| CO5 | - | - | - | - | - | - | - | 3 | 1 | - | - | - |

# 101009/MS500D
# BUSINESS STRATEGY

| COURSE CODE | COURSE NAME | L | T | P | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|
| 101009/MS500D | BUSINESS STRATEGY | 2 | 0 | 0 | 2 | 2021 |

**Syllabus**

**Module – I**

Introduction to Strategic Management

- Importance of Strategic Management
- Vision and Objectives
- Schools of thought in Strategic Management
- Strategy Content, Process, and Practice
- Fit Concept and Configuration Perspective in Strategic Management

**Module – II**

Internal Environment of Firm- Recognizing a Firm's Intellectual Assets

- Core Competence as the Root of Competitive Advantage
- Sources of Sustained Competitive Advantage
- Business Processes and Capabilities-based Approach to Strategy

**Module – III**

External Environments of Firm- Competitive Strategy

- Five Forces of Industry Attractiveness that Shape Strategy
- The concept of Strategic Groups, and Industry Life Cycle
- Generic Strategies
- Generic Strategies and the Value Chain

**Module – IV**

Corporate Strategy, and Growth Strategies

- The Motive for Diversification
- Related and Unrelated Diversification
- Business Portfolio Analysis
- Expansion, Integration and Diversification
- Strategic Alliances, Joint Ventures, and Mergers & Acquisitions

**Module– V**

Strategy Implementation: Structure and Systems

- The 7S Framework
- Strategic Control and Corporate Governance

**Assignment:**

- Latest business events would be discussed in class and students should be ready to discuss these events (in groups). The topic will be mentioned beforehand. Students are required to meet in groups before coming to class and prepare on the topic.
- There will be periodic homework assignments relating to the course concepts or mini-cases. Specific instructions will be given separately.

**Text Books:**

1. Robert M. Grant (2012). Contemporary Strategic Management, Blackwell, 7th Edition.

**Reference Books:**

1. M.E. Porter, Competitive Strategy, 1980.M.E. Porter, Competitive Advantage, 1985 Richard Rumelt (2011). Good Strategy Bad Strategy: The Difference and Why It Matters.

# 101009/EN500E BUSINESS COMMUNICATION AND VALUE SCIENCES III

**COURSE INFORMATION SHEET**

| | |
|---|---|
| **PROGRAMME: COMPUTER SCIENCE AND BUSINESS SYSTEMS** | **DEGREE: B.TECH** |

| | |
|---|---|
| **COURSE: BUSINESS COMMUNICATION AND VALUE SCIENCES III** | **SEMESTER: V CREDITS: 2** |
| **COURSE CODE: 101009/EN500E**<br><br>**REGULATION: 2021** | **COURSE TYPE: Mandatory Credited Course** |
| **COURSE AREA/DOMAIN: HUMANITIES** | **CONTACT HOURS: 3 hours/week** |

**SYLLABUS:**

| UNIT | DETAILS |
|---|---|
| **I** | Basic principles of SWOT and Life Positions - Apply SWOT in real-life scenarios - Recognize how motivation helps real-life - Leverage motivation in real-life scenarios. |
| **II** | Identify pluralism in cultural spaces - Differentiate between the different cultures in India - Global, glocal and translocation - Cross-cultural communication: Implications, common mistakes and application - Roles and relations of different genders. |
| **III** | Role of science in nation building - Role of science post-independence - Best practices of technical writing - Application of technical writing in real-life scenarios. |
| **IV** | What is AI - Importance of AI - AI in Everyday Life - AI and the future of humanity |

**TEXT/REFERENCE BOOKS:**

There are no prescribed textbooks.

**COURSE PREREQUISITES:**

| | |
|---|---|
| **1** | Basic Knowledge of English, both verbal as well as written, upon completion of all units from Semesters 1 and 2. |

**COURSE OBJECTIVES:**

| | |
|---|---|
| 1 | Develop technical writing skills |
| 2 | Introduce students to Self-analysis techniques like SWOT & TOWS |
| 3 | Introduce students to key concepts of<br>a. Pluralism & cultural spaces<br>b. Cross-cultural communication |

| | |
|---|---|
| | c. Science of Nation building |

**COURSE OUTCOMES:**

| NO | DESCRIPTION |
|---|---|
| **CO1** | Apply & analyze the basic principles of SWOT & life positions. |
| **CO2** | Understand, analyze & leverage the power of motivation in real life. |
| **CO3** | Identify & respect pluralism in cultural spaces. |
| **CO4** | Understand and apply the concepts of Global, glocal and translocational. |
| **CO5** | Analyze cross-cultural communication. |
| **CO6** | Apply the science of Nation building. |
| **CO7** | Identify the common mistakes made in cross-cultural communication. |
| **CO8** | Understand, apply & analyze the tools of technical writing. |
| **CO9** | Recognize the roles and relations of different genders. |
| **CO10** | Understand Artificial intelligence & recognize its impact on daily life. |
| **CO11** | Identify the best practices of technical writing. |
| **CO12** | Differentiate between the diverse cultures of India. |

**MAPPING OF COURSE OUTCOMES TO PROGRAMME OUTCOMES:**

| | PO1 | PO2 | PO3 | PO 4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | 1 | | | | | | | 2 | | 1 | 2 |
| CO2 | | | | | | | | | 2 | | 1 | 2 |
| CO3 | | | | | | | | | 1 | | 1 | 2 |
| CO4 | | | | | | | | | | 1 | | 3 |
| CO5 | | 1 | | | | | | | 1 | 3 | 1 | 3 |
| CO6 | | 1 | | | | | 1 | 1 | | | | 3 |
| CO7 | | 1 | | | | | | | | 3 | | 2 |
| CO8 | | | | | | | | | | 3 | | |
| CO9 | | | | | | | | | 1 | | | 2 |
| CO10 | | | | | | | | 1 | | | | |
| CO11 | | 1 | | | | | | | | 3 | | |
| CO12 | | 1 | | | | | | 1 | 1 | 1 | 1 | 2 |

**JUSTIFICATION:**

| CO | PO | JUSTIFICATION |
|---|---|---|
| CO1 | PO2 | The SWOT analysis method is one of the most widely used strategic planning methods used by companies in the present day. |
| | PO9 | The SWOT analysis method is applicable at an individual or team level for analysing the team's trajectory. |
| | PO11 | Most project management meetings and analyses can be summarised to the areas focussed on by the SWOT analysis method. |
| | PO12 | Constant upgradation is required in a dynamic market. |

| | | |
|---|---|---|
| CO2 | PO9 | Both extrinsic and intrinsic motivation is required in team building. |
| | PO11 | Smooth running of a project requires all members to be motivated. |
| | PO12 | Understanding and utilising motivation is a lifelong process. |
| CO3 | PO9 | While focusing on a single goal, team members must be aware of how different their colleagues are and how they approach a goal. |
| | PO11 | Managers should acknowledge and respect the different backgrounds and work processes of the team members. |
| | PO12 | Understanding the individuals we meet along our lifespan is an ongoing process. |
| CO4 | PO10 | Globalisation and glocalisation require learning and understanding of different cultures and how their communication makes them unique. |
| | PO12 | Globalism is connecting the planet in an ongoing process. |
| CO5 | PO2 | Analysis and problem-solving go hand in hand when it comes to understanding cross-cultural communication. |
| | PO9 | Most of team building requires coming to terms with the differences in communication of people from different backgrounds. |
| | PO10 | The foundation for cross-cultural communication will always be the basics of communication. |
| | PO11 | Most of project management is effectively communicating the division or labour and handling the delegated tasks. |
| | PO12 | Learning the differences in communication across cultures is an ongoing process. |
| CO6 | PO2 | Nation building requires an analysis of and determining solutions to the problems currently plaguing the country. |
| | PO7 | In the process of nation-building, one must be focused on the global goal of sustainability and negating the outcomes of climate change. |
| | PO8 | Without an ethical framework, the process of nation-building will simply lead to fascism. |
| | PO12 | Due to globalism and every country being part of the international economy, the process of nation-building is an ongoing process that requires constant updates |

| | | |
|---|---|---|
| | | and revival. |
| CO7 | PO2 | Analysis and problem-solving go hand in hand when it comes to figuring out the common mistakes in cross-cultural communication. |
| | PO10 | The foundation for cross-cultural communication will always be the basics of communication. |
| | PO12 | Learning the mistakes in communication across cultures is an ongoing process. |
| CO8 | PO10 | Technical writing is currently the most viable and long-lasting form of communication when it comes to a professional setting as it eliminates most of the human errors and biases. |
| CO9 | PO9 | Eliminating gender biases leads to smoother teamwork. |
| | PO12 | Removing the gender biases and ideologies in place due to decades of social norms requires constant scrutiny. |
| CO10 | PO8 | An ethical framework is required to maintain a robust machine-learning process that does not include unnecessary human ideology and biases. |
| CO11 | PO2 | In order to arrive at the best practices of technical writing, one must first eliminate the lesser practices through analysis and scrutiny. |
| | PO10 | Technical writing is currently the most viable and long-lasting form of communication when it comes to a professional setting. |
| CO12 | PO2 | Understanding the diversity of Indian sub-cultures requires an analysis of possible cultural clashes that need to be avoided before their onset. |
| | PO8 | One must not place one culture as superior to another lest it lead to the oppression of a minority community. |
| | PO9 | Handling a project with a pan-India crowd will require a team member to understand and empathise with their fellow teammates along with their varying backgrounds. |
| | PO10 | Most of the issues in India stem from the lack of communication across cultural barriers. |
| | PO11 | Handling a project with a pan-India crowd will require a project manager to understand and empathise with their fellow teammates along with their varying backgrounds. |
| | PO12 | Despite India's finite space and culture, the process of maintaining a pan-Indian |

| | | |
|---|---|---|
| | | sentiment will always require further investigation and growth. |

**TOPICS BEYOND SYLLABUS:**

| | **TOPICS** | **PROPOSED ACTION** |
|---|---|---|
| 1 | Limitation of AI | Lecture |
| 2 | Current trend of using AI as a marketing gimmick | Lecture/ Activity |

**WEB REFERENCES:**

| | |
|---|---|
| 1 | https://www.mindtools.com/amtbj63/swot-analysis |
| 2 | https://www.investopedia.com/terms/s/swot.asp |
| 3 | https://www.simplypsychology.org/maslow.html#:~:text=From%20the%20bottom%20of%20the,can%20attend%20to%20higher%20needs. |
| 4 | https://www.knowledgehut.com/tutorials/project-management/motivation-theories |
| 5 | https://www.simplypsychology.org/self-determination-theory.html |
| 6 | https://www.youtube.com/watch?v=_juPDoa3GBY |
| 7 | https://smallbusiness.chron.com/different-approaches-organizational-development-towards-industrial-relations-81594.html |
| 8 | https://academic.oup.com/book/10138/chapter-abstract/157647867?redirectedFrom=fulltext |
| 9 | https://saksham.ugc.ac.in/ |
| 10 | https://www.languagescientific.com/what-is-glocalism-and-how-does-it-affect-your-international-business/ |
| 11 | https://en.wikipedia.org/wiki/Science_and_technology_in_India |
| 12 | https://www.skillsyouneed.com/write/report-writing.html |
| 13 | https://www.naukri.com/blog/how-to-write-a-job-application/amp/ |

| | |
|---|---|
| 14 | https://www.wildapricot.com/articles/how-to-write-meeting-minutes |
| 15 | https://www.britannica.com/technology/artificial-intelligence |

**DELIVERY/INSTRUCTIONAL METHODOLOGIES:**

| | | | |
|---|---|---|---|
| **√CHALK & TALK** | **√STUD. ASSIGNMENT** | **√WEB RESOURCES** | **ADD-ON COURSES** |
| **LCD/SMART BOARDS** | **STUD. SEMINARS** | | |

**ASSESSMENT METHODOLOGIES-DIRECT:**

| | | | |
|---|---|---|---|
| **√ASSIGNMENTS** | **√STUD. SEMINARS** | **√TESTS/MODEL EXAMS** | **√UNIV. EXAMINATION** |
| **STUD. LAB PRACTICES** | **STUD. VIVA** | **MINI/MAJOR PROJECTS** | **CERTIFICATIONS** |
| **ADD-ON COURSES** | **OTHERS** | | |

**ASSESSMENT METHODOLOGIES-INDIRECT:**

| | |
|---|---|
| **√ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)** | **√STUDENT FEEDBACK ON FACULTY (TWICE)** |
| **ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS** | **OTHERS** |

**Prepared by** **Approved By**

**Vinay Menon** **Dr. Anju C.**

## Course Plan

| Day | Module | Topic | Dates |
|---|---|---|---|
| 1 | 1 | Introduction to BCVS III | September 11 |

| | | | |
|---|---|---|---|
| 2 | 1 | Introduction to BCVS III | September 13 |
| 3 | 1 | Self analysis | September 14 |
| 4 | 1 | SWOT Analysis: Basic principles of SWOT and Life Positions | September 18 |
| 5 | 1 | SWOT Analysis: Apply SWOT in real-life scenarios | September 20 |
| 7 | 1 | Motivation: Recognize how motivation helps real-life | September 21 |
| 6 | 1 | Motivation: Leverage motivation in real-life scenarios | September 25 |
| 8 | 1 | Assignment I | October 4 |
| 9 | 2 | Identify pluralism in cultural spaces: Cultural Pluralism | October 5 |
| 10 | 2 | Identify pluralism in cultural spaces: India | October 9 |
| 11 | 2 | Identify pluralism in cultural spaces: Globalisation | October 11 |
| 12 | 2 | Identify pluralism in cultural spaces: Glocalisation and tanslocationalism | October 12 |
| 13 | 2 | | October 16 |
| 14 | 2 | | October 18 |
| 15 | 4 | Assignment II | October 19 |
| 16 | 1 | First Internal Exam | October 25 |
| 17 | 2 | First Internal Exam | October 25 |
| 18 | 3 | Role of science in nation building: National identity | October 30 |
| 19 | 3 | Role of science in nation building: Science and progress | November 1 |
| 20 | 3 | Role of science post-independence | November 2 |
| 21 | 3 | Best practices of technical writing: Types of technical writing | November 6 |
| 22 | 3 | Application technical writing in real-life scenarios | November 8 |
| 23 | 3 | Application technical writing in real-life scenarios | November 9 |
| 24 | 3 | Application technical writing in real-life scenarios | November 13 |
| 25 | 4 | What is AI | November 15 |
| 26 | 4 | What is AI | November 16 |

| | | | |
|---|---|---|---|
| 27 | 4 | What is AI | November 20 |
| 28 | 4 | Importance of AI | November 22 |
| 29 | 4 | AI in Everyday Life | November 23 |
| 30 | 4 | AI in Everyday Life | November 27 |
| 31 | 4 | AI and the future of humanity | November 29 |
| 32 | 1 | Revision | November 30 |
| | | Cross-cultural communication: Implications, common mistakes and application. Identify pluralism in cultural spaces: Roles and relations of different genders | |
| 33 | 3 | Second Internal Exam | December 4 |
| 34 | 4 | Second Internal Exam | December 4 |
| 35 | 1 | Assignment II presentation | December 11 |
| 36 | 1 | Assignment I presentation | December 13 |
| 37 | 1 | Assignment I presentation | December 14 |
| 38 | 1 | Revision | December 18 |
| 39 | 1 | Revision | December 20 |
| 40 | 1 | Revision | December 21 |

## Assignment I: AI Tool for Students in 2030

Create an AI tool for students in 2030 based on your assessment of the technology available then. Present and submit the presentation for the tool.

Deadline: 13th December

Total marks: 7.5

CO mapping: CO10

## Assignment II: Understanding the Underprivileged

| Activity | Date of Submission |
|---|---|
| **Initial Interview**<br>After selecting your subject, have a casual conversation with the individual to get a basic idea of their life, family background, job, personality, goals and aspirations<br><br>**Submission**: 50-word report | Second week of semester |
| **SWOT Analysis**<br>Conduct a complete SWOT analysis, including a TOWS Matrix to better understand their trials and tribulations<br><br>**Submission**: SWOT and TOWS matrix with expansion | Before first internals |
| **Motivation**<br>Identify areas where the subject is motivated and areas where they lack motivation based on the SWOT analysis<br><br>**Submission**: 100-word report on the motivation along with an explanation | Before first internals |
| **Globalisation**<br>Analyse their understanding of a global perspective of humanity<br><br>**Submission**: List of sources or media used and the subject's interpretation of the same | Before first internals |
| **Nation-building**<br>Considering their motivation and perspective on globalisation, analyse which aspect of nation-building needs to be improved for the subject<br><br>**Submission**: 100-word report on the aspect along with an explanation | Before second internals |
| **Conclusion**<br>Set long and short-term goals for the subject and collect their feedback<br><br>**Submission**: 50-word report on the goals list and the subject's feedback | End of semester |

Deadline: 13th December

Total marks: 7.5

CO mapping: CO1, CO2, CO3, CO4, CO6, CO11

# 101009/IT503F
# MACHINE LEARNING

**Course Information Sheet**

| | |
|---|---|
| **PROGRAMME:** COMPUTER SCIENCE AND BUSINESS SYSTEMS | **DEGREE:** B. TECH |
| **COURSE:** MACHINE LEARNING | **SEMESTER:** FIVE **CREDITS:** 3 |
| **COURSE CODE:** 101009/IT503F<br>**REGULATION:** 2021 | **COURSE TYPE:** ELECTIVE |
| **COURSE AREA/DOMAIN:** Data Science | **CONTACT HOURS:** 4 hours/week. |
| **CORRESPONDING LAB COURSE CODE** (IF ANY): 101009/IT522S | **LAB COURSE NAME:** Machine Learning Lab |

**SYLLABUS:**

| No | Topic | No. of Lectures |
|---|---|---|
| **1** | **Module1: Introduction to Machine Learning (ML)** | |
| 1.1 | Introduction to Machine Learning (ML); Relationship between ML and human learning | 1 |
| 1.2 | A quick survey of major models of how machines learn; Example applications of ML | 1 |
| 1.3 | Classification: Supervised Learning; | 1 |
| 1.4 | The problem of classification; Feature engineering; Training and testing classifier models; | 1 |
| 1.5 | Cross-validation; Model evaluation (precision, recall, F1-mesure, accuracy, area under curve); | 2 |
| 1. 6 | St Statistical decision theory including discriminant functions and decision surfaces; | 1 |
| **2** | **Module 2: Classification** | |
| 2.1 | Naive Bayes classification; Bayesian networks | 1 |
| 2.2 | Decision Tree and Random Forests | 2 |
| 2.3 | k-Nearest neighbor classification | 1 |
| 2.4 | Support Vector Machines | 1 |
| 2.5 | Artificial neural networks including back propagation | 2 |
| 2.6 | Applications of classifications | 1 |
| 2.7 | Ensembles of classifiers including bagging and boosting | 1 |
| **3** | **Module 3: Hidden Markov Models (HMM) & Regression** | |
| 3.1 | Hidden Markov Models (HMM) with forward-backward and Vierbi algorithms | 1 |
| 3.2 | Sequence classification using HMM | 1 |
| 3.3 | Conditional random fields | 1 |
| 3.4 | Applications of sequence classification such as part-of-speech tagging. | 1 |
| 3.5 | Regression: Multi-variable regression; Model evaluation | 2 |
| 3. 6 | Least squares regression; Regularization | 1 |
| 3.7 | LASSO | 1 |
| 3.8 | Applications of regression | 1 |
| **4** | **Module 4: Association rule mining & Outlier Detection.** | |
| 4.1 | Association rule mining algorithms including apriori. | 3 |
| 4.2 | Expectation-Maximization (EM) algorithm for unsupervised learning | 2 |

| | | |
|---|---|---|
| 4.3 | Anomaly and outlier detection methods | 2 |
| **5** | **Module 5: Clustering** | |
| 5.1 | Clustering | 1 |
| 5.2 | Average linkage | 1 |
| 5.3 | Ward's algorithm | 1 |
| 5.4 | Minimum spanning tree clustering | 1 |
| 5.5 | K-nearest neighbors clustering | 1 |
| 5.6 | BIRCH | 2 |
| 5.7 | CURE | 1 |
| 5.8 | DBSCAN | 2 |

**TEXT/REFERENCE BOOKS:**

| T/R | BOOK TITLE/AUTHORS/PUBLICATION |
|---|---|
| T | Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006. |
| T | Ethem Alpaydın, Introduction to Machine Learning (Adaptive Computation and Machine Learning), MIT Press, 2004. |
| R | R.O. Duda, P.E. Hart, D.G. Stork, Pattern Classification, 2/e, Wiley, 2001. |
| R | C. Bishop, Pattern Recognition and Machine Learning, Springer, 2007. |
| R | E. Alpaydin, Introduction to Machine Learning, 3/e, Prentice-Hall, 2014. |
| R | Rostamizadeh, A. Talwalkar, M. Mohri, Foundations of Machine Learning, MIT Press. |
| R | Andrew R Webb, Keith D Kopsey, Statistical Pattern Recognition, 3/e, Wiley, 2011. |

**COURSE PRE-REQUISITES:**

NIL

**COURSE OUTCOMES:**

| CO No. | Course Outcome (CO) | Bloom's Category Level |
|---|---|---|
| **CO 1** | Understand the basics of machine learning and identify the major models and applications of machine learning. | Level 2: Understand |
| **CO 2** | Differentiate various learning approaches, and to interpret the concepts of Supervised learning. | Level 2: Understand |
| **CO 3** | Identify the state sequence and evaluate a sequence emission probability from a given HMM. | Level 3: Apply |
| **CO 4** | Make use of the concept of association rule mining in real world scenario. | Level 3: Apply |
| **CO 5** | Illustrate and apply clustering algorithms and identify its applicability in real life problems. | Level 3: Apply |

**Mapping of Course Outcomes with Program Outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | - | - | - | - | - | - | - | - | 3 |
| CO2 | 3 | 1 | 2 | - | - | - | - | - | - | - | - | 3 |
| CO3 | 3 | 3 | 3 | - | - | - | - | - | - | - | - | 3 |
| CO4 | 3 | 2 | 3 | 3 | - | - | - | - | - | - | - | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 3 |

3/2/1: high/medium/low

**JUSTIFICATION FOR CO-PO CORRELATION:**

| **MAPPING** | **LEVEL** | **JUSTIFICATION** |
|---|---|---|
| CO1-PO1 | 3 | Study the concept of machine learning and its applications involves solving complex engineering problems |
| CO1-PO2 | 1 | Principles of mathematics and engineering sciences are used in understanding various machine learning functionalities |
| CO1-PO3 | 2 | Using the knowledge of various data mining functionalities, we can design and develop solutions for complex engineering problems |
| CO1- PO12 | 3 | The knowledge of machine learning is a life-long learning in the broadest context of technological change. |
| CO2-PO1 | 3 | Study of various supervised learning techniques to improve the quality of data involves solving complex engineering problems |
| CO2- PO2 | 1 | Principles of mathematics and engineering sciences are used in understanding various supervised learning functionalities |
| CO2- PO3 | 2 | Using the knowledge of various supervised learning methods, we can design and develop solutions for complex engineering problems |
| CO2- PO12 | 3 | Supervised learning is a life-long learning in the broadest context of technological change. |
| CO3- PO1 | 3 | The study of state sequence and emission probability of HMM involves solving complex engineering problems |
| CO3- PO2 | 3 | The study of state sequence and emission probability of HMM is used to learn engineering sciences. |
| CO3- PO3 | 3 | Knowledge of state sequence and emission probability can be used to design and develop solutions for complex engineering problems |

| | | |
|---|---|---|
| CO3- PO12 | 3 | The study of state sequence and emission probability is a life-long learning in the broadest context of technological change. |
| CO4- PO1 | 3 | The association rule mining methods study involves solving complex engineering problems |
| CO4- PO2 | 2 | Principles of mathematics and engineering sciences are used to learn the concept of association rule mining methods. |
| CO4- PO3 | 3 | Knowledge of various association rule mining methods can be used to design and develop solutions for complex engineering problems |
| CO4- PO4 | 3 | Use research-based knowledge and research methods for various association rule mining. |
| CO4- PO12 | 3 | Association rule mining is a life-long learning in the broadest context of technological change. |
| CO5- PO1 | 3 | The study of unsupervised learning techniques involves solving complex engineering problems |
| CO5- PO2 | 3 | The study of the algorithm used for data clustering involves principles of mathematics and engineering |
| CO5- PO3 | 3 | The study of unsupervised learning techniques and the algorithm used for data clustering can be used to design and develop solutions for complex engineering problems |
| CO5- PO4 | 3 | The knowledge of clustering algorithms can be used to design and conduct experiments to provide valid conclusions |
| CO5- PO5 | 3 | The knowledge of clustering algorithms can be used to modeling to complex engineering activities with an understanding of the limitations. |
| CO5- PO12 | 3 | The knowledge of clustering algorithms is a life-long learning in the broadest context of technological change. |

**GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:**

| SNO | DESCRIPTION | PROPOSED ACTIONS | PO MAPPING |
|---|---|---|---|
| 1 | FP Growth Algorithm - https://www.geeksforgeeks.org/frequent-pattern-growth-algorithm/ | Seminar | 1, 2, 3, 4, 5, 6 |

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURE/NPTEL ETC

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:**

| Sl No: | DESCRIPTION | PO MAPPING |
|---|---|---|

| | | |
|---|---|---|
| 1 | CNN- https://www.kaggle.com/code/kanncaa1/convolutional-neural-network-cnn-tutorial | 1, 2, 3, 4, 5, 6 |

**WEB SOURCE REFERENCES:**

| | |
|---|---|
| 1. | https://www.javatpoint.com/pytorch-convolutional-neural-network |
| 2. | https://www.guru99.com/data-mining-tutorial.html |
| 3. | https://www.tutorialandexample.com/data-mining-tutorial/ |
| 4. | https://nptel.ac.in/courses/106106179 (NPTEL) |

**DELIVERY/INSTRUCTIONAL METHODOLOGIES:**

| | | |
|---|---|---|
| ☑ CHALK & TALK | ☑ STUD. ASSIGNMENT | ☑WEB RESOURCES |
| ☑ LCD/SMART BOARDS | ☐ STUD. SEMINARS | ☑ADD-ON COURSES |

**ASSESSMENT METHODOLOGIES-DIRECT**

| | | | |
|---|---|---|---|
| ☑ ASSIGNMENTS | ☑ STUD. SEMINARS | ☑ TESTS/MODEL EXAMS | ☑ UNIV. EXAMINATION |
| ☐ STUD. LAB PRACTICES | ☐ STUD. VIVA | ☐ MINI/MAJOR PROJECTS | ☑ CERTIFICATIONS |
| ☐ ADD-ON COURSES | ☐ OTHERS | | |

**ASSESSMENT METHODOLOGIES-INDIRECT**

| | |
|---|---|
| ☑ ASSESSMENT OF COURSE OUTCOMES(BY FEEDBACK, ONCE) | ☑ STUDENT FEEDBACK ON FACULTY (TWICE) |

**Prepared by**
**Ms. Ancy C A**
**(Faculty in charge)**

**Approved by**
**Dr. Neeba E. A.**
**(HOD)**

## Course Plan

| No | Topic | No. of Lectures |
|---|---|---|
| **1** | **Module1: Introduction to Machine Learning (ML)** | |
| 1.1 | Introduction to Machine Learning (ML); Relationship between ML and human learning | 1 |
| 1.2 | A quick survey of major models of how machines learn; Example applications of ML | 1 |
| 1.3 | Classification: Supervised Learning; | 1 |
| 1. 4 | The problem of classification; Feature engineering; Training and testing classifier models; | 1 |
| 1.5 | Cross-validation; Model evaluation (precision, recall, F1-mesure, accuracy, area under curve); | 2 |
| 1.6 | Statistical decision theory including discriminant functions and decision surfaces; | 1 |
| **2** | **Module 2: Classification** | |
| 2.1 | Naive Bayes classification; Bayesian networks | 1 |
| 2.2 | Decision Tree and Random Forests | 2 |
| 2.3 | k-Nearest neighbor classification | 1 |
| 2.4 | Support Vector Machines | 1 |
| 2.5 | Artificial neural networks including back propagation | 2 |
| 2.6 | Applications of classifications | 1 |
| 2.7 | Ensembles of classifiers including bagging and boosting | 1 |
| **3** | **Module 3: : Hidden Markov Models (HMM) & Regression** | |
| 3.1 | Hidden Markov Models (HMM) with forward-backward and Vierbi algorithms | 1 |
| 3.2 | Sequence classification using HMM | 1 |

| | | |
|---|---|---|
| 3.3 | Conditional random fields | 1 |
| 3.4 | Applications of sequence classification such as part-of-speech tagging. | 1 |
| 3.5 | Regression: Multi-variable regression; Model evaluation | 2 |
| 3.6 | Least squares regression; Regularization | 1 |
| 3.7 | LASSO | 1 |
| 3.8 | Applications of regression | 1 |
| **4** | **Module 4: Association rule mining & Outlier Detection.** | |
| 4.1 | Association rule mining algorithms including apriori. | 3 |
| 4.2 | Expectation-Maximization (EM) algorithm for unsupervised learning | 2 |
| 4.3 | Anomaly and outlier detection methods | 2 |
| **5** | **Module 5 : Clustering** | |
| 5.1 | Clustering | 1 |
| 5.2 | average linkage | 1 |
| 5.3 | Ward's algorithm | 1 |
| 5.4 | Minimum spanning tree clustering | 1 |
| 5.5 | K-nearest neighbors clustering | 1 |
| 5.6 | BIRCH | 2 |
| 5.7 | CURE | 1 |
| 5.8 | DBSCAN | 2 |

## Tutorial Questions

1. Consider the confusion matrix given below for a binary classifier predicting the presence of a disease. Calculate any seven classifier performance evaluation metrices with suitable equations.

| | Predicted No | Predicted Yes |
|---|---|---|
| Actual No | 45 | 5 |

| | | |
|---|---|---|
| Actual Yes | 5 | 95 |

2. Suppose we have 10 samples in the dataset. Classify whether the student {Name=Niya, Age=44, Gender=F} like Music or Dance using KNN, where k=3?

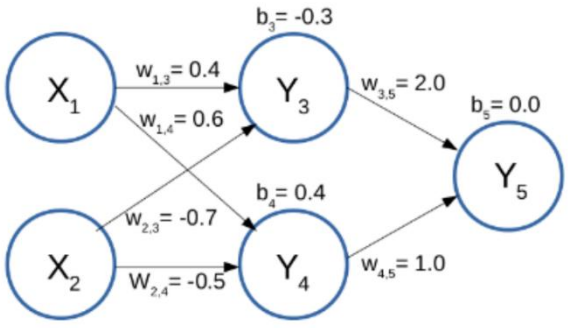
| Name | Age | Gender | Art |
|---|---|---|---|
| Anil | 32 | M | Music |
| Maya | 40 | F | Dance |
| Sara | 16 | F | Dance |
| Zei | 34 | M | Neither |
| Sachin | 55 | M | Music |
| Neha | 40 | F | Neither |
| Rahul | 20 | M | Dance |

3. The following table contains training examples that help predict whether a patient is likely to have
a heart attack.

| Patient id | Chest pain? | Male? | Smokes? | Exercises? | Heart attack? |
|---|---|---|---|---|---|
| 1. | yes | yes | no | yes | yes |
| 2. | yes | yes | yes | no | yes |
| 3. | no | no | yes | no | yes |
| 4. | no | yes | no | yes | no |
| 5. | yes | no | yes | yes | yes |
| 6. | no | yes | yes | yes | no |

Use information gain to construct a minimal decision tree that predicts whether or not a patient is
likely to have a heart attack.

4. Consider the following neural network with weights w for the edges and offset b for the nodes. Consider input values X1 = 1 and X2 =1. Find Y3, Y4, Y5 for the forward propagation.




5. Consider the following hypothetical data concerning student characteristics. Use Naive Bayes classifier to determine whether or not someone with poor GPA, and lots of effort should be hired or not.

| Name | GPA | Effort | Hirable |
|---|---|---|---|
| Sarah | Poor | Lots | Yes |

| | | | |
|---|---|---|---|
| Dona | Average | Some | No |
| Alex | Average | Some | No |
| Annie | Average | Lots | Yes |
| Emily | Excellent | Lots | Yes |
| Pete | Excellent | Lots | No |
| John | Excellent | Lots | No |
| Kathy | Poor | Some | No |

6. Consider the following transactional data. Generate association rules using the Apriori algorithm
   from the given data with support threshold S = 33% and confidence threshold C = 60%.
   Show the candidate and frequent itemsets for each database scan. Enumerate all the final frequent itemsets. Also indicate the association rules that are generated and highlight the strong ones, sort them by confidence.

| Transaction ID | Item Purchased |
|---|---|
| T1 | P, Q, R |
| T2 | P, Q |
| T3 | P, S, T |
| T4 | S, T |
| T5 | R, T |
| T6 | P, S, T |

## Assignment Questions

1. Write short note on the following topics.
   1. The problems of classification.
   2. Applications of classifications.

2. Write a short note on the following topics.
   1. Applications of sequence classification such as part-of-speech tagging
   2. Applications of regression

# 101009/IT522 G
# COMPILER DESIGN LAB
# (LEX & YACC)

**COURSE INFORMATION SHEET**

| | |
|---|---|
| PROGRAMME: **COMPUTER SCIENCE & BUSINESS SYSTEM** | DEGREE: **BTECH** |
| COURSE: **COMPILER DESIGN LAB** | SEMESTER: **V** CREDITS: **2** |
| COURSE CODE**:** **101009/IT522 G**<br>REGULATION: **2021** | COURSE TYPE: **CORE** - Lab |
| COURSE AREA/DOMAIN: **Programming, Data Structures and Algorithms** | CONTACT HOURS: **3 hours per week** |

## Syllabus

1. Design and implement a lexical analyzer for given language using C and the lexical analyzer should ignore redundant spaces, tabs and new lines.

2. Implementation of Lexical Analyzer using Lex Tool

3. Generate YACC specification for a few syntactic categories.

a) Program to recognize a valid arithmetic expression that uses operator +, – , *and /.

b) Program to recognize a valid variable which starts with a letter followed by any number of letters or digits.

c) Implementation of Calculator using LEX and YACC

d) Convert the BNF rules into YACC form and write code to generate abstract syntax tree

4. Write a program to find ε – closure of all states of any given NFA with ε transition.

5. Write a program to convert NFA with ε transition to NFA without ε transition.

6. Write a program to convert NFA to DFA

7. Write a program to minimize any given DFA.

8. Develop an operator precedence parser for a given language.

9. Write a program to find Simulate First and Follow of any given grammar.

10. Construct a recursive descent parser for an expression.

11. Construct a Shift Reduce Parser for a given language.

12. Write a program to perform loop unrolling.

13. Write a program to perform constant propagation.

14. Implement Intermediate code generation for simple expressions.

15. Implement the back end of the compiler which takes the three-address code and produces the 8086 assembly language instructions that can be assembled and run using an 8086 assembler. The target assembly instructions can be simple move, add, sub, jump etc.

## Lab cycle

1. Design and implement a lexical analyzer for given language using C and the lexical analyzer should ignore redundant spaces, tabs and new lines.
2. Implementation of Lexical Analyzer using Lex Tool
3. Implementation of Lexical Analyzer using Lex Tool toignore redundant spaces, tabs and new lines.
4. Generate YACC specification for a few syntactic categories.

   a) Program to recognize a valid arithmetic expression that uses operator +, – , * and /.

   b) Program to recognize a valid variable which starts with a letter followed by any number of letters or digits.

   c) Implementation of Calculator using LEX and YACC

5. Write a program to convert NFA to DFA
6. Write a program to find Simulate First and Follow of any given grammar.
7. Design and implement a recursive descent parser for a given grammar.
8. Construct a Shift Reduce Parser for a given language.
9. Implement Intermediate code generation for simple expressions
10. Write a C program to recognize strings under 'a', 'a*b+', 'abb'.

11. Write a C program to simulate lexical analyzer for validating operators

12. Convert the BNF rules into YACC form and write code to generate abstract syntax tree

13. Implement the back end of the compiler which takes the three address code and produces the 8086 assembly language instructions. The target assembly instructions can be simple move, add, sub, jump etc.

14. Write a program to minimize any given DFA.

15. Write a program to find ε – closure of all states of any given NFA with ε transition.

## Text Books

1. V. Aho, R. Sethi and J. Ullman, Compilers: Principles, Techniques and Tools, 2nd Edition, Addison Wesley, 2006.

2. Levine R. John, Tony Mason and Doug Brown, Lex & Yacc, 2nd Edition, O'Reilly Media, Inc., 1992.

## Reference Books

1. Bjarne Stroustrup, The Design and Evolution of C++, 1st Edition, Addison-Wesley Professional, 1994.

2. Kenneth C. Louden, Compiler Construction – Principles and Practice, Cengage Learning Indian Edition, 2006.

3. Tremblay and Sorenson, The Theory and Practice of Compiler Writing, Tata McGraw Hill & Company,1984.

4. Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures: A Dependence-based Approach, Morgan Kaufmann Publishers, 2008.

5. Steven S. Muchnick, Advanced Compiler Design and Implementation, Morgan Kaufmann Publishers – Elsevier Science, India, Indian Reprint 2008.

## COURSE PRE-REQUISITES:

| C.CODE | COURSE NAME | DESCRIPTION | SEM |
|---|---|---|---|
| 101009/IT100C | Fundamentals of Computer Science | The basics of C programming | S1 |
| 101009/IT200C | DATA STRUCTURES & | Basics of Data Structures | S2 |

| | | | |
|---|---|---|---|
| | ALGORITHMS | | |

## COURSE OBJECTIVES:

| | |
|---|---|
| 1 | This course is intended to provide a hands-on experience on implementing the different<br>phases of compiler, implementing and testing simple optimization techniques and to give exposure to compiler writing tools. |

## Course Outcomes

After the completion of the course the student will be able to

CO1: Implement the techniques of Lexical Analysis and Syntax Analysis.

CO2: Apply the knowledge of Lex & Yacc tools to develop programs.

CO3: Generate intermediate code.

CO4: Implement Optimization techniques and generate machine level code.

CO5: Understand and analyze the role of syntax and semantics of programming languages in compiler construction

## Mapping of Course Outcomes with Program Outcomes

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | 2 | - | - | - | 1 | 1 | 1 | 1 |
| CO2 | 3 | 2 | 3 | 2 | 2 | - | - | - | 2 | 1 | 1 | 1 |
| CO3 | 3 | 2 | 3 | 2 | 2 | - | - | - | - | - | - | 2 |
| CO4 | 3 | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - |
| CO5 | 3 | 2 | 3 | 2 | 2 | - | - | - | 1 | 1 | 1 | 2 |

**1-Low(L) 2-Medium(M) 3-High(H)**

## JUSTIFICATIONS FOR THE MAPPING

| MAPPING | LOW/MEDIUM/HIGH | JUSTIFICATION |
|---|---|---|
| CO1-PO1 | H | Students will acquire knowledge about phases of compilation |
| CO1-PO3 | L | Students will be able to understand the role of Lexical Analyzer in Compilation Process |
| CO1-PO12 | H | Information acquired from the compilation phases provides lifelong learning in the context of Compiler Construction. |
| CO1-PSO2 | M | Having the knowledge about the compiler construction tools helps in the study and design of compiler. |
| CO2-PO2 | H | Knowledge of Ambiguities in the context free Grammar helps students in problem analysis. |
| CO2-PO3 | M | Students gain the ability to design syntax analyzer tool used for compilation process. |
| CO2-PO4 | H | Studies about the various parsing techniques helps the students to understand about Parsing Process. |
| CO2-PO12 | H | Students will be able to analyze different parsing techniques used for Compilation |
| CO3-PO2 | H | Studies about the type checking process helps in the semantic analysis phase of compilation. |
| CO3-PO3 | H | Understanding the various storage al location strategies helps in organization of information in the Run Time Environment of Compilation. |
| CO3-PO12 | L | Information acquired from bottom up and top down evaluation provides lifelong learning in the compilation |
| CO3-PSO3 | H | Students could apply the knowledge of Overloaded and Polymorphic function used in semantic Analysis Phase of Compiler. |

| | | |
|---|---|---|
| CO4-PO1 | H | Students gain the ability to learn about the Intermediate code generation in compilation process. |
| CO4-PO2 | H | Students will understand the need of intermediate representation for the generation of target code . |
| CO4-PO12 | M | The students could understand and implement different types Intermediate Representation of code used for generating target code. |
| CO4-PSO2 | M | Information acquired from the fundamentals of intermediate representation leads to implementation of target code |
| CO5-PO1 | H | Students will be obtain basic knowledge of code optimization |
| CO5-PO2 | H | Information acquired from the sources of optimization helps in implementation of target code |
| CO5-PO12 | M | Students could apply the knowledge of code optimization in Compiler Construction |
| CO5-PSO2 | M | Students will be acquiring knowledge about code improving transformation. |
| CO6-PO1 | H | Students will be acquiring knowledge about Instruction Scheduling |
| CO6-PO4 | M | Students will be acquiring knowledge about Register Allocation |
| CO6-PO12 | H | Students will be acquiring knowledge about Instruction Level Optimization |
| CO6-PSO3 | M | Students will be acquiring knowledge about Design issues in Code Generation for a Target Processor |

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:**

| Sl no | DESCRIPTION | PO MAPPING |
|---|---|---|
| 1 | Design of Interpreter | **a,b,d,e** |
| 2 | Design of Optimized Compiler | **a,b,d,e** |
| | | |

**WEB SOURCE REFERENCES:**

| | |
|---|---|
| 1 | https://www.cs.utexas.edu/~novak/lexpaper.htm |
| 2 | https://compilers.iecc.com/crenshaw/ |

**DELIVERY/INSTRUCTIONAL METHODOLOGIES:**

| | | |
|---|---|---|
| ✓ CHALK & TALK | ✓ HOME ASSIGNMENT | ✓ WEB RESOURCES |
| LCD/SMART BOARDS | STUD. SEMINARS | ADD-ON COURSES |

**ASSESSMENT METHODOLOGIES-DIRECT**

| | | | |
|---|---|---|---|
| ASSIGNMENTS | STUD. SEMINARS | ✓ TESTS/MODEL EXAMS | ✓ UNIV. EXAMINATION |
| ✓ STUD. LAB PRACTICES | ✓ STUD. VIVA | ☐ MINI/MAJOR PROJECTS | ☐ CERTIFICATIONS |
| ADD-ON COURSES | OTHERS | | |

**ASSESSMENT METHODOLOGIES-INDIRECT**

| | |
|---|---|
| ✓ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE) | ✓ STUDENT FEEDBACK ON FACULTY (ONCE) |
| ☐ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS | ☐ OTHERS |

**Prepared by** **Approved by**

**Tinku Soman Jacob** **HOD**

## Open questions

1. Write a C program for implementing the functionalities of predictive parser for the mini language
   specified.
2. Write a program to perform loop unrolling.

3. Write a program to perform constant propagation.
4. Simulation of DFA
5. Implementation of symbol table
6. Construction of LR parsing table
7. Write program to identify string constant or not
8. Syntax checking for for loop

## Advanced Questions

1. Implement the lexical analyzer using JLex, flex or other lexical analyzer generating tools.
2. Write a C program for constructing of LL (1) parsing.
3. Write a C program to implement LALR parsing.
4. Construction of minimized dfa from a given regular expression
5. Implement lexical analyser using finite automata

## Course Plan

| Sl No | Experiment | Schedule |
|---|---|---|
| 1 | Lexical analyzer using C | Week 1 |
| 2 | LEX programs(keyword-iden, uppr-case word, vowels, count) | Week 2 |
| 3 | Yacc program(calculator) | Week 3 |
| 4 | Yacc program(expression validation, identifier validation) | Week 4 |
| 5 | LEX program(eliminate WS & comments, lexical analyzer) | Week 5 |
| 6 | NFA to DFA conversion | Week 6 |
| 7 | FIRST & FOLLOW | Week 7 |
| 8 | Recognize strings | Week 8 |
| 9 | RD parser | Week 9 |
| 10 | Shift reduce parser | Week 10 |
| 11 | Intermediate code generator | Week 11 |
| 12 | Code generation | Week 12 |

# 101009/IT522S MACHINE LEARNING LAB

# Course Information Sheet

**SYLLABUS:**

| Sl. No. | LIST OF EXPERIMENTS | HOURS |
|---|---|---|
| 1 | **Explore WEKA Machine Learning Toolkit**<br>Experiment No.1:<br>• Downloading and/or installation of WEKA data mining toolkit,<br>• Understand the features of WEKA toolkit such as Explorer, Knowledge Flow interface, Experimenter, command-line interface.<br>• Navigate the options available in the WEKA (ex. Select attributes panel, Preprocess panel, Classify panel, Cluster panel, Associate panel and Visualize panel) | |
| 2 | Experiment No.2:<br>• Study the arff file format<br>• Explore the available data sets in WEKA<br>• Load a dataset (breast cancer)and observe the following:<br>a. List the attribute names and their types<br>b. Number of records in each dataset<br>c. Identify the class attribute (if any)<br>d. Perform necessary pre-processing (minimum 3)<br>e. Plot Histogram | 3 |
| 3 | **Explore Graphical Plots in R.**<br>Experiment No.3: Create a Scatter plot with the iris dataset using the ggplot package. Add legends, lines, and labels, and use the aes function in the plot. | 3 |
| 4 | Experiment No.4: Create a histogram with the titanic dataset using the ggplot package. Add legends, lines, and labels, and use the aes function in the plot. | |
| | **Classification** | |
| 5 | Experiment No.5: Demonstrate pre-processing in soyabean dataset using R, with minimum of four preprocessing to be done, and prepare it for classification. | 3 |
| 6 | Experiment No.6: Demonstrate the following Classification algorithms using some public domain datasets in UCI ML repository and compute the accuracy of the classifier, considering few test datasets.<br>i. Naive Bayes classification<br>ii. Decision Tree<br>iii. Random Forests<br>iv. Ensembles of classifiers including bagging and boosting | 12 |
| 7 | Experiment 7: Demonstrate the following Classification algorithms using some public domain datasets in UCI ML repository and compute the accuracy of the | 6 |

| | | |
|---|---|---|
| | classifier, considering few test datasets.<br>i. k-Nearest neighbor classification<br>ii. Support Vector Machines | |
| 8 | **Micro Project:**<br>1. Implementation of clustering algorithms<br>2. Implementation of association rule mining algorithm (Apriori)<br>3. Implementation of anomaly detection algorithms<br>4. Implementation of EM algorithm for some specific problem<br>Theory (to be written in the record).<br>1. Details on the techniques used.<br>2. The domain selected.<br>3. Aim of the project.<br>4. Motivation behind the project.<br>5. Reason to choose the technique.<br>6. Pre-processing steps used.<br>7. Performance measures used, and accuracy obtained.<br>8. Inference from the implementation.<br><br>Output should include:<br>1. Code (Print)<br>2. Sample outputs of pre-processing, analysis and prediction.<br>3. Sample of performance evaluation.<br>4. Graphs, if any. | 9 |

**TEXT/REFERENCE BOOKS:**

| T/R | BOOK TITLE/AUTHORS/PUBLICATION |
|---|---|
| T | 1. Christopher M. Bishop, *Pattern Recognition and Machine Learning*, Springer, 2006.<br>2. Ethem Alpaydın, Introduction to Machine Learning (Adaptive Computation and Machine Learning), MIT Press, 2004. |
| R | 1. R.O. Duda, P.E. Hart, D.G. Stork, *Pattern Classification*, 2/e, Wiley, 2001.<br>2. C. Bishop, Pattern Recognition and Machine Learning, Springer, 2007.<br>3. E. Alpaydin, *Introduction to Machine Learning*, 3/e, Prentice-Hall, 2014.<br>4. Rostamizadeh, A. Talwalkar, M. Mohri, *Foundations of Machine Learning*, MIT Press.<br>5. Andrew R Webb, Keith D Kopsey, Statistical Pattern Recognition, 3/e, Wiley, 2011. |

**COURSE PRE-REQUISITES:**
Nil

**COURSE OUTCOMES:**
**After the completion of the course the student will be able to:**

CO1: Familiarize the usage of Machine Learning tools such as WEKA and R.
CO2: Implement and apply machine learning algorithms to analyze the complex problems.
CO3: Select and apply appropriate algorithms for solving a of real-world problems.
CO4: Understand the associations in data and infer knowledge for future predictions.

**CO-PO AND CO-PSO MAPPING**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 2 | 2 | 2 | 3 | 1 | - | - | - | - | - | 1 |
| CO2 | 2 | 2 | 2 | 3 | 3 | 1 | - | - | - | - | - | 1 |
| CO3 | 3 | 2 | 2 | 3 | 3 | 1 | - | - | - | - | - | 1 |
| CO4 | 2 | 3 | 3 | 2 | 3 | 1 | - | - | - | - | - | 1 |

**JUSTIFICATIONS FOR CO-PO/PSO MAPPING**

| MAPPING | LOW/MEDIUM/HIGH | JUSTIFICATION |
|---|---|---|
| CO1-PO1 | LOW | The knowledge of data mining tools will help the students to formulate solutions for engineering problems. |
| CO1-PO2 | MEDIUM | The knowledge of data mining tools will help the students to apply the same to identify and analyze engineering problems. |
| CO1-PO3 | MEDIUM | Understanding the data preprocessing techniques and tools will help the students to apply the same in designing system components or processes satisfying specific needs and constraints. |
| CO1-PO4 | MEDIUM | Understanding the data preprocessing techniques and tools will help the students to apply the same in investigating complex problems. |
| CO1-PO5 | HIGH | Understanding data mining tools help the students to create, select, and apply appropriate techniques to model complex engineering activities. |
| CO1-PO6 | LOW | The knowledge of data preprocessing help students to apply reasoning informed by the contextual |

| | | |
|---|---|---|
| | | knowledge. |
| CO1-PO12 | LOW | The knowing of data mining is a life-long learning in the broadest context of technological change. |
| CO2-PO1 | MEDIUM | The knowledge of various machine learning algorithms will help the students to formulate solutions for engineering problems. |
| CO2-PO2 | MEDIUM | The knowledge of various machine learning algorithms will help the students to apply the same to identify and analyze engineering problems. |
| CO2-PO3 | MEDIUM | Understanding the data machine learning techniques and tools will help the students to apply the same in designing system components or processes satisfying specific needs and constraints. |
| CO2-PO4 | MEDIUM | Understanding the data classification techniques and tools will help the students to apply the same in investigating complex problems. |
| CO2-PO5 | HIGH | Understanding various machine learning algorithms help the students to create, select, and apply appropriate techniques to model complex engineering activities. |
| CO2-PO6 | LOW | The knowledge of machine learning algorithms help students to apply reasoning informed by the contextual knowledge. |
| CO2-PO12 | LOW | The knowing of machine learning is a life-long learning in the broadest context of technological change. |
| CO3-PO1 | HIGH | The use of appropriate ML algorithms in realistic data will help the students to formulate solutionsfor engineering problems. |
| CO3-PO2 | MEDIUM | The use of appropriate ML algorithms in realistic data will help the students to apply the same to identify and analyze engineering problems. |
| CO3-PO3 | MEDIUM | The use of appropriate ML algorithms on realistic data will help the students to apply the same in designing system components or processes satisfying specific needs and constraints. |
| CO3-PO4 | MEDIUM | The use of appropriate ML algorithms on realistic data will help the students to apply the same in investigating complex problems. |
| CO3-PO5 | HIGH | The use of appropriate ML algorithms help the students to create, select, and apply appropriate techniques to model complex engineering activities. |
| CO3-PO6 | LOW | The use of appropriate ML algorithms help students to apply reasoning informed by the contextual knowledge. |
| CO3-PO12 | LOW | The use of appropriate ML algorithms is a life-long |

| | | |
|---|---|---|
| | | learning in the broadest context of technological change. |
| CO4-PO1 | MEDIUM | The knowledge of pattern designs and association rule mining will help the students to formulate solutions for engineering problems. |
| CO4-PO2 | HIGH | The knowledge of various association rule mining algorithms will help the students to apply the same to identify and analyze engineering problems. |
| CO4-PO3 | HIGH | Understanding the association rule mining techniques and tools will help the students to apply the same in designing system components or processes satisfying specific needs and constraints. |
| CO5-PO4 | MEDIUM | Understanding the association rule mining techniques and tools will help the students to apply the same in investigating complex problems. |
| CO6-PO5 | HIGH | Understanding the association rule mining techniques help the students to create, select, and apply appropriate techniques to model complex engineering activities. |
| CO6-PO6 | LOW | Understanding the association rule mining techniques help students to apply reasoning informed by the contextual knowledge. |
| CO6-PO12 | LOW | Understanding the association rule mining techniques is a life-long learning in the broadest context of technological change. |

**GAPS IN THE SYLLABUS - TO MEET INDUSTRY REQUIREMENTS:**

| Sl. No. | DESCRIPTION | PROPOSED ACTIONS |
|---|---|---|
| 1. | Implementation of ANN | Video Lectures |

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:**

| | |
|---|---|
| 1. | Implementation of HMM and EM Algorithm. |

**WEB SOURCE REFERENCES:**

| | |
|---|---|
| 1 | https://www.youtube.com/watch?v=m7kpIBGEdkI |
| 2 | https://www.youtube.com/watch?v=12eWvSvOqF4 |
| 3 | https://www.educba.com/weka-data-mining/ |
| 4 | https://www.javatpoint.com/weka-data-mining |

**DELIVERY/INSTRUCTIONAL METHODOLOGIES:**

| | | |
|---|---|---|
| CHALK & TALK | WEB RESOURCES | |
| LCD/SMART BOARDS | | |

**ASSESSMENT METHODOLOGIES-DIRECT:**

| | | | |
|---|---|---|---|
| STUD. LAB PRACTICES | ASSIGNMENTS | UNIV. EXAMINATION | STUD. VIVA |
| MICRO PROJECTS | | | |

**ASSESSMENT METHODOLOGIES-INDIRECT:**

| | |
|---|---|
| ✓ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE) | ✓ STUDENT FEEDBACK ON FACULTY (TWICE) |

**Prepared by**
**Ms. Ancy C A**
**(Faculty in charge)**

**Approved by**
**Dr. Neeba E. A.**
**(HOD)**

# Lab Cycle

**Explore WEKA Machine Learning Toolkit**

Experiment No.1:

• Downloading and/or installation of WEKA data mining toolkit,

• Understand the features of WEKA toolkit such as Explorer, Knowledge Flow interface, Experimenter, command-line interface.

• Navigate the options available in the WEKA (ex. Select attributes panel, Preprocess panel, Classify panel, Cluster panel, Associate panel and Visualize panel)

Experiment No.2:

• Study the arff file format

• Explore the available data sets in WEKA

• Load a dataset (breast cancer)and observe the following:

a. List the attribute names and their types

b. Number of records in each dataset

c. Identify the class attribute (if any)

d. Perform necessary pre-processing (minimum 3)

d. Plot Histogram

**Explore Graphical Plots in R.**

Experiment No.3: Create a Scatter plot with the iris dataset using the ggplot package. Add legends, lines, and labels, and use the aes function in the plot.

Experiment No.4: Create a histogram with the titanic dataset using the ggplot package. Add legends, lines, and labels, and use the aes function in the plot.

**Classification**

Experiment No.5: Demonstrate pre-processing in soyabean dataset using R, with minimum of four preprocessing to be done, and prepare it for classification.

Experiment No.6: Demonstrate the following Classification algorithms using some public domain datasets in UCI ML repository and compute the accuracy of the classifier, considering few test datasets.

i. Naive Bayes classification

ii. Decision Tree

iii. Random Forests

iv. Ensembles of classifiers including bagging and boosting

Experiment 6: Demonstrate the following Classification algorithms using some public domain datasets in UCI ML repository and compute the accuracy of the classifier, considering few test datasets.

i. k-Nearest neighbor classification

ii. Support Vector Machines

**Micro Project:**

1. Implementation of clustering algorithms

2. Implementation of association rule mining algorithm (Apriori)

3. Implementation of anomaly detection algorithms

4. Implementation of EM algorithm for some specific problem

Theory (to be written in the record).

1. Details on the techniques used.
2. The domain selected.
3. Aim of the project.
4. Motivation behind the project.
5. Reason to choose the technique.
6. Pre-processing steps used.
7. Performance measures used, and accuracy obtained.
8. Inference from the implementation.

Output should include:

1. Code (Print)
2. Sample outputs of pre-processing, analysis and prediction.
3. Sample of performance evaluation.
4. Graphs, if any.

## Open Experiments

**1. Data Preprocessing**
i. Separate the nominal attributes and the real valued attributes from a given dataset by using the Weka tool.
ii. Demonstrate the preprocessing of a given arff file using Weka.

2. **Classification**
Write R program to implement a Naïve bayes classifier and compare its performance with decision tree classifier.

3**. Regression**:
Write R program to demonstrate linear regression on a sample dataset

4. **Association Rule Mining**
Write R programs to:
i. Implement Apriori algorithm and generate association rules for the given dataset.
ii. Using FP-Growth algorithm, generate association rules for the given dataset

5. **Clustering**
Write R programs to:
i. Perform K-means clustering on a given dataset.

## Advanced Questions

1. Implement Single Linear and Muti - Variable Regression.
2. Implement Polynomial Regression. Evaluate accuracy obtained using different methods.
3. Perform Regularization using LASSO model using given dataset.
4. Perform Regularization using RIDGE model using given dataset.
5. Implement DBSCAN clustering on sample dataset.
6. Perform dimensionality reduction using PCA.
7. Perform image compression using PCA.
8. Implement kernel function in SVM using polynomial, gaussian and sigmoid kernel.
9. Implement ANN.
10. Implement Gradient Boosting Classifier for given data with interpretation.
11. Implement agglomerative clustering on a sample dataset.
12. Implement divisive clustering on a sample dataset.

## Course Plan

| No | Experiments | No. of Lab hours |
|---|---|---|
| 1 | Experiment No.1: Explore WEKA Machine Learning Toolkit | 3 Hours |
| 2 | Experiment No.2: Study the arff file format and explore the available datasets in WEKA | 3 Hours |
| 3 | Experiment No.3: Implementation of various plots R | 3 Hours |
| 4 | Experiment No.4: Data manipulation with R, Pre-processing and preparing a dataset for Classification. | 3 Hours |
| 5 | Experiment No.5: Implementation of Naïve Bayes Classification algorithm using some public domain datasets in UCI ML repository. | 3 Hours |
| 6 | Experiment No.6: Implementation of Decision Tree and Random Forest Classification algorithm using some public domain datasets in UCI ML repository. | 3 Hours |
| 7 | Experiment No.7: Implementation of ensemble classification algorithm using some public domain datasets in UCI ML repository. | 3 Hours |
| 8 | Experiment No.8: Implementation of k-Nearest neighbor classification algorithm using some public domain datasets in UCI ML repository. | 3 Hours |
| 9 | Experiment No. 9: Implementation of Support Vector Machine Classification algorithm using some public domain datasets in UCI ML repository. | 3 Hours |
| 10 | Experiment No.10: Implementation of KNN | 3 Hours |
| 11 | Experiment No.11: Implementation of ANN | 3 Hours |
| 12 | Experiment No.12: Microproject | 9 Hours |

# 101009/IT522T
# MINI PROJECT

# COURSE INFORMATION SHEET

## Mini Project

| | |
|---|---|
| PROGRAMME:COMPUTER SCIENCE AND BUSINESS SYSTEMS | DEGREE: B. TECH |
| COURSE: **Mini Project** | SEMESTER: V CREDITS: 1 |
| COURSE CODE: 101009/IT522T<br>REGULATION: 2020 | COURSE TYPE: PSW |
| COURSE AREA/DOMAIN: Engineering | CONTACT HOURS: 3(Practical)hours/Week. |
| CORRESPONDING LAB COURSE CODE (IF ANY): NA | LAB COURSE NAME: NA |

## SYLLABUS:

| PHASE | DETAILS | HOURS |
|---|---|---|
| COURSE PLAN | In this course, each group consisting of three/four members is expected to design and developa moderately complex software/hardware system with practical applications. This should be aworking model. The basic concept of product design may be taken into consideration.<br><br>Students should identify a topic of interest in consultation with Faculty-in-charge of mini project/Advisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout thedesign/fabrication or develop codes/programs to achieve the objectives. Demonstrate theINFORMATION TECHNOLOGYnovelty of the project through the results and outputs. The progress of the mini project isevaluated based on a minimum of two reviews.<br><br>The review committee may be constituted by the Head of the Department. A project report isrequired at the end of the semester. The product has to be demonstrated for its full designspecifications. Innovative design concepts, reliability considerations, aesthetics/ergonomicaspects taken care of in the project shall be given due weight. | 39 (13 WEEKS) |

## COURSE OBJECTIVES:

This course is designed for enabling the students to apply the knowledge to address the real-world situations/problems and find solutions. The course is also intended to estimate the ability of the students in transforming theoretical knowledge studied as part of the curriculum so far into a working model of a software system. The students are expected to design and develop a software/hardware project to innovatively solve a real-world problem.

## COURSE OUTCOMES:

After completion of the course the student will be able to

| Si.NO | DESCRIPTION | Blooms' Taxonomy Level |
|---|---|---|
| CO1 | Make use of acquired knowledge within the selected area of technology for project development. | Level 3: Apply |
| CO2 | Identify, discuss and justify the technical aspects and design aspects of the project with a systematic approach. | Level 3: Apply |
| CO3 | Interpret, improve and refine technical aspects for engineering projects. | Level 3: Apply |
| CO4 | Associate with a team as an effective team player for the development of technical projects. | Level 3: Apply |
| CO5 | Report effectively the project related activities and findings. | Level 2: Understand |

## CO-PO AND CO-PSO MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | | | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | | 2 | 3 | | 3 | 2 | 3 | 3 | | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | | 2 | 3 | 3 | 2 | 2 | 2 |
| CO4 | 3 | 3 | 2 | 2 | | | | 3 | 3 | 3 | 3 | 3 | | | |
| CO5 | 3 | | | | 2 | | | 3 | 2 | 3 | 2 | 3 | | | |

3/2/1: high/medium/low

## JUSTIFICATIONS FOR CO-PO MAPPING

| MAPPING | LOW/MEDIUM/HIGH | JUSTIFICATION |
|---|---|---|
| CO1-PO1 | H | Knowledge acquired in the selected area of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of project development. |
| CO1-PO2 | H | Knowledge acquired in the selected area of project development can be used to Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions. |
| CO1-PO3 | H | Can use the acquired knowledge in designing solutions to complex problems. |
| CO1-PO4 | H | Can use research-based knowledge in the design & development of project. |
| CO1-PO5 | H | Knowledge in the area of technology for project development using IT tools makes better modelling. |
| CO1-PO6 | H | Creative project development assess societal, health, safety, legal and cultural issues and the consequent responsibilities. |
| CO1-PO7 | H | Project development based on societal and environmental context solution identification is the need for sustainable development. |
| CO1-PO8 | H | Project development should be based on professional ethics and responsibilities. |
| CO1-PO12 | H | Project brings technological changes in the society. |
| CO1-PSO1 | H | Acquiring knowledge for project development gather skills in design, analyse, develop and implementation of algorithms. |
| CO1-PSO2 | H | Knowledge for project development contributes engineering skills in computing & information gatherings. |
| CO1-PSO3 | H | Knowledge acquire for project development will also include systematic planning, developing, testing and implementation IT solutions in various domain. |
| CO2-PO1 | H | Projects design and development in systematic |

| | | |
|---|---|---|
| | | approach brings knowledge in mathematics and engineering fundamentals. |
| CO2-PO2 | H | Identify, formulate and analyse of project makes a systematic approach. |
| CO2-PO3 | H | Systematic approach is the tip of solving complex problems in various domains. |
| CO2-PO4 | H | Systematic approach in the technical and design aspects provide valid conclusions. |
| CO2-PO5 | H | Systematic approach in the technical and design aspects demonstrate the knowledge of sustainable development. |
| CO2-PO7 | M | Identification and justification of technical aspects of project development demonstrates the need for sustainable development. |
| CO2-PO8 | H | Apply professional ethics and responsibilities in engineering practice of development. |
| CO2-PO10 | H | Systematic approach also includes effective reporting and documentation which gives clear instructions. |
| CO2-PO11 | M | Project development in systematic approach based on managemental principles will provides teamwork. |
| CO2-PO12 | H | Project development as a team in identification and analysis bring ability to engage in independent and lifelong learning. |
| CO2-PSO1 | H | Identification, formulation and justification in technical aspects will be based on acquiring skills in design and development of algorithms. |
| CO2-PSO3 | H | Identification, formulation and justification in technical aspects provides the betterment of life in various domains. |
| CO3-PO1 | H | Students can able to interpret, improve and redefine technical aspects with mathematics, science and engineering fundamentals for the solutions of complex problems. |
| CO3-PO2 | H | Students can able to interpret, improve and redefine technical aspects with identification formulation and analysis of complex problems. |
| CO3-PO3 | H | Students can able to interpret, improve and redefine technical aspects meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental |

| | | |
|---|---|---|
| | | considerations. |
| CO3-PO4 | H | Students can able to interpret, improve and redefine technical aspects for design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. |
| CO3-PO5 | H | Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools for interpret, improve and redefine. |
| CO3-PO6 | M | Students can able to interpret, improve and redefine technical aspects by applying contextual knowledge to assess societal, health and consequential responsibilities relevant to professional engineering practices. |
| CO3-PO7 | H | Students can able to interpret, improve and redefine technical aspects demonstrate the knowledge of, and need for sustainable development. |
| CO3-PO8 | H | Students can able to interpret, improve and redefine technical aspects apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| CO3-PO10 | M | Students can able to interpret, improve and redefine technical aspects communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. |
| CO3-PO11 | H | Students can able to interpret, improve and redefine technical aspects demonstrate knowledge and understanding of the engineering and management principle in multidisciplinary environments. |
| CO3-PO12 | H | Students can able to interpret, improve and redefine technical aspects recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. |
| CO3-PSO1 | M | Students can able to interpret, improve and redefine technical aspects in acquiring skills to design, analyse and develop algorithms and implement those using high-level programming languages. |

| | | |
|---|---|---|
| CO3-PSO2 | M | Students can able to interpret, improve and redefine technical aspects contribute their engineering skills in computing and information engineering domains like network design and administration, database design and knowledge engineering. |
| CO3-PSO3 | M | Students can able to interpret, improve and redefine technical aspects develop strong skills in systematic planning, developing, testing, implementing and providing IT solutions for different domains which helps in the betterment of life. |
| CO4-PO1 | H | Students will be able to associate with a team as an effective team player for the development of technical projects by apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. |
| CO4-PO2 | H | Students will be able to associate with a team as an effective team player for Identify, formulate, review research literature, and analyze complex engineering problems |
| CO4-PO3 | M | Students will be able to associate with a team as an effective team player for designing solutions to complex engineering problems and design system components |
| CO4-PO4 | M | Students will be able to associate with a team as an effective team player use research-based knowledge and research methods including design of experiments, analysis and interpretation of data |
| CO4-PO8 | H | Students will be able to associate with a team as an effective team player need to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| CO4-PO9 | H | Students will be able to associate with a team as an effective team player will function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. |
| CO4-PO10 | H | Students will be able to associate with a team as an effective team player communicate effectively on complex engineering activities with the engineering community |
| CO4-PO11 | H | Students will be able to associate with a team as an effective team player demonstrate knowledge and |

| | | |
|---|---|---|
| | | understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments |
| CO4-PO12 | H | Students will be able to associate with a team as an effective team player recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change |
| CO5-PO1 | H | Students will be able to report effectively the project related activities and findings by applying engineering specialization to the solution of complex engineering problems. |
| CO5-PO5 | M | Students will be able to report effectively the project related activities and findings by apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations. |
| CO5-PO8 | H | Students will be able to report effectively the project related activities and findings by apply ethical principles and commit to professional ethics and responsibilities |
| CO5-PO9 | M | Students will be able to report effectively the project related activities and findings which Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings |
| CO5-PO10 | H | Students will be able to report effectively the project related activities and findings to give and receive clear instructions |
| CO5-PO11 | M | Students will be able to report effectively the project related activities and findings to manage projects and in multidisciplinary environments |
| CO5-PO12 | 3 | Students will be able to report effectively the project related activities and findings to engage in independent and life-long learning in the broadest context of technological change |

## DELIVERY/INSTRUCTIONAL METHODOLOGIES:

| | | | |
|---|---|---|---|
| ✓ CHALK & TALK | ✓ STUD. ASSIGNMENT | ✓ WEB RESOURCES | |
| ✓ LCD/SMART BOARDS | ✓ STUD. SEMINARS | ☐ ADD-ON COURSES | |

## ASSESSMENT METHODOLOGIES-DIRECT

| | | | |
|---|---|---|---|
| ☐ASSIGNMENTS | ✓ STUD. SEMINARS | ☐TESTS/MODEL EXAMS | ☐ UNIV. EXAMINATION |
| ✓ STUD. LAB PRACTICES | ✓ STUD. VIVA | ☐ MINI/MAJOR PROJECTS | ☐CERTIFICATIONS |
| ☐ ADD-ON COURSES | ☐ OTHERS | | |

## ASSESSMENT METHODOLOGIES-INDIRECT

| | |
|---|---|
| ✓ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE) | ✓ STUDENT FEEDBACK ON FACULTY (TWICE) |
| ☐ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS | ☐ OTHERS |

**Prepared by** **Approved by**

**Mr. Ajith Jacob** **Dr. Neeba E A**

**Mini Project Coordinator** **HOD-IT**

## 100008/IT622T Mini Project Schedule (Sept 2023- Dec 2023)

| Sl No | Activity | Period | In- Charge |
|---|---|---|---|
| 1 | Group and problem statement identification | Week 1 | MiniProject Coordinators |
| 2 | Submission of Project Proposal Document | Week 2 | MiniProject Coordinators/Guide |
| 3 | Submission of Project Proposal Document | Week 3 | MiniProject |

| | | | |
|---|---|---|---|
| | (Zeroth Review) | | Coordinators/Guide |
| **4** | Weekly Review | Week 4 | MiniProject Coordinators/Guide |
| **5** | Design Report Presentation | Week 5 | MiniProject Coordinators/Guide |
| **6** | 1st Review | Week 6 | Review Committee |
| **7** | Weekly Review (Code Inspection) | Week 7 | MiniProject Coordinators/Guide |
| **8** | Weekly Review (Completion of Coding & Testing) | Week 8 | MiniProject Coordinators/Guide |
| **9** | Submission of Project Report (Draft) | Week 9 | Guide |
| **10** | 2nd Review | Week 10 | Review Committee |
| **11** | Final Report Submission | Week 11 | Guide/Project Coordinator |

**RAJAGIRI SCHOOL OF ENGINEERING AND TECHNOLOGY**
**S5 CU(2021 SCHEME) MINI PROJECTS GROUPS AND GUIDES**

| SL NO. | GROUP MEMBERS | GUIDE NAMES |
|---|---|---|
| 1 | AADARSH SURESH-U2109001 | DR. NEEBA E A |
| | DAVID VINOJ MATHEW-U2109023 | |
| | MEGHA RAJESH-U2109039 | |
| | NEDHA FATHIMA-U2109048 | |
| 2 | JOEHAN SEBY-U2109031 | FR. DR. JAISON PAUL MULERICKAL CMI |
| | ANN MARIYA JOY-U2109010 | |
| | MEHFIL FAIJU-U2109040 | |
| | NEVIN TOM-U2109050 | |
| 3 | THOMAS T ALEX-U2109067 | DR. RANJU S KARTHA |

| | | |
|---|---|---|
| | BENITTA PAUL-U2109017 | |
| | MERRIN JOHN-U2109041 | |
| | NIHAL S-U2109051 | |
| 4 | AMAL THOMAS-U2109008 | MR. MATHEWS ABRAHAM |
| | MOHAMED AHSAN-U2109045 | |
| | ROHAN JOHNSON-U2109058 | |
| | ROHIT MENON-U2109059 | |
| 5 | BHARATH S-U2109018 | MS. DIVYA JAMES |
| | ROYAL SEBI PARAPPURAM-U2109061 | |
| | STESHA SIBI PHILIP-U2109065 | |
| | JOEPAUL VILSAN-U2109033 | |
| 6 | CELINA ELIZABETH JACOB-U2109021 | MS. KUTTYAMMA A J |
| | ANN RINTO-U2109011 | |
| | BHAVESH SURESH KUMAR-U2109019 | |
| | VISHNU SOORAJ-U2109068 | |
| 7 | GAYATHRI S RAO-U2109027 | DR. NIKHILA T BHUVAN |
| | JUSTINA JOSEPH-U2109035 | |
| | ALWIN JOSEPH-U2109006 | |
| | ALLEN PRINCE-U2109005 | |
| 8 | HATHIK H-U2109028 | MR. AJITH JACOB |
| | NANDANA MOHIT-U2109047 | |
| | AMAL MANOJ-U2109007 | |
| | JOEL STANLY-U2109032 | |
| 9 | JESS GEORGE SAJI-U2109030 | MR. TINKU SOMAN JACOB |
| | S SIVA KARTHIK-U2109062 | |
| | AMEL CHANDRA-U2109009 | |
| | JOHAN RONY-U2109034 | |
| 10 | LAKSHMI-U2109036 | MS. VIJI MOHAN A |
| | SHANE GEORGE SALPHIE-U2109063 | |
| | ANU LAKSHMI-U2109012 | |
| | MATHEW ZACHARIAH-U2109038 | |
| 11 | LOUIS ANTONY VINCY-U2109037 | MS. TANIYA SHIRLEY STALIN |
| | TESSA SOJI CHERIAN-U2109066 | |
| | ANUSHA K A-U2109013 | |
| | MOHAMMED FADIL-U2109046 | |
| 12 | MINAL SARA VINOD-U2109043 | DR. VIDHYA PM |
| | AKSHAY.G-U2109004 | |
| | AORON SEBY-U2109014 | |
| | NEVIN JOYCE-U2109049 | |
| 13 | NIRUPAMA NAIR-U2109052 | MS. SHAREENA BASHEER |
| | AQUILINE ROSE FERNANDEZ-U2109015 | |
| | BASIL AHMED USMAN-U2109016 | |

**RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY**

**S5 CLGROUP MEMBERS AND TOPIC**

| SL NO. | GROUP MEMBERS | PROJECT TOPIC | |
|---|---|---|---|
| | PAUL DINS-U2109054 | | |
| 14 | NOEL MATHEN ELDHO-U2109053<br>BRIDE BENSON-U2109020<br>DEA ELIZABETH VARGHESE-U2109024<br>REHAN BENIL ALUNKAL-U2109062 | | MS. ANCY C A |
| 15 | RIA M<br>MILI<br>MISH<br>AJIL S | | |
| 16 | ROSH<br>ZAHR<br>CHIT | | |
| 17 | SHRU<br>DEVI<br>DURG | | |
| 18 | YOHA<br>JAYA<br>ABHAY SOORAJ-U2109002 | | |
| 1 | AADARSH SURESH-U2109001 | HOTEL MANAGEMENT SYSTEM | MS. JESHMOL P J |
| 2 | DAVID VINOJ MATHEW-U2109023<br>MEGHA RAJESH-U2109039<br>NEDHA FATHIMA-U2109048 | | |
| 3 | JOEHAN SEBY-U2109031<br>ANN MARIYA JOY-U2109010<br>MEHFIL FAIJU-U2109040<br>NEVIN TOM-U2109050 | AUTOMATED CUSTOMER SATISFACTION SURVEY SYSTEM<br>USING AI FACIAL EXPRESSION ALGORITHMS | MR. MATHEWS ABRAHAM |
| 4 | THOMAS T ALEX-U2109067<br>BENITTA PAUL-U2109017<br>MERRIN JOHN-U2109041<br>NIHAL S-U2109051 | RECRUITMENT BASED WEBSITE<br>CATERING TO PROVIDE TRADESMEN TO HIRE, DEPENDINGON THE<br>GEOGRAPHICAL LOCATION | MS. BENCY WILSON<br>MR. RANJITH SAMUEL |

| | | |
|---|---|---|
| 4 | AMAL THOMAS-U2109008 | PLACEMENT CELL |
| | MOHAMED AHSAN-U2109045 | |
| | ROHAN JOHNSON-U2109058 | |
| | ROHIT MENON-U2109059 | |
| 5 | BHARATH S-U2109018 | SMART STOCK PRO |
| | ROYAL SEBI PARAPPURAM-U2109061 | |
| | STESHA SIBI PHILIP-U2109065 | |
| | JOEPAUL VILSAN-U2109033 | |
| 6 | CELINA ELIZABETH JACOB-U2109021 | STOCKSAVVY |
| | ANN RINTO-U2109011 | |
| | BHAVESH SURESH KUMAR-U2109019 | |
| | VISHNU SOORAJ-U2109068 | |
| 7 | GAYATHRI S RAO-U2109027 | FOOD SERVICE MANAGEMENT SYSTEM |
| | JUSTINA JOSEPH-U2109035 | |
| | ALWIN JOSEPH-U2109006 | |
| | ALLEN PRINCE-U2109005 | |
| 8 | HATHIK H-U2109028 | BUY, SELL AND HOLD |
| | NANDANA MOHIT-U2109047 | |
| | AMAL MANOJ-U2109007 | |
| | JOEL STANLY-U2109032 | |
| 9 | JESS GEORGE SAJI-U2109030 | HEALTH HUB: YOUR HEALTHCARE COMPANION |
| | S SIVA KARTHIK-U2109062 | |
| | AMEL CHANDRA-U2109009 | |
| | JOHAN RONY-U2109034 | |
| 10 | LAKSHMI-U2109036 | EVENT MANAGEMENT SYSTEM |
| | SHANE GEORGE SALPHIE-U2109063 | |
| | ANU LAKSHMI-U2109012 | |
| | MATHEW ZACHARIAH-U2109038 | |
| 11 | LOUIS ANTONY VINCY-U2109037 | STUDENT RESOURCE SHARING SYSTEM |
| | TESSA SOJI CHERIAN-U2109066 | |
| | ANUSHA K A-U2109013 | |
| | MOHAMMED FADIL-U2109046 | |
| 12 | MINAL SARA VINOD-U2109043 | BIBLIO TECH: AN INNOVATIVE LIBRARY ECOSYSTEM |
| | AKSHAY.G-U2109004 | |
| | AORON SEBY-U2109014 | |
| | NEVIN JOYCE-U2109049 | |
| 13 | NIRUPAMA NAIR-U2109052 | RATION SHOP MANAGEMENT SYSTEM |
| | AQUILINE ROSE FERNANDEZ-U2109015 | |
| | BASIL AHMED USMAN-U2109016 | |
| | PAUL DINS-U2109054 | |
| 14 | NOEL MATHEN ELDHO-U2109053 | CAMPUS CATALYST- STUDENT LIFESTYLE MANAGEMENT SYSTEM |
| | BRIDE BENSON-U2109020 | |

| | | |
|---|---|---|
| | DEA ELIZABETH VARGHESE-U2109024 | |
| | REHAN RENJU ALUNKAL-U2109056 | |
| 15 | RIA MARY SUNIL-U2109057 | RAJAGIRI CANTEEN CONNECT |
| | MILIN SHOY-U2109042 | |
| | MISHEL MARY NETTO-U2109044 | |
| | AJIL SHAJI-U2109003 | |
| 16 | ROSHNI ALDRIN-U2109060 | AQUASYNC |
| | ZAHRAH MUHAMMED-U2109070 | |
| | CHITHRALEKSHMI R-U2109022 | |
| 17 | SHRUTI MARIA SHIBU-U2109064 | AI POWERED CV BULIDER |
| | DEVIKA S-U2109025 | |
| | DURGA RAMASESHAN-U2109026 | |
| 18 | YOHAN JOSE THUNDIL-U2109069 | DINESCAN: DIGITAL DINING MADE EASY |
| | JAYASANKAR C M-U2109029 | |
| | ABHAY SOORAJ-U2109002 | |