KANNUR UNIVERSITY

**(Abstract)**

New Generation Courses - Integrated M.Sc. in Computer Science with Specialization in Artificial Intelligence & Machine Learning Programme under the CBCSS, offered at NAS College, Kanhangad- Scheme of 1 to 10 Semesters, Syllabus of 1st and 2nd Semester with pattern of Question papers-- - Implemented w.e.f 2020 admission onwards- orders issued

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**ACADEMIC C SECTION**

Acad/C2/16586/NGCI/2021 (I) Dated: 30.07.2021

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Read:-1.GO (Ms) No. 389/2020/HEDN dated 05/11/2020

2. Minutes of the meeting of the Syndicate held on 17/11/2020 Vide Item No. 2020.550
3. U.O No. Acad/A3/389/NEW COURSE/2020-21 dated 23/12/2020
4. Minutes of the meeting of CSMC held on 20/11/2020
5. U.O No. Acad/C2/2408/2020 dated 27.11.2020
6. U.O No. Acad/C2/16586/NGCI/2021 dated 31.05.2021
7. Full Scheme and Syllabus of Core course (1st & 2nd semesters) , QP Pattern submitted by the convener CSMC on 24.06.2021
8. Order of the Vice-Chancellor dated 20.07.2021

**ORDER**

1. As per paper read (1) above, sanction was accorded by the Government to start New Generation UG/PG courses in 15 Govt/Aided Colleges under Kannur University, during the academic year 2020-21.
2. Subsequently, the meeting of the Syndicate as per paper read (2) resolved to start the newly sanctioned UG/PG Programmes in Govt/Aided Colleges under Kannur University, during the academic year 2020-21.
3. Accordingly, provisional affiliation was granted for conducting the Integrated M.Sc. Computer Science with Specialization in Artificial Intelligence & Machine Learning Programme [New Generation Course] at Nehru Arts & Science College, Kanhangad, in the academic year 2020-21, as per paper read (3).
4. Further, the Curriculum Syllabus Monitoring Committee, as per the paper read (4) was entrusted with preparing the draft regulations for the Integrated M.Sc. in Computer Science with Specialization in Artificial Intelligence & Machine Learning Programme. An Expert Committee was also constituted as per paper read (5), for preparing the draft Curriculum Syllabus of the New Generation Courses, by conducting two day Workshop.
5. Subsequently, Regulations for the Integrated M.Sc. Computer Science with Specialization in Artificial Intelligence & Machine Learning programme was implemented, as per paper read (6) above,
6. As per paper read (7) the Convener, Curriculum Syllabus Monitoring Committee submitted the Scheme of 1 to 10 Semesters, Syllabus of 1st and 2nd semester Core Courses and Pattern of Question paper of the Integrated M.Sc. in Computer Science with Specialization in Artificial Intelligence & Machine Learning

Programme, prepared by the Expert Committee.

7. The Vice Chancellor, after considering the matter in detail and in exercise of the power of Academic Council conferred under section 11(1) Chapter III of Kannur University Act 1996, accorded sanction to implement the Scheme of 1 to 10 semesters, Syllabus of the 1st and 2nd Semester Core courses and the Pattern of Question Papers of the Integrated M.Sc.Computer Science with Specialization in Artificial Intelligence & Machine Learning Programme (CBCSS), offered at Nehru Arts & Science College Kanhangad, with effect from 2020 admission, subject to reporting to the Academic Council.
8. The Scheme of 1 to 10 Semesters, Syllabus of 1st and 2nd Semester Core Courses and pattern of Question Papers for the Integrated M.Sc. Computer Science with Specialization in Artificial Intelligence & Machine Learning Programme (CBCSS) w.e.f 2020 admission are uploaded in the university website (www.kannuruniversity.ac.in).

Orders are issued accordingly.

sd/-
**BALACHANDRAN V K**
**DEPUTY REGISTRAR (ACAD)**
For REGISTRAR

To: The Principal
Nehru Arts & Science College
Kanhangad

Copy To: 1. The Examination Branch (through PA to CE)
2. PS to VC/PA to PVC/ PA to Registrar
3. DR/AR I Academic
4. The Computer Programmer (for uploading in website)
6. SF/DF/FC

KANNUR UNIVERSITY
CIVIL STATION P.O.
KANNUR
Pin-670 002
THAVAKKARA

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SECTION OFFICER

# KANNUR UNIVERSITY

**SYLLABUS AND PROGRAMME STRUCTURE**

FOR

# Integrated M.Sc. in Computer Science
## with Specialization in
## Artificial Intelligence and Machine Learning

# 2020

## About the Programme

An Integrated M.Sc. Programme in Computer Science with specialization in Artificial Intelligence and Machine Learning addresses the current and future market needs by producing graduates with a good background of Computer Science, Mathematics, Modelling and Statistical skills. The relevance of Artificial Intelligence and Machine Learning is becoming more and more evident day by day. Some of the areas where Artificial Intelligence and Machine Learning techniques can be applied include data science, personal assistants, surveillance systems, financial services, cyber security, video games, self driving cars, robotic manufacturing etc. Thus the area of application ranges from scientific research to social life, from medical field to economic theories, from sensitive robotic technology to games for entertainment. Along with traditional computer science courses, this programme focuses on courses in areas such as machine learning, deep learning, natural language processing, robotics and image processing. Through numerous workshops and discussion with experts and stakeholders in the area, this curriculum and syllabus clearly states the programme outcomes. Basic knowledge in mathematical and statistical tools and techniques is required to pursue various courses in this programme.

**Programme Specific Outcomes**

**PSO1:** Understand the concepts of Computer Science and Applications.

**PSO2:** Understand the concepts of System Software and Application Software.

**PSO3:** Understand the concepts of Algorithms and Programming.

**PSO4:** Understand the concepts of Computer Networks and Operating Systems

**PSO5:** Design, develop, implement and test software systems to meet the given specifications, following the principles of Software Engineering.

**PSO6:** Gain knowledge and experience in major areas of Artificial Intelligence and Machine Learning such as Prediction, Classification, Clustering, and Information Retrieval.

**PSO7:** Learn to analyze large and complex datasets and create systems that adapt and improve over time using machine learning techniques.

## PROGRAMME STRUCTURE

### SEMESTER-I

| Course Code | Course Title | Instructional Hrs/week | | | Marks | | | Credit |
|---|---|---|---|---|---|---|---|---|
| | | L | P | T | CA | ESE | Total | |
| | Common Course – English -1* | 5 | 0 | 0 | 10 | 40 | 50 | 4 |
| | Common Course – English -2* | 4 | 0 | 0 | 10 | 40 | 50 | 3 |
| | Common Course – Additional Language -1* | 5 | 0 | 0 | 10 | 40 | 50 | 4 |
| 1B01ICSC | Core Course -1 : Introduction to C Programming * | 1 | 2 | 0 | 10 | 40 | 50 | 2 |
| | Complementary - 1 (Mathematics) | 4 | 0 | 0 | 10 | 40 | 50 | 3 |
| | Complementary Elective -1 (Statistics) | 4 | 0 | 0 | 10 | 40 | 50 | 3 |
| | Total | 23 | 2 | 0 | 60 | 240 | 300 | 19 |

* Syllabus and question paper pattern are same as BSc Computer Science programme in affiliated colleges in Kannur University (Implemented with effect from 2019 admission)

### SEMESTER-II

| Course Code | Course Title | Instructional Hrs/week | | | Marks | | | Credit |
|---|---|---|---|---|---|---|---|---|
| | | L | P | T | CA | ESE | Total | |
| | Common Course – English - 3 * | 5 | 0 | 0 | 10 | 40 | 50 | 4 |
| | Common Course – English – 4 * | 4 | 0 | 0 | 10 | 40 | 50 | 3 |
| | Common Course – Additional Language – 2 * | 5 | 0 | 0 | 10 | 40 | 50 | 4 |
| 2B02ICSC | Core Course – 2 : Advanced C Programming * | 1 | 0 | 0 | 10 | 40 | 50 | 2 |
| 2B03ICSC | Core Course – 3 : Lab 1 - C Programming * | | 2 | 0 | 5 | 20 | 25 | 2 |
| | Complementary - 2 (Mathematics) | 4 | 0 | 0 | 10 | 40 | 50 | 3 |
| | Complementary Elective - 2 (Statistics) | 4 | | 0 | 10 | 40 | 50 | 3 |
| | Total | 23 | 2 | 0 | 65 | 260 | 325 | 21 |

* Syllabus and question paper pattern are same as BSc Computer Science programme in affiliated colleges in Kannur University (Implemented with effect from 2019 admission)

**SEMESTER-III**

| Course Code | Course Title | Instructional Hrs/week | | | Marks | | | Credit |
|---|---|---|---|---|---|---|---|---|
| | | L | P | T | CA | ESE | Total | |
| 3B04ICSC | Core Course – 4 : Python for Machine Learning | 3 | 0 | 0 | 10 | 40 | 50 | 3 |
| 3B05ICSC | Core Course - 5 : Operating System | 3 | 0 | 0 | 10 | 40 | 50 | 3 |
| 3B06ICSC | Core Course – 6 : Data Structures | 4 | 0 | 0 | 10 | 40 | 50 | 3 |
| 3B07ICSC | Core Course – 7 : Lab-2 : Python for Machine Learning | 0 | 3 | 0 | 5 | 20 | 25 | 2 |
| 3B08ICSC | Core Course – 8 : Lab-3 : Data Structures using C | 0 | 2 | 0 | 5 | 20 | 25 | 2 |
| | Complementary - 3 (Mathematics) | 5 | 0 | 0 | 10 | 40 | 50 | 3 |
| | Complementary Elective - 3 (Statistics) | 5 | 0 | 0 | 10 | 40 | 50 | 3 |
| | Total | 20 | 5 | 0 | 60 | 240 | 300 | 19 |

**SEMESTER-IV**

| Course Code | Course Title | Instructional Hrs/week | | | Marks | | | Credit |
|---|---|---|---|---|---|---|---|---|
| | | L | P | T | CA | ESE | Total | |
| 4B09ICSC | Core Course - 9 : Computer Organization | 3 | 0 | 0 | 10 | 40 | 50 | 3 |
| 4B10ICSC | Core Course - 10 : Database Management System | 3 | 0 | 0 | 10 | 40 | 50 | 3 |
| 4B11ICSC | Core Course – 11 : Object Oriented Programming using Java | 4 | 0 | 0 | 10 | 40 | 50 | 3 |
| 4B12ICSC | Core Course – 12 : Lab-4 : Object Oriented Programming using java | 0 | 3 | 0 | 5 | 20 | 25 | 2 |
| 4B13ICSC | Core Course – 13: Lab-5: Database Management System | 0 | 2 | 0 | 5 | 20 | 25 | 2 |
| | Complementary - 4 (Mathematics) | 5 | 0 | 0 | 10 | 40 | 50 | 3 |
| | Complementary Elective - 4 (Statistics) | 5 | | 0 | 10 | 40 | 50 | 3 |
| | Total | 20 | 5 | 1 | 60 | 240 | 300 | 19 |

**SEMESTER-V**

| Course Code | Course Title | Instructional Hrs/week | | | Marks | | | Credit |
|---|---|---|---|---|---|---|---|---|
| | | L | P | T | CA | ESE | Total | |
| 5B14ICSC | Core Course - 14 : Introduction to Artificial Intelligence | 4 | 0 | 0 | 10 | 40 | 50 | 3 |
| 5B15ICSC | Core Course - 15 : Software Engineering | 4 | 0 | 0 | 10 | 40 | 50 | 3 |
| 5B16ICSC | Core Course – 16 : UNIX Shell Programming | 3 | 0 | 0 | 10 | 40 | 50 | 3 |
| 5B17ICSC | Core Course – 17 : Introduction to Machine Learning | 4 | 0 | 0 | 10 | 40 | 50 | 4 |
| | General Elective Course | 2 | 0 | 0 | 5 | 20 | 25 | 2 |
| 5B18ICSC | Core Course – 18 : Lab-6 : UNIX Shell Programming | 0 | 4 | 0 | 5 | 20 | 25 | 2 |
| 5B19ICSC | Core Course – 19: Lab-7: Machine Learning | 0 | 4 | 0 | 5 | 20 | 25 | 3 |
| | Total | 17 | 8 | 0 | 55 | 220 | 275 | 20 |

**SEMESTER-VI**

| Course Code | Course Title | Instructional Hrs/week | | | Marks | | | Credit |
|---|---|---|---|---|---|---|---|---|
| | | L | P | T | CA | ESE | Total | |
| 6B20ICSC | Core Course - 20 : Web Technology | 4 | 0 | 0 | 10 | 40 | 50 | 3 |
| 6B21ICSC | Core Course - 21 : Introduction to Deep Learning | 4 | 0 | 0 | 10 | 40 | 50 | 3 |
| 6B22ICSC | Core Course – 22 : Computer Networks | 3 | 0 | 0 | 10 | 40 | 50 | 3 |
| 6B23ICSC | Core Course – 23 : Design and Analysis of Algorithms | 3 | 0 | 0 | 10 | 40 | 50 | 3 |
| 6B24ICSC | Core Course – 24: Lab-8 : Web Technology | 0 | 3 | 0 | 5 | 20 | 25 | 3 |
| 6B25ICSC | Core Course – 25 : Project | | 8 | 0 | 20 | 80 | 100 | 7 |
| | Total | 14 | 11 | 0 | 65 | 260 | 325 | 22 |

**SEMESTER –VII**

| Course Code | Course Title | Instructional Hrs/week | | | Marks | | | Credit |
|---|---|---|---|---|---|---|---|---|
| | | L | P | T | CA | ESA | Total | |
| 7B26ICSC | Mathematical Models of Machine Learning - 1 | 3 | 0 | 0 | 20 | 80 | 100 | 3 |
| 7B27ICSC | Theory of Computation | 3 | 0 | 0 | 20 | 80 | 100 | 3 |
| 7B28ICSC | Soft Computing Techniques | 3 | 0 | 0 | 20 | 80 | 100 | 3 |
| 7B29ICSC | Digital Image Processing | 4 | 0 | 0 | 20 | 80 | 100 | 4 |
| 7B30ICSC | Seminar* | 0 | 0 | 2 | 50 | 0 | 50 | 1 |
| 7B31ICSC | Lab- 9 : Digital Image Processing | | 6 | 0 | 20 | 80 | 100 | 4 |
| 7B32ICSC | Lab –10 : Soft Computing Techniques | 0 | 6 | 0 | 20 | 80 | 100 | 4 |
| | Total | 13 | 12 | 2 | 170 | 480 | 650 | 22 |

* Seminar topic related to AI and ML

**SEMESTER -VIII**

| Course Code | Course Title | Instructional Hrs/week | | | Marks | | | Credit |
|---|---|---|---|---|---|---|---|---|
| | | L | P | T | CA | ESA | Total | |
| 8B33ICSC | Mathematical Models of Machine Learning - 2 | 3 | 0 | 0 | 20 | 80 | 100 | 3 |
| 8B34ICSC | Advanced Artificial Intelligence | 3 | 0 | 0 | 20 | 80 | 100 | 3 |
| 8B35ICSC | Advanced Machine Learning Techniques | 3 | 0 | 0 | 20 | 80 | 100 | 3 |
| 8B36ICSC | Data Mining | 3 | 0 | 0 | 20 | 80 | 100 | 3 |
| 8B37ICSC | Research Methodology | 1 | 0 | 2 | 50 | 0 | 50 | 1 |
| 8B38ICSC | Lab -11 : Case Study | 0 | 6 | 0 | 20 | 80 | 100 | 4 |
| 8B39ICSC | Lab -12 : Advanced Machine Learning | 0 | 6 | 0 | 20 | 80 | 100 | 4 |
| | Total | 13 | 12 | 2 | 170 | 480 | 650 | 21 |

* Case Study - Data Mining

**SEMESTER -IX**

| Course Code | Course Title | Instructional Hrs/week | | | Marks | | | Credit |
|---|---|---|---|---|---|---|---|---|
| | | L | P | T | CA | ESA | Total | |
| 9B40ICSC | Optimization Techniques | 3 | 0 | 0 | 20 | 80 | 100 | 3 |
| 9B41ICSC | Deep Learning | 4 | 0 | 0 | 20 | 80 | 100 | 4 |
| 9B42ICSC | Information Security and Blockchain Technology | 3 | 0 | 0 | 20 | 80 | 100 | 3 |
| 9B43ICSC | Natural Language Processing | 3 | 0 | 0 | 20 | 80 | 100 | 3 |
| 9B44ICSC | Lab-13 : Natural Language Processing | 0 | 6 | 0 | 20 | 80 | 100 | 4 |
| 9B45ICSC | Lab-14 : Mini Project | 0 | 6 | 2 | 20 | 80 | 100 | 4 |
| | Total | 13 | 12 | 2 | 120 | 480 | 600 | 21 |

* Mini Project : Implementation of journal paper published by IEEE/Springer/Elsevier etc. with more than one Impact factor (Scopus indexed) in the area of AI/ML

**SEMESTER- X**

| Course Code | Course Title | Instructional Hrs/week | | | Marks | | | Credit |
|---|---|---|---|---|---|---|---|---|
| | | L | P | T | CA | ESA | Total | |
| 10B46ICSC | Elective - 1* | 3 | 0 | 2 | 50 | 0 | 50 | 3 |
| 10B47ICSC | Elective - 2* | 3 | 0 | 2 | 50 | 0 | 50 | 3 |
| 10B48ICSC | Project # | | 16 | 5 | 20 | 80 | 100 | 8 |
| 10B49ICSC | General Viva Voce | - | - | - | 0 | 100 | 100 | 2 |
| | Total | 9 | 16 | 9 | 120 | 180 | 300 | 16 |

# Project based on Artificial Intelligence/Machine Learning / Deep Learning.

* Elective-1 and Elective-2 courses will be proposed at the beginning of the IX semester due to the dynamic nature of the field. Above electives should be forwarded to the university and get prior approval from Board of Studies before the commencement of X semester. Electives may be changed every 2 years depending on the industrial needs. Electives courses may be offered on online or regular mode.

## SYLLABUS

### 1B01ICSC: INTRODUCTION TO C PROGRAMMING

***COURSE OUTCOME***

CO1: Aware about basics of programming.
CO2: Capable to analyze the problem and design algorithm and flowchart.
CO3: Familiar the basics of high-level language – C.
CO4: Able to develop efficient and error free programs in C.

**Unit I:**

Computer Programming and Languages: Introduction, Developing a Program, Program Development Cycle, Algorithm, Flowchart: Flowchart Symbols, Guidelines for Preparing Flowcharts, Benefits of Flowcharts, Limitations of Flowcharts, Examples of Algorithm and Flowchart. [Text Book 1]

**(5 Hrs)**

**Unit II:**

Overview of C: History of C, Importance of C, Basic Structure of C Programming Style, Executing a C program, Source Code, Object Code, Executable File, File Extensions, Character Set, C Tokens - Keywords, Identifiers, Constants, Variables, Data Types, Declaration of Variables, Assigning Values to Variables, Reading Data from Keyboard, Operators and Expressions: Arithmetic Operator, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operator, Bitwise Operator, Special Operators,. Arithmetic Expressions, Precedence of Arithmetic Operators, Type Conversion in Expressions.

**(5 Hrs)**

**Unit III:**

Managing Input Output Operation: Reading a Character, Writing a Character, Formatted Input, Formatted Output. Decision Making and Branching: Decision Making with if Statement - Simple if, if - else, Nested if - else, else if Ladder, switch Statement, go to Statement, Decision Making and Looping: while, do-while, for Statement, Jumps in Loops - break and continue Statements.

**(4 Hrs)**

**Unit IV:**

Arrays: Introduction, One Dimensional Arrays - Declaration of Arrays, Initialization of Arrays; Two-Dimensional Arrays - Initializing Two-Dimensional Arrays, Multi-Dimensional Array, Handling of Character Strings: Introduction, Declaring and Initializing String

Variables, Reading a Line of Text, Writing Strings to Screen, Arithmetic Operations on Characters, String Handling functions: strlen, strcpy, strcmp, strcat, strrev.

**(4 Hrs)**

**Books for Study:**

**1.** Introduction to information technology ITL Education solutions Limited, second Edition

**2.** Programming in ANSI C Second Edition – E Balagurusamy – Tata McGraw-Hill Publishing company Limited

**Books for Reference:**

**1.** Let us C, YeshavantKanetkar, 16thEdn, BPB

**2.** Programming in C, Ashok N Kamthane, Pearson Education

**3.** Computer Basics and c Programming, V. Rajaraman, PHI, 2008 6

**4.** Fundamentals of information technology, Dr. S.B Kishor, A.S Khandelwal, 2nd Ed, Published by DAS GANU Prakashan.

**Online References:**

1. http://www.yspuniversity.ac.in/cic/algorithm-manual.pdf
2. https://www.it.iitb.ac.in/~vijaya/ssrvm/dokuwiki/media/s6_l7_20jan.pdf

**Marks Including Choice:**

| Unit | Marks |
|---|---|
| I | 14 |
| II | 14 |
| III | 16 |
| IV | 16 |

## 2B02ICSC: ADVANCED C PROGRAMMING

*COURSE OUTCOME*

**CO1:** Familiar with advanced concepts of C program.
**CO2:** Capable to work with user defined as well as library functions.
**CO3:** Skilled to solve more complex problems.
**CO4:** Able to develop C programs using structure, union, pointers and files.

**Unit I:**

User Defined Functions: Need for User-defined Functions, The Form of C Functions – Function Name, Argument List, Return value and Their Types, Calling a Function, Category of Functions – No Argument and No Return Values, Argument but no Return Values, Arguments with Return Values, Handling of Non-integer Functions, Functions Returning Nothing, Nesting of Functions, Recursion, The Scope and Life-time of Variables in a Function, Automatic Variables, External Variables, Static Variables, Register Variables.

**(5 Hrs)**

**Unit II:**

Pointers: Introduction; understanding pointers; Accessing the address of a variable; Declaration and initialization of a pointer; Accessing a variable through its pointer; Pointer expressions; Pointer increments and scale factor; Pointers and Arrays; Pointers and Functions – pointers as function arguments, pointers to functions; pointers and structures.

**(4 Hrs)**

**Unit III:**

Structures and Unions: Structure Definition; Giving values to members; Structure initialization; Comparison of structure variables; Arrays of Structures; Arrays within Structures; Structures within Structures; Unions; Dynamic Memory Allocation: Memory allocation process; Allocating a block of memory; Allocating multiple blocks of memory; Releasing the used space, Altering the size of a block.

**(4 Hrs)**

**Unit IV:**

File Management in C: Introduction; Defining and Opening a File; Closing a file; Input/ output operations on files – the getc and putc functions; getw and putw functions; fprintf and fscanf functions; Error handling during I/O operations; Random Access to Files; Command

line arguments; The preprocessor: Macro substitution-simple macro substitution; Macros with arguments; Nesting of macros; Undefining a macro; File inclusion.

**(5 Hrs)**

**Books for Study:**

**1.** Programming in ANSI C Second Edition – E Balagurusamy – Tata McGraw-Hill Publishing company Limited

**Books for Reference:**

1. Let us C, YeshavantKanetkar, 3rd Edn, BPB
2. Programming in C, Ashok N Kamthane, Pearson Education
3. Programming using C, Dr. S.B Kishor, 2nd Ed, DAS GANU Prakashan.

**Marks including choice:**

| Unit | Marks |
|---|---|
| I | 17 |
| II | 13 |
| III | 13 |
| IV | 17 |

## 2B03ICSC : LAB 1 - C PROGRAMMING

### Part A

**Conditional operator**

1. Write a program to print largest among three numbers

**sizeof operator**

2. Write a program to print the size of built in data types.

**else if**

3. Write a program to check whether the given number is odd or even

4. Write a program to find the roots of a quadratic equation

**else if ladder**

5. Write a program to print grade of students

6. Write a program to count number of vowels, consonants and spaces in a line of text.

**switch**

7. Write a program to accept two numbers and perform various arithmetic operations (+, -, *, /) based on the symbol entered.

**while**

8. Write a program to check whether the given number is Armstrong number or not.

9. Write a program to print Fibonacci series up to a given number.

**do-while**

10. Write a program to print multiplication table for the given number

**for**

11. Write a program to print prime numbers within range.

12. Write a program to convert decimal number to its binary equivalent.

### Part B

**Array**

13. Write a program to perform Matrix multiplication

**String**

14. Write a program to check whether the given string is palindrome or not

15. Write a program to implement 5 string handling functions

**Function**

16. Write a program to print transpose of a given matrix

**Recursive function**

17. Write a program to find the factorial of a given number.

18. Write a program to print sum of n natural numbers

**Pointers**

19. Write a program to swap two numbers using pointers

**Pointers and function**

20. Write a program to access the elements of an array using function pointer

**Structure**

21. Write a program to add two complex numbers using structure

22. Write a program to calculate and display the Gross_salary and Net_salary of employees working in a retail medical shop if their Basic, DA, TA, other allowances and deductions are given.

**File**

23. Write a program to read a line of text from the keyboard and write it to a file.

**Macros**

24. Write a program to print volume of a triangle using the concept macros with argument.

## PATTERN OF QUESTION PAPER FOR END SEMESTER EVALUATION

| | | |
|---|---|---|
| **Part A** | **Short Answer** | **6 Questions x 1 Mark = 6 Marks** |
| | Answer all questions | 6 Questions x 1 Mark = 6 Marks |
| **Part B** | **Short Essay** | **8 Questions x 2 Marks = 16 Marks** |
| | Answer any 6 questions | 6 Questions x 2 Marks = 12 Marks |
| **Part C** | **Essay** | **6 Questions x 3 Marks = 18 Marks** |
| | Answer any 4 questions | 4 Questions x 3 Marks = 12 Marks |
| **Part D** | **Long Essay** | **4 Questions x 5 Marks = 20 Marks** |
| | Answer any 2 questions | 2 Questions x 5 Marks = 10 Marks |
| **Total Marks Including Choice: 60** | | |
| **Maximum Marks for the Course: 40** | | |

## CONTINUOUS EVALUATION FOR PRACTICAL

| COMPONENT | WEIGHTAGE | REMARKS |
|---|---|---|
| COMPONENT 1: LAB SKILLS, OBSERVATION NOTE AND PUNCTUALITY | 20% FOR LAB SKILL<br>20% FOR OBSERVATION NOTE AND PUNCTUALITY | OBSERVATION NOTE IS MANDATORY. MARKS SHOULD BE GIVEN CONSIDERING OBSERVATION NOTE LAB SKILLS AND PUNCTUALITY. |
| COMPONENT1: TEST | 60% | MODEL EXAMINATION SHOULD BE CONDUCTED BEFORE EXTERNAL EXAM AND CONSIDERED FOR INTERNAL MARK |

## DISTRIBUTION OF MARKS FOR END SEMESTER EVALUATION

| COMPONENT | PART A | PART B |
|---|---|---|
| Code Writing | 3 | 3 |
| Output | 3 | 3 |
| Modification for Part A or Part B | 2 | |
| Algorithm/Flowchart for part A or Part B | 2 | |
| Record | 1 | |
| Viva | 3 | |
| **Total Marks** | **20** | |

**KANNUR UNIVERSITY**

**(Abstract)**

New Generation course- Integrated M.Sc. in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme under CBCSS, offered at NAS College Kanhangad- Syllabus of 3rd Semester Core Courses with Model Question Papers- Implemented w.e.f 2020 admission onwards- Orders issued.

**ACADEMIC C SECTION**

Acad/C2/16586/NGCI/2021 (I) Dated: 11.08.2021

Read:-1. U.O Acad/C2/16586/NGCI/2021(I) dated 30.07.2021

2. Syllabus of 3rd Semester Core Course & Model Question Papers submitted by the Convener CSMC on 31.07.2021

**ORDER**

1.. As per paper read (1) above, the syllabus of 1st and 2nd Semester Core Course and Pattern of Question Papers of New Generation Course Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme (CBCSS) w.e.f 2020 admission, offered at Nehru Arts & Science College Kanhangad, was implemented.
2. As per paper read (2) above, the Convener, Curriculum Syllabus Monitoring Committee submitted the syllabus of 3rd Semester Core Course & Model Question Papers of Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme prepared by the Expert Committee.
3. The Vice-Chancellor, after considering matter in detail and in exercise of the power of Academic Council conferred under section 11(1) Chapter III of the Kannur University Act 1996, accorded sanction to implement the syllabus of 3rd Semester Core Course & Model Question Paper of Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme (CBCSS)w.e.f 2020 admission, offered at Nehru Arts & Science College Kanhangad, subject to reporting to the Academic Council.
4. The 3rd Semester Syllabus of Core Course & Model Question Papers for the Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme (CBCSS), w.e.f 2020 admission are uploaded in the university website (www.kannuruniversity.ac.in).
5. Orders are issued accordingly.

sd/-

**BALACHANDRAN V K**

**DEPUTY REGISTRAR (ACAD)**

For REGISTRAR

To: The Principal
Nehru Arts & Science College

Copy To: 1.The Examination Branch (PA to CE)
2. PS to VC/PA to PVC/PA to Registrar
3. DR/ARi Academic
4.The Computer Programmer (for uploading in website)
5. SF/DF/FC

KANNUR UNIVERSITY CIVIL STATION P.O. KANNUR Pin-670 002 THAVAKKARA

Forwarded / By Order

SECTION OFFICER

## 3B04ICSC: PYTHON FOR MACHINE LEARNING

| Semester | Course Code | Hours per Week | Exam Hours |
|---|---|---|---|
| 3 | 3B04ICSC | 3 | 3 |

### Course Outcome

**CO1:** Understanding the basic building blocks of Python programs and develop programs by utilizingthe Lists, Tuples, Sets and Dictionaries in Python.

**CO2:** Develop programs using functions and modules

**CO3:** Understand the usage of file handling and exception handling in python

**CO4:** Write programs in Python to process data stored in files by utilizing the modules NumPy and Pandas

### Unit I

Features of Python, Different methods to run Python, Basic elements (Objects, Expressions, Numerical Types, Strings, Variables), Comments, Indentation in Python, Input and Output in Python, import function, Operators in Python, Tuples, Lists, Sets, Dictionaries, Built-in methods of lists, sets and dictionaries, Mutable and Immutable Objects.

(16 Hours)

### Unit II

Control flow statements - Branching (if, else, elif), Iteration (while, for), range and enumerate functions, break and continue statements. Functions -functions definition, function calling, function arguments (Required, Keyword, Default), Lambda functions, Recursion.

(12 Hours)

### Unit III

File Handling (Opening, Closing, Writing, Reading), Exceptions: Exception Handling, Built-in Exceptions (IndexError, OverflowError, ZeroDivisionError, RuntimeError), Modules - Built-in Modules (os, sys).

(10 Hours)

### Unit IV

NumPy - ndarray, Creating Arrays (array, zeros, ones, empty, linspace, arange, random), 2D Array, Indexing, Slicing, Iterating, Copying, Splitting, Shape Manipulation (reshape, transpose, resize), Arithmetic Operations on Arrays, Broadcasting. Pandas - Series, dataframe, Index objects, Essential basic functionality - head and tail, indexing, selection and filtering, arithmetic and data alignment, sorting and ranking, descriptive statistics, reading and writing csv files using pandas, plotting basics.

(16 Hours)

**Reference:**


[1] The Python Tutorial (https://docs.python.org/3/tutorial/index.html)

[2] NumPy quickstart (https://www.numpy.org/devdocs/user/quickstart.html)

[3] Pandas User Guide (https://pandas.pydata.org/pandas-docs/stable/user_guide/index.html)

[4] Mark Pilgrim., *Dive Into Python3*, Apress (Freely available at https://diveintopython3.net/)

[5] Wes McKinney (2017), *Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython*, O'Reilly Media.

[6] John V. Guttag (2016), *Introduction to Computation and Programming Using Python with Application to Understanding Data*, PHI.


**Marks Including Choice:**

| Unit | Marks |
|---|---|
| I | 16 |
| II | 16 |
| III | 12 |
| IV | 16 |

## 3B05ICSC: OPERATING SYSTEM

| Semester | Course Code | Hours per Week | Exam Hours |
|---|---|---|---|
| 3 | 3B05ICSC | 3 | 3 |

### Course Outcome

**CO1:** Explain the types, structure, functions and major concepts of Operating Systems.

**CO2:** Understand the concepts of process and process synchronization.

**CO3:** Understand the concepts of CPU scheduling and deadlocks

**CO4:** Understand memory management and file system concepts

### Unit I

Introduction: Types of OS - Mainframe, server, multiprocessor, Personal computer, handheld, embedded, sensor-node, real-time, smart card. Operating System Concepts, System Calls - process management, file management, directory management, Miscellaneous System Calls. Operating System Structure. System boot process. Open-Source Operating Systems.

(12 Hours)

### Unit II

Processes: Process concept, Process scheduling, Operations on processes, Inter-process communication. Overview of threads.

Process Synchronization: Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic problems of Synchronization.

*Simple programs using fork(), semaphores and other IPC mechanisms should be discussed in class*

(14 Hours)

### Unit III

CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms - First come First Served, Shortest Job First, Priority scheduling, Round robin scheduling, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling. Overview of Linux scheduling.

Deadlocks: System Model, Necessary conditions, Resource allocation graphs, Deadlock prevention, Deadlock avoidance - Banker's algorithms, Deadlock detection, Recovery from deadlock.

(14 Hours)

### Unit IV

Memory Management: Concept of address spaces, Swapping, Contiguous memory allocation, Segmentation, Paging. Virtual memory, Demand paging, Page replacement algorithms.

File System: File concept, Access methods, Tree-structured directories, File system mounting, Protection.

File System Implementation: File System structure, implementation.

(14 Hours)

**Text Book:**


[1] Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2013). *Operating System Concepts, 9th edition*, John Wiley & Sons.

[2] Andrew S. Tanenbaum, Herbert Bos (2016). *Modern Operating Systems, 4th edition*, Pearson Education India

[3] William Stallings (2018), *Operating systems - Internals and Design Principles, 9th Edition*, Pearson Education, PHI.


**Reference:**


[1] Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau (2018), Operating Systems: Three Easy Pieces, Arpaci-Dusseau Books. Available Online: https://pages.cs.wisc.edu/~remzi/OSTEP/

[2] Garry Nutt, NabenduChaki, SarmisthaNeogy, Operating Systems, 3rd Edition, Pearson Education.

[3] D. M. Dhamdhere (2011), Operating Systems, 2nd Edition, Tata McGraw Hill.


**Marks Including Choice:**

| Unit | Marks |
|---|---|
| I | 12 |
| II | 16 |
| III | 16 |
| IV | 16 |

## 3B06ICSC: DATA STRUCTURES

| Semester | Course Code | Hours per Week | Exam Hours |
|---|---|---|---|
| 3 | 3B06ICSC | 4 | 3 |

### Course Outcome

**CO1:** To understand how integer and floating point data is represented inside a computer.

**CO2:** To understand linear data structures such as stacks, queues and their applications.

**CO3:** To understand non-linear data structures such as trees, graphs and their applications.

**CO4:** To familiarize with various sorting, searching and hashing techniques.

### Unit I

**Information Storage** - Hexadecimal notation, Data Sizes, Addressing and Byte Ordering, Representing strings, Introduction to Boolean Algebra, Integer representations - integral data types, Unsigned encoding, 2's complement encoding, Floating point - Fractional Binary Numbers, IEEE Floating-Point Representation.

(16 Hours)

### Unit II

**Basic data structures** – Arrays, **Linked lists** - singly linked list, doubly linked list, Circular linked list, operations on linked list, linked list with header nodes, applications of linked list - polynomials. **Stacks** - Representation of stacks using arrays and linked lists, Operations on stacks, Applications of stacks - Evaluation of arithmetic expressions. **Queues** - Representation of queues using arrays and linked lists, Circular Queue, Priority Queue.

(18 Hours)

### Unit III

**Trees**- Binary Trees – level and height of the tree, complete-binary tree, representation using array, tree traversals (Recursive only), applications. Binary search tree – creation, insertion and deletion and search operations, applications. **Heaps**- Min-max heaps, **Graphs** – representation of graphs, BFS and DFS, applications. Minimum Spanning Trees – Prim's and Kruskal's algorithms. Shortest path algorithms – Dijkstra's and Warshall's algorithms. (20 Hours)

### Unit IV

Sorting techniques – Bubble sort, Selection Sort, Insertion sort, Merge sort, Quick sort, Searching algorithms - Linear searching with arrays and linked lists, binary search, Hash Tables – Hashing functions – Mid square, division, folding, digit analysis, collision resolution and Overflow handling techniques.

(18 Hours)

**Text Book:**


[1] Randal E. Bryant, Davie Richard O'Hallaron (2016), *Computer Systems: A Programmer's Perspective, 3/E*, Pearson.

[2] Samanta D. (2009), *Classic Data Structures, 2/E*, Prentice Hall India.


**Reference:**


[1] Algorithms, Part I MOOC Course (https://www.coursera.org/learn/algorithms-part1)

[2] Aho A. V., Hopcroft J. E. and Ullman J. D. (1983), Data Structures and Algorithms, Pearson Publication.

[3] Gilberg, R., &Forouzan, B. (2004). Data Structures: A Pseudocode Approach with C. Cengage Learning.

[4] Sedgewick, R. (2002). Algorithms In C: Fundamentals, Data Structures, Sorting, Searching, Parts 1-4, 3/E. Pearson Education.

[5] Langsam, Y., Augenstein, M., Tenenbaum, A. M. (2019). Data Structures Using C. 1/E. Pearson Education.


**Marks Including Choice:**

| Unit | Marks |
|---|---|
| I | 12 |
| II | 16 |
| III | 16 |
| IV | 16 |

## 3B07ICSC: LAB 3: PYTHON FOR MACHINE LEARNING

| Semester | Course Code | Hours per Week | Exam Hours |
|---|---|---|---|
| 3 | 3B07ICSC | 3 | 3 |

### Course Outcome

**CO1:** To implement programs to familiarize the usage of data structures in python.

**CO2:** Develop programs using functions and modules

**CO3:** Understand the usage of file handling and exception handling in python

**CO4:** Write programs in Python to process data stored in files by utilizing the modules NumPy and Pandas

### List of Programs

1. Write a python program to find the square root of a number using Newton Raphson and bisection search methods.
2. Write a python program to check whether a string is palindrome or not using recursion.
3. Write a program to create a dictionary in which keys are the words in a given input sentence and values are the frequency of each word. (Use loop)
4. Write a program to find the frequency of each word in a text file.
5. Write a python program using lambda function to separate the odd numbers and even numbers in a given list.
6. Write a Python program to iterate over a root level path and print all its sub-directories and files, also loop over specified *dirs* and *files*.
7. Write a python program using NumPy to compute the multiplication of two given matrices
8. Write a python program using NumPy to compute the determinant, eigenvalues and right eigenvectors of a given square matrix.
9. Given an input csv file with 4 attributes of a student (id, name, programme, marks), write a program using pandas to get the details of students (name, programme, marks) with marks between 60 and 80.
10. Given an input csv file with details of each over of a 1-day cricket match with 50 overs (over, bowler name, runs scored, wickets fallen), write a program using pandas to create a bar plot showing the score in each over.

## 3B08ICSC: LAB 4: DATA STRUCTURES USING C

| Semester | Course Code | Hours per Week | Exam Hours |
|---|---|---|---|
| 3 | 3B08ICSC | 2 | 3 |

### Course Outcome

**CO1:** To implement basic linear and non-linear data structures and their major operations.

**CO2:** To implement applications which uses these data structures.

**CO3:** To implement algorithms for various sorting, searching and hashing techniques.

### List of Programs

1. Write a program to implement stack operations
2. Write a program to evaluate postfix expression using stack
3. Write a program to implement Queue Operations
4. Write a program to implement Circular Queue Operations
5. Write a program to implement various linked list operations.
6. Write a program to represent polynomials using linked list and add polynomials.
7. Write a program to implement binary search trees – creation, insertion, deletion, search
8. Write a program to implement linear search algorithm and print number of comparisons
9. Write a program to implement binary search algorithm and print number of comparisons
10. Write a program to implement Insertion sort algorithm and print number of comparisons
11. Write a program to implement Bubble sort algorithm and print number of comparisons
12. Write a program to implement Quick sort algorithm and print number of comparisons
13. Write a program to implement Merge sort algorithm and print number of comparisons
14. Write a program to implement of hash tables using various mapping functions, various collision and overflow resolving schemes.
15. Write a program to implement BFS and DFS.

# Model Question Papers

## Model Question Paper

## 3B04ICSC: PYTHON FOR MACHINE LEARNING

**Time: 3 Hours** **Max. Marks: 40**

### Part A: Short Answer

**Answer All Questions** **(6 × 1 = 6 Marks)**

1. How comments are included in python?
2. What is the use of range function in python?
3. What is the use of ones function NumPy?
4. Mention any one function defined in sys module and specify its use.
5. What is Overflow error?
6. Write the syntax for opening a file in read mode in python.

### Part B: Short Essay

**Answer any 6 Questions** **(6 ×2 = 12 Marks)**

7. Explain how input can be accepted in python. Explain how formatted output can be achieved in python.
8. Write about 4 built-in methods for lists in python.
9. Write a program to check whether a year is leap year or not.
10. Write a Python code to create a function called count_words that takes a string as input and prints the number of occurrences of each word.
11. Explain about broadcasting in NumPy.
12. Explain plotting methods in pandas.
13. Explain about any 4 functions in os module.
14. Explain different functions used to handle files in python.

### Part C: Essay

**Answer any 4 Questions** **(4× 3 = 12 Marks)**

15. What is meant by mutable and immutable objects in python?
16. Explain about exception handling in python.
17. What are lambda functions? Write a program using lambda function to select numbers greater than 5 from a list.

18. Write a Python code to determine whether the given string is a Palindrome or not using slicing. Do not use any string function.
19. Explain about reshape, transpose and resize function in python.
20. Explain about arithmetic and data alignment operations in pandas.

## Part D: Long Essay

**Answer any 2 Questions** **(2×5 = 10 Marks)**

21. Explain in detail about lists and dictionaries in python.
22. Explain about exception handling in python.
23. Explain abut series and data frame in pandas. Explain how pandas can be used to read and write csv files with the help of an example.
24. Explain how functions can be created in python? Write a Python program using functions to add two matrices and also find the transpose of the resultant matrix.

## Model Question Paper

## 3B05ICSC: OPERATING SYSTEM

**Time: 3 Hours** **Max. Marks: 40**

### Part A: Short Answer

**Answer All Questions** **(6 × 1 = 6 Marks)**

1. Mention any two deadlock prevention mechanisms.
2. What is fork()?
3. List out different types of files
4. Define OS.
5. What are embedded operating systems?
6. What is a process?

### Part B: Short Essay

**Answer any 6 Questions** **(6 × 2 = 12 Marks)**

7. Explain about shortest job first scheduling algorithm.
8. What are the necessary conditions for deadlock?
9. Explain about bounded buffer problem.
10. What is a semaphore?
11. Write short not about virtual memory.
12. What are the different file access methods?
13. With example explain system calls
14. What are the functions of an OS?

### Part C: Essay

**Answer any 4 Questions** **(4 × 3 = 12 Marks)**

15. Explain about round robin scheduling.
16. Explain about Banker's algorithm.
17. What is critical section problem?
18. Explain inter process communication.
19. With example explain LRU page replacement algorithm.
20. Explain segmentation.

## Part D: Long Essay

**Answer any 2 Questions** **(2 × 5 = 10 Marks)**

21. Explain the techniques for handling deadlocks.
22. Explain about different operating systems.
23. Explain about file system structure.
24. Explain about critical section problem and Peterson's solution.

## Model Question Paper

## 3B06ICSC: DATA STRUCTURES

**Time: 3 Hours** **Max. Marks: 40**

### Part A: Short Answer

**Answer All Questions** **(6 × 1 = 6 Marks)**

1. What is meant by height of a tree?
2. What is ADT?
3. Mention any two hashing techniques.
4. Define Data Structure.
5. Convert the hexadecimal number 3CAD to binary.
6. What is meant by little endian byte ordering?

### Part B: Short Essay

**Answer any 6 Questions** **(6 × 2 = 12 Marks)**

7. Explain Warshall's algorithm.
8. What is a complete binary tree? Give an example.
9. How is a stack different from a queue?
10. What is a priority queue?
11. What is a hash function?
12. Explain about hash tables.
13. Convert the decimal number$1256.75_{10}$ to binary
14. Explain how negative numbers can be represented in binary.

### Part C: Essay

**Answer any 4 Questions** **(4 × 3 = 12 Marks)**

15. List the properties ofa binary search tree. Write algorithm to perform searching in binary search tree.
16. Explain DFS with suitable example.
17. Explain how stacks can be used to evaluate a postfix expression.
18. How stacks can be implemented using linked lists.
19. Explain about quick sort algorithm.
20. Explain linear searching with linked lists.

## Part D: Long Essay

**Answer any 2 Questions** **(2 × 5 = 10 Marks)**

21. Explain Prim's and Kruskal's algorithm with the help of suitable examples.
22. How floating-point numbers are represented in binary? Explain in detail about IEEE floating point representation.
23. What is hashing? Explain different hashing techniques with examples.
24. Explain how queues can implemented using arrays and linked lists. Explain in detail about circular linked lists.

**KANNUR UNIVERSITY**

**(Abstract)**

New Generation course - Integrated M.Sc. in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme under CBCSS, offered at NAS College Kanhangad- Syllabus of 4th Semester Core Courses with Model Question Papers- Implemented w.e.f 2020 admission onwards- Orders issued.

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**ACADEMIC C SECTION**

Acad/C2/16586/NGCI/2021 Dated: 17.03.2022

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Read:-1. U.O Acad/C2/16586/NGCI/2021(I) dated 30.07.2021
2. U.O Acad/C2/16586/NGCI/2021 dated 18.08.2021
3. Syllabus of 4th Semester Core Course & Model Question Papers submitted by the Expert Committee Convener, dated 02.03.2022

**ORDER**

1. As per paper read (1 & 2) above, the syllabus of 1st, 2nd and 3rd Semester Core Course and Pattern of Question Papers of New Generation Course Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme (CBCSS) w.e.f 2020 admission, offered at Nehru Arts & Science College Kanhangad, was implemented.
2. As per paper read (3) above, the Convener, Expert Committee submitted the syllabus of 4th Semester Core Course & Model Question Papers of Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme prepared by the Expert Committee.
3. The Vice-Chancellor, after considering matter in detail and in exercise of the power of Academic Council conferred under section 11(1) Chapter III of the Kannur University Act 1996, accorded sanction to implement the syllabus of 4th Semester Core Course & Model Question Paper of Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme (CBCSS) w.e.f 2020 admission, offered at Nehru Arts & Science College Kanhangad, subject to report the same to the Academic Council.
4. The 4th Semester Syllabus of Core Course & Model Question Papers for Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme (CBCSS), w.e.f 2020 admission are uploaded on the university website (www.kannuruniversity.ac.in).
5. U. O read (1) &(2) stands modified to this extent.

Orders are issued accordingly.

KANNUR UNIVERSITY
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SECTION OFFICER

# 4B09ICSC: Computer Organization

| Semester | Course Code | Hours per Week | Exam Hours |
|---|---|---|---|
| 4 | 4B09ICSC | 3 | 3 |

## Course Outcome

CO 1: Understand the basics of digital electronics to design simple combinational logic and sequential logic circuits
CO 2: Understand the different design features of computer architecture
CO 3: Understand Processor logic design conventions and data path, pipelining and hazards, I/O organization, Interrupts and direct memory access
CO 4: Understand different types of memory and design techniques

### Unit I

Logic Gates - AND, OR, NOT, NAND, NOR, XOR, Boolean Algebra - Basic Theorem and Properties, Boolean Functions, Standard Forms of Boolean Expressions - Sum of Products and Product of Sums, Boolean Expressions and Truth Tables, Minimization of Boolean Functions using Karnaugh Map Method - Basic Combinational Logic Circuits, Implementing Combinational Logic, Functions of Combinational Logic - Half Adder, Full Adder, Decoder, Encoder, Multiplexer, Demultiplexer.

(14 Hours)

### Unit II

Sequential Circuit - Clocking, Flip Flops - SR, JK, D, T flip flops, Counters - Synchronous and Asynchronous counters, Up/Down Synchronous Counters, Registers - Serial In Serial Out, Serial in Parallel Out, Parallel In Serial Out and Parallel In Parallel Out Registers.

(14 Hours)

### Unit III

Computer abstractions and technology - Introduction, Computer architecture -8 Design features, Application program - layers of abstraction, Five key components of a computer, Technologies for building processors and memory, Performance, Instruction set principles – Introduction, Classifying instruction set architectures, Memory addressing, Encoding an instruction set.
The Processor - Introduction, Logic design conventions, Building a datapath, A simple implementation scheme, An overview of pipelining - Pipelined datapath and control - Structural hazards - Data hazards - Control hazards

(14 Hours)

### Unit IV

I/O Organization - Accessing I/O Devices, Interrupts - Handling Multiple Devices, Direct Memory Access, The Memory System – Basic concepts, Semiconductor RAM Memories - Internal Organization, SRAM, DRAM, Structure of Larger Memories, ROM Memories, Speed, Size and Cost, Cache Memory - Mapping Functions, Replacement Algorithms (LRU).

(12 Hours)

**Text Books**


[1] Floyd, T. L. (2017). Digital Fundamentals, 11th Edition. Pearson Education. (Unit I & II)

[2] Hennessy, J. L., Patterson, D. A. (2017). Computer Organization and Design MIPS Edition: The Hardware/Software Interface, *5th Edition*. Elsevier Science. (Unit III)

[3] Patterson, D. A., Hennessy, J. L. (2017). Computer Architecture: A Quantitative Approach, *6th Edition*. Elsevier Science. (Unit III)

[4] Zaky, S., Hamacher, C., Vranesic, Z. (2017). Computer Organization, *5th Edition*. McGraw-Hill. (Unit IV)


**References**


[1] Stallings, W. (2016). Computer Organization and Architecture: Designing for Performance, *10th Edition*. Pearson.

[2] Mano, M. M. (2016). Digital Logic and Computer Design. Pearson Education.


**Marks Including Choice**

| Unit | Marks |
|---|---|
| I | 16 |
| II | 16 |
| III | 16 |
| IV | 12 |

# 4B10ICSC: Database Management System

| Semester | Course Code | Hours per Week | Exam Hours |
|---|---|---|---|
| 4 | 4B10ICSC | 3 | 3 |

## Course Outcome

CO 1: Understand the structure and characteristics of database system
CO 2: Learn to design and query data using relational database management systems.
CO 3: Understand the concepts of database normalization
CO 4: Understand the basic concepts of transaction management and concurrency control
CO 5: Understand the basic concepts of NoSQL databases

### Unit I

Introduction to Database and Database Management System - Evolution, Advantages, Applications, Overview of DBMS, Concept of Data Models, Schemas and Instances, Three-schema Architecture and Data Independence, Database Languages (DDL and DML), Database Users, DBA, Centralized and Client/Server Architecture for DBMS.
Entity relationship model - Entity Types, Entity Sets, Attributes, Keys, Relationship Types, Relationship Sets, Roles, Structural Constraints, Weak Entity Types, ER Diagram, Specialization and Generalization.

(14 Hours)

### Unit II

Relational Data Model - Concepts, Relational Data Model Constraints and Schemas. Structured Query Language - Data Types, Data Definition, DDL statements - CREATE, ALTER, DROP, Specifying Constraints in SQL, DML Statements - INSERT, UPDATE, DELETE, SELECT, DCL Statements - GRANT and REVOKE, Joins in SQL, Aggregate Functions in SQL, GROUP BY and HAVING Clauses, Views, Indexes in SQL - Motivation, Declaration, Selection of Indexes.
Relational Algebra - Select, Project, Rename, Union, Intersection, Minus, Set Operations, Cartesian Product, Join, Equi Join and Natural Join.

(14 Hours)

### Unit III

Functional Dependencies, Normal Forms - 1NF, 2NF, 3NF, BCNF, Multivalued Dependencies, 4NF.
Transaction Processing - Need for Concurrency Control, Transaction States, System Log, Commit Point, ACID Properties of Transactions, Schedules of Transactions, Characterizing Schedules Based on Recoverability and Serializability, Testing for Serializability, Two-phase Locking Techniques for Concurrency Control.

(14 Hours)

### Unit IV

Introduction to NoSQL databases, Characteristics of NoSQL Databases, Overview of Document-Based NoSQL Systems and MongoDB, Overview of NoSQL Key-Value Stores, Overview of Column Based NoSQL Systems, Overview of NoSQL Graph Databases and Neo4j.

(12 Hours)

**Text Books**


[1] Navathe, S., Elmasri, R. (2017). *Fundamentals of database systems*, *7th Edition*, Pearson Education.

[2] Sudarshan, S., Silberschatz, A., Korth, H. F. (2019). *Database System Concepts, 7th Edition*. McGraw-Hill.


**References**


[1] Ullman, J. D., Garcia-Molina, H., Widom, J. (2014). *Database Systems: The Complete Book, 2nd Edition*. Pearson Education.

[2] Ramakrishnan, R., Gehrke, J. (2000). *Database Management Systems, 3rd Edition*, McGraw-Hill.

[3] Ramesh, V., Hoffer, J. A., Topi, H. (2018). *Modern Database Management, 12th Edition*, Pearson Education.

[4] Begg, C., Connolly, T. (2020). D*atabase Systems: A Practical Approach to Design, Implementation, and Management, 6th Edition,* Pearson Education.


**Marks Including Choice**

| Unit | Marks |
|---|---|
| I | 16 |
| II | 16 |
| III | 16 |
| IV | 12 |

# 4B11ICSC: Object Oriented Programming using Java

| Semester | Course Code | Hours per Week | Exam Hours |
|---|---|---|---|
| 4 | 4B11ICSC | 4 | 3 |

## Course Outcome

CO 1: Understand the concepts of object oriented programming
CO 2: Know the overall structure and concept of logic building activity of Java programming language
CO 3: Identify the real-world things as well as the relationship between them and understand transforming them into their corresponding computer representations.
CO 4: Realise how to achieve code reusability using inheritance, interfaces and packages and expedite application development activities.
CO 5: Familiarise simple and robust way of handling multitasking and runtime error as well as such kinds of abnormal situations within a program.

### Unit I

Introduction to Java - History, Features of Java, Byte Code, Java Language Fundamentals - Data Types, Variables, Arrays, Operators - Arithmetic, Bitwise, Relational, Boolean Logical, Assignment, Control Statements - if, else, else if, switch, while, do-while, for, break, continue, return.

(16 Hours)

### Unit II

Object Oriented Programming Concepts - Abstraction, Data Hiding, Encapsulation, Polymorphism, Inheritance, Concepts of Class and Objects, Methods, Constructors, Garbage Collection, Method Overloading, Access Control, static members, Nested and Inner Classes, String Class, String Buffer and String Builder, Varargs. Inheritance - Basics, Member Access and Inheritance, Multi-level Inheritance, Method Overriding, Dynamic Method Dispatching, Abstract Class, Object Class.

(20 Hours)

### Unit III

Packages - Introduction, Creating a Package, CLASSPATH, Packages and Member Access, Simple Programs using Package, Importing Packages, Interfaces - definition and implementation, Simple programs using Interface, Default interface methods.
Exception handling- Basics, try, catch, finally, multiple catch, nested try, throw, throws, finally, User Defined exception, Chained Exception.

(16 Hours)

### Unit IV

Multi-threaded Programming - Basics of threading, Creating threads, Thread Life Cycle, Thread Priorities, Synchronization. Enumerations, Type Wrappers, Autoboxing, Annotations, Generics - Basics, Wildcard Arguments, Generic Methods. Collections - Overview, Collection Classes - ArrayList Class, LinkedList Class.

(20 Hours)

**Text Books**

[1] Schildt, H. (2020). *Java: The Complete Reference, 11th Edition*. McGraw-Hill Education.

**References**

[1] Schildt, H. (2020). *Java: A Beginner's Guide, 8th Edition*. McGraw-Hill Education.
[2] Bloch, J. (2016). *Effective Java, 3rd Edition*. Pearson Education.
[3] Horstmann, C. (2016). *Core Java Volume I-Fundamentals, 10th Edition*. Pearson Education.
[4] Horstmann, C. (2020). *Core Java Volume II-Advanced Features, 11th Edition*. Pearson Education.
[5] Sierra, K., Bates, B. (2005). *Head First Java: A Brain-Friendly Guide, 2nd Edition*. O'Reilly Media.
[6] Horstmann, C. (2012). *Object-Oriented Design And Patterns, 2nd Edition*. Wiley.
[7] West, D., McLaughlin, B., Pollice, G. (2011). *Head First Object-Oriented Analysis and Design: A Brain Friendly Guide to OOA&D*. O'Reilly Media.

**Marks Including Choice**

| Unit | Marks |
|---|---|
| I | 12 |
| II | 16 |
| III | 16 |
| IV | 16 |

# 4B12ICSC: Lab 4: Object Oriented Programming Using Java

| Semester | Course Code | Hours per Week | Exam Hours |
|---|---|---|---|
| 4 | 4B12ICSC | 3 | 3 |

## Course Outcome

CO 1: Understand the concepts of object oriented programming
CO 2: Know the overall structure and concept of logic building activity of Java programming language
CO 3: Identify the real-world things as well as the relationship between them and understand transforming them into their corresponding computer representations.
CO 4: Realise how to achieve code reusability using inheritance, interfaces and packages and expedite application development activities.
CO 5: Familiarise simple and robust way of handling multitasking and runtime error as well as such kinds of abnormal situations within a program.

## Exercises

1. Write a Java program to show method overloading.
2. Write a Java program to show the implementation of inheritance.
3. Write Java Program to show method overriding. (Exercise to understand Polymorphism)
4. Write a java program to implement interface.
5. Write a java program that handles various exceptions. Use try, catch and finally statements.
6. Write a java program to demonstrate threads using runnable interface
7. Write a java program that creates three threads. First thread displays “Good Morning” every one second, the second thread displays “Hello” every two seconds and the third thread displays “Welcome” every three seconds.
8. Write a program to show an implementation of Packages.
9. Write a java program to implement abstract classes.
10. Write a Java program using Java Swing to create a simple calculator. Arrange Buttons for digits and the + - * % operations properly. Add a text field to display the result. Handle any possible exceptions like divide by zero.
11. Write a Java program to display all records from a table using Java Database Connectivity (JDBC).
12. Write a program that demonstrates generics.

## Text Books

[1] Schildt, H. (2020). *Java: The Complete Reference, 11th Edition*. McGraw-Hill Education.

## References

[1] Schildt, H. (2020). *Java: A Beginner's Guide, 8th Edition*. McGraw-Hill Education.
[2] Bloch, J. (2016). *Effective Java, 3rd Edition*. Pearson Education.
[3] Horstmann, C. (2016). *Core Java Volume I-Fundamentals, 10th Edition*. Pearson Education.
[4] Horstmann, C. (2020). *Core Java Volume II-Advanced Features, 11th Edition*. Pearson Education.

[5] Sierra, K., Bates, B. (2005). *Head First Java: A Brain-Friendly Guide, 2nd Edition*. O'Reilly Media.
[6] Horstmann, C. (2012). *Object-Oriented Design And Patterns, 2nd Edition*. Wiley.
[7] West, D., McLaughlin, B., Pollice, G. (2011). *Head First Object-Oriented Analysis and Design: A Brain Friendly Guide to OOA&D*. O'Reilly Media.

# 4B13ICSC: Lab 5: Database Management System

| Semester | Course Code | Hours per Week | Exam Hours |
|---|---|---|---|
| 4 | 4B13ICSC | 3 | 3 |

## Course Outcome

CO 1: Understand the structure and characteristics of database system
CO 2: Learn to design and query data using relational database management systems.
CO 3: Implement queries using SQL for database creation, interaction, modification, and updation
CO 4: Implement procedures, functions, and control structures using PL/SQL
CO 5: Practice of SQL TCL commands like Rollback, Commit, Savepoint

## Exercises

1. Implement DDL Statements in SQL.
2. Implement DML Statements in SQL.
3. Implement DCL statements in SQL.
4. Implement different types of operators in SQL
    a. Arithmetic, relational and logical operators
    b. BETWEEN … AND
    c. LIKE
    d. IN
5. Implement different types of SQL functions
    a. Character Functions (Character Manipulation, Case Conversion)
    b. Number Functions
    c. Aggregate Functions
6. Implement Join Statements in SQL
    a. Inner Join
    b. Outer Join (Left outer join, Right outer Join)
7. Implement Subqueries in SQL.
    a. Single Row Subqueries
    b. Multiple Row Subqueries
8. Implement views in SQL.
9. Implement WHERE, GROUP BY, ORDER BY and HAVING clauses in SQL.
10. Create a database procedure to add, update and delete a book to a Library database (use parameters).
11. Simple program for implementing cursors.

## References


[1] Navathe, S., Elmasri, R. (2017). *Fundamentals of database systems*, *7th Edition*, Pearson Education.
[2] Sudarshan, S., Silberschatz, A., Korth, H. F. (2019). *Database System Concepts, 7th Edition*. McGraw-Hill.
[3] Ullman, J. D., Garcia-Molina, H., Widom, J. (2014). *Database Systems: The Complete Book, 2nd Edition*. Pearson Education.

[4] Ramakrishnan, R., Gehrke, J. (2000). *Database Management Systems, 3rd Edition*, McGraw-Hill.
[5] Ramesh, V., Hoffer, J. A., Topi, H. (2018). *Modern Database Management, 12th Edition*, Pearson Education.
[6] Begg, C., Connolly, T. (2020). D*atabase Systems: A Practical Approach to Design, Implementation, and Management, 6th Edition,* Pearson Education.

# Model Question Paper

## 4B09ICSC: Computer Organization

**Time: 3 Hours** **Max. Marks: 40**

### Part A: Short Answer

**Answer All Questions** **(6 x 1 = 6 Marks)**

1. Draw the truth table for XOR gate
2. State the Demorgan's theorem
3. What is meant by the Sum-of-Products (SOP) Form?
4. Draw the circuit of an SR latch
5. What is Moore's law?
6. What is a structural hazard?

### Part B: Short Essay

**Answer Any 6 Questions** **(6 x 2 = 12 Marks)**

7. Implement a full adder using 8:1 MUX
8. What are edge-triggered flip flops?
9. Draw a 4 bit Serial In Serial Out Shift register.
10. Write the design features of computer architecture.
11. Differentiate between data hazard and control hazard.
12. Explain about LRU Replacement algorithm used for cache memories.
13. What is PROM?
14. Explain memory hierarchy inside a computer.

### Part C: Essay

**Answer Any 4 Questions** **(4 x 3 = 12 Marks)**

15. Explain about full adder.
16. Differentiate between multiplexers and demultiplexers
17. Differentiate between synchronous and asynchronous counters
18. Explain up/down synchronous counter in detail
19. Explain 4 stage pipelining with a diagram.
20. Explain how an instruction set can be encoded.

### Part D: Long Essay

**Answer Any 2 Questions** **(2 x 5 = 10 Marks)**

21. Write a note on K Map. Use a Karnaugh map to minimize the following SOP expression B'C'D'+A'BC'D'+ABC'D'+A'B'CD+AB'CD+A'B'CD'+ A'BC'D'+ABCD'+AB'CD'
22. Demonstrate the working of a JK flip flop. How does it eliminate the invalid condition in SR flip flop? List out its applications.
23. Explain how a single data path can be represented for memory instructions and R-type instructions with the help of a diagram.
24. Explain in detail about various cache memory mapping techniques.

# Model Question Paper

## 4B10ICSC: Database Management System

**Time: 3 Hours** **Max. Marks: 40**

### Part A: Short Answer

**Answer All Questions** **(6 x 1 = 6 Marks)**

1. What is meant by a weak entity type?
2. What is meant by a database schema?
3. Define super key.
4. Give 2 DCL statements in SQL.
5. What is the criteria for a relation to be in 1 NF.
6. What are the 4 properties of a transaction known as ACID properties?

### Part B: Short Essay

**Answer Any 6 Questions** **(6 x 2 = 12 Marks)**

7. What are the functions of a DBA?
8. Explain about INSERT statement in SQL.
9. Explain about left outer join in SQL.
10. What are views in SQL?
11. Explain about UPDATE statement in SQL.
12. What are aggregate functions in SQL?
13. Write a short note about MongoDB CRUD operations.
14. Write a short note about Neo4j Data Model.

### Part C: Essay

**Answer Any 4 Questions** **(4 x 3 = 12 Marks)**

15. Explain about centralized and Client/Server architectures of DBMS.
16. Explain about specialiazation and generalization.
17. What is the need for concurrency control in a DBMS.
18. Explain about multivalued dependencies.
19. Explain how schedules can be characterized based on recoverability.
20. What are the characteristics of NOSQL systems?

### Part D: Long Essay

**Answer Any 2 Questions** **(2 x 5 = 10 Marks)**

21. Explain about ER Model in detail.
22. Explain in detail about different relational algebra operations.
23. Explain in detail about different normal forms.
24. Explain in detail about NOSQL Key-Value stores.

# Model Question Paper

## 4B11ICSC: Object Oriented Programming using Java

**Time: 3 Hours** **Max. Marks: 40**

### Part A: Short Answer

**Answer All Questions** **(6 x 1 = 6 Marks)**

1. Define Byte code.
2. Define DMD.
3. What is the use of this keyword?
4. Differentiate between class and object.
5. What is the use of finally?
6. What is meant by autoboxing?

### Part B: Short Essay

**Answer Any 6 Questions** **(6 x 2 = 12 Marks)**

7. What are the features of Java?
8. How is garbage collection done in Java?
9. What is a constructor?
10. What is meant by multi-level inheritance?
11. What is the use of the CLASSPATH environment variable?
12. Explain about chained exceptions.
13. Write a short note about type wrappers.
14. Write a short note about the ArrayList class.

### Part C: Essay

**Answer Any 4 Questions** **(4 x 3 = 12 Marks)**

15. Explain about bitwise operators in Java.
16. What are the characteristics of Object oriented programming?
17. What are packages? How can packages be imported?
18. What is an interface? Explain with the help of an example.
19. Explain about the LinkedList class in Java with the help of an example.
20. Explain how thread synchronization is achieved in Java with the help of an example.

### Part D: Long Essay

**Answer Any 2 Questions** **(2 x 5 = 10 Marks)**

21. Explain about different control statements in Java.
22. Differentiate between method overloading and method overriding with the help of examples.
23. Explain how exceptions are handled in Java with the help of an example.
24. What are generic methods? Explain with the help of an example.

**KANNUR UNIVERSITY**

**(Abstract)**

Integrated M.Sc. in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme under CBCSS, offered at NAS College Kanhangad- Syllabus of 5th Semester Core Courses with Model Question Papers- Implemented w.e.f 2020 admission onwards- Orders issued.

**ACADEMIC C SECTION**

Acad/C2/16586/NGCI/2021 Dated: 19.10.2022

Read:-1. U.O Acad/C2/16586/NGCI/2021(I) dated 30.07.2021
2. U.O Acad/C2/16586/NGCI/2021 dated 18.08.2021
3. U.O Acad/C2/16586/NGCI/2021 dated 17.03.2022
4. Syllabus of 5th Semester Core Course & Model Question Papers submitted by the Expert Committee Convener, dated 20.09.2022

**ORDER**

1. As per paper read (1), (2) & (3) above, the Scheme, Syllabus of 1st, 2nd , 3rd and 4th Semester Core Course and Model Question Papers of the New Generation programme Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning (CBCSS) w.e.f 2020 admission, offered at Nehru Arts & Science College Kanhangad, was implemented.
2. As per paper read (4) above, the Convener, Expert Committee submitted the syllabus of 5th Semester Core Course & Model Question Papers of Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme prepared by the Expert Committee.
3. The Vice-Chancellor, after considering matter in detail and in exercise of the power of Academic Council conferred under section 11(1) Chapter III of the Kannur University Act 1996, accorded sanction to implement the syllabus of 5th Semester Core Course & Model Question Paper of Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme (CBCSS) w.e.f 2020 admission, offered at Nehru Arts & Science College Kanhangad, and to report the same to Academic Council.
4. The Syllabus of 5th Semester Core Course & Model Question Papers for Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme (CBCSS), w.e.f 2020 admission are appended and uploaded in the university website (www.kannuruniversity.ac.in).
5. U. O read (1) ,(2) & (3) stands modified to this extent.

Orders are issued accordingly.

Sd/-
**BALACHANDRAN V K**
**DEPUTY REGISTRAR (ACAD)**
For REGISTRAR

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Nehru Arts & Science College

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SECTION OFFICER

# 5B14ICSC: Introduction to Artificial Intelligence

| Semester | Course Code | Hours per Week | Exam Hours | Credits |
|---|---|---|---|---|
| 5 | 5B14ICSC | 4 | 3 | 3 |

## Course Outcome

CO 1: A detailed idea about AI and its applications
CO 2: Describe AI knowledge representation methods and concept of Robot
CO 3: Implementation of AI in real world problem like Machine learning and natural language Processing
CO 4: Understand basics of AI programming using LISP and PROLOG

### Unit I

Artificial Intelligence: History and Applications,,Agent and Rational Agent Approaches-Types of Agent,Searching Strategies for state space search-Data driven and goal driven search , Depth First and Breadth First Search, DFS with Iterative Deepening, Heuristic Search-Best First Search with 8 puzzle problem, A* Algorithm, AO* Algorithm, Constraint Satisfaction problem, heuristics in games-Minimax Search procedure, Alpha Beta pruning.

(20 Hours)

### Unit II

Knowledge representation schemes - Semantic Networks, Frames, Scripts, Conceptual graph, ConceptualDependency,Logic approaches - Propositional calculus,Predicate Calculus ,Unification, Overview of Expert System Technology-Rule based Expert Systems, case based Expert Systems,Model based Expert Systems, expert system drawbacks, ProductionSystems.

(18 Hours)

### Unit III

MachineLeaming and Types- Supervised ML, Unsupervised ML, Reinforcement ML, TheGeneticAlgorithm-GeneticProgramming, Introduction to Natural Language Processing - Steps in NLP, difficulties in Natural Language Understanding, NLP Terminology.

(18 Hours)

### Unit IV

Languages and Programming Techniques for Al-Introduction to PROLOG-Defining relations by facts,defining relations by rules,recursive rules, Head and body of the clause,Variables, atoms. Introduction to LISP, Features of LISP Programming Language, Prefix Notation, predicates atom,equal,eq,number,listp.

(16 Hours)

## Text Books

[1] George. F. Luger, *Artificial Intelligence - Structures and Strategies for Complex Problem Solving*, 6/e, 2021, Pearson Education.

[2] Rich E., Knight K., Nair B. S (2017). *Artificial Intelligence*, Tata McGraw-Hill Publ.
[3] Winston, P. H., Horn, B. (2000). *Lisp*, Addison-Wesley.
[4] Ivan Bratko, *Prolog Programming for Artificial Intelligence*, 3/e, Addison Wesley, 2000.

**References**

[1] Norvig, P., Russell, S. J. (2016). *Artificial Intelligence: A Modern Approach*, Pearson.
[2] Mitchell, Melanie (2020). *Artificial Intelligence: A Guide for Thinking Humans*. Penguin Books.

**Marks Including Choice**

| Unit | Marks |
|---|---|
| I | 18 |
| II | 18 |
| III | 12 |
| IV | 12 |

# 5B15ICSC: Software Engineering

| Semester | Course Code | Hours per Week | Exam Hours | Credits |
|---|---|---|---|---|
| 5 | 5B15ICSC | 4 | 3 | 3 |

## Course Outcome

CO 1: Understand what software engineering is and why it is important
CO 2: Understand the importance of different software engineering techniques
CO 3: Understand the software design and development stages
CO 4: Understand the stages of testing a software

### Unit I

Introduction to Software Engineering - Professional Software Development, Software Engineering, Software Engineering Diversity, Internet Software Engineering, Software Engineering Ethics. Case Study - Weather Station, Digital Learning Environment.

(16 Hours)

### Unit II

Software Processes - Software Process Models, Activities- Software Specification, Software Design and Implementation, Software Validation, Software Evolution, Coping with Change, Process Improvement.

(20 Hours)

### Unit III

Introduction to Agile methods - Agile development techniques. Software Requirement specification - Functional and non-functional requirements, Requirements engineering processes, Requirements elicitation and specification. Architectural design decisions. Architectural views and patterns.

(16 Hours)

### Unit IV

Object-oriented design using the UML, Implementation issues, Open-source development. Configuration Management - Version Management. Software Testing.

(20 Hours)

## Text Books


[1] Sommerville, I. (2017). *Software Engineering, 10th Edition*. Pearson Education.


## References


[1] Maxim, B. R., Pressman, R. S. (2014). *Software Engineering: A Practitioner's Approach, 8th Edition*. McGraw-Hill Education.
[2] Sommerville, I. (2019). *Engineering Software Products: An Introduction to Modern Software Engineering*. Pearson Education.
[3] Jalote, P. (2013). *An Integrated Approach to Software Engineering*. Springer.

[4] https://git-scm.com/doc

**Marks Including Choice**

| Unit | Marks |
|---|---|
| I | 14 |
| II | 16 |
| III | 16 |
| IV | 14 |

# 5B16ICSC: UNIX Shell Programming

| Semester | Course Code | Hours per Week | Exam Hours | Credits |
|---|---|---|---|---|
| 5 | 5B16ICSC | 3 | 3 | 3 |

## Course Outcome

CO 1: Understand the Open Source ecosystem
CO 2: Understand UNIX file system concepts and simple commands
CO 3: Understand UNIX shell programming concepts
CO 4: Understand AWK scripting concepts

### Unit I

Unix Philosophy, History of Unix, Comparing Unix with MacOs, Windows and Linux, Open Source Software - Issues, Portability, Documentation, Best Practises for Working with Open Source Developers, Varieties of Open Source Licences, Free Software vs Open Source software.

(16 Hours)

### Unit II

Understanding File system, File Ownership and Permission. Shell - Types, Responsibilities. Basic Commands - cd, mkdir, echo, ls, pwd, rm, who, date, cp, mv, cat, ps. Working with Directories, Standard Input/Output, and I/O Redirection, pipes. .

(12 Hours)

### Unit III

Job Control. Regular Expressions - grep. Text editors - vim, emacs. Shell Programming - variables, quotes, comments, command substitution, arguments, decisions, loops, reading and printing data, functions.

(14 Hours)

### Unit IV

Awk - Invoking and Basic Concepts, Patterns, Actions, Variables, Printing, Operators, BEGIN and END, for, while, if, break, continue, next, exit.

(12 Hours)

## Text Books


[1] Raymond, E. S. (2009). *The Art of UNIX Programming*, *3rd Edition*, Pearson Education.
[2] Wood, P., Kochan, S. G. (2016), *Shell Programming in Unix, Linux and OS X, 4th edition*, Pearson Education.
[3] The GNU Awk User's Guide - https://www.gnu.org/software/gawk/manual/gawk.html


## References


[1] Kanetkar, Y. P. (2003), *UNIX Shell Programming, 1st Edition*, BPB Publications.

[2] Forouzan, B. A., Gilberg, R. F. (2003), *UNIX and Shell Programming, 1st Edition*, Cengage Learning India
[3] Das, S. (2017), *UNIX : Concepts and Applications, 4th Edition*, McGraw Hill Education.

**Marks Including Choice**

| Unit | Marks |
|---|---|
| I | 12 |
| II | 16 |
| III | 16 |
| IV | 16 |

# 5B17ICSC: Introduction to Machine Learning

| Semester | Course Code | Hours per Week | Exam Hours | Credits |
|---|---|---|---|---|
| 5 | 5B17ICSC | 4 | 3 | 4 |

## Course Outcome

CO 1: Understand applications of machine learning
CO 2: Understand different learning techniques
CO 3: Apply clustering of raw data
CO 4: Analyse the performance of classification methods
CO 5: Evaluate hierarchical methods
CO 6: Create a semi supervised learning model.

### Unit I

What is Machine Learning? Machine Learning Vs. Traditional Programming, HowMachine Learning Works? Applications of Machine Learning, Selecting the right features, Understanding data:- numeric variables – mean, median, mode, Measuring spread. Types of Learning – Supervised Learning, Unsupervised Learning, Semi-supervised Learning, Challenges in Machine Learning.

(14 Hours)

### Unit II

Regression - Introduction, Types of Regression, Linear Regression, Multiple Linear Regression, Non-Linear Regression (Polynomial Regression)Classification –Introduction, Logistic Regression, Decision Trees, Naïve Bayes Classification, Support Vector Machines, K-Nearest Neighbours, Random Forest.

(18 Hours)

### Unit III

Clustering- Introduction, Requirements of Clustering, Types of Data in Cluster Analysis -Interval-Scaled Variables, Binary Variables, Categorical Variables, Ordinal Variables, Ratio-Scaled Variables, Variables of Mixed Types. Categorization of Major Clustering Methods - Partitioning Methods - K-means, K-medoids, CLARANS. Hierarchical Methods - Agglomerative Clustering, BIRCH, Density-based Methods – DBSCAN.

(20 Hours)

### Unit IV

Advanced multivariate analysis – Introduction-Dimensionality Reduction - Principal Component Analysis, Linear Discriminant Analysis, Principal Component Analysis Vs. Linear Discriminant Analysis. Multidimensional scaling. Evaluating Model Performance:Precision and recall, Confusion matrix, Cross validation Bootstrap sampling, Improving model performance with ensemble learning, Bagging and Boosting.

(20 Hours)

## References

[1] C. Bishop (2010), *Pattern Recognition and Machine Learning*, Springer.

[2] K. Murphy (2012), *Machine Learning: A Probabilistic Perspective*, MIT Press.
[3] Brett Lantz, *Machine Learning with R*, Packt Publishing, 2nd Edition.
[4] Tom Micheal (1997), *Machine Learning*, Mcgraw Hill
[5] Simon Rogers, Mark Girolami, *A First course in Machine Learning*, CRC Press, First Indian reprint, 2015.
[6] N. P. Padhy, *Artificial Intelligence and Intelligent Systems*, Oxford University Press, 1st Edition.
[7] E. Alpayidin, *Introduction to Machine Learning*, Prentice Hall of India (2005)
[8] T. Hastie, RT Ibrashiran and J. Friedman, *The Elements of Statistical Learning*, Springer 2001
[9] https://www.coursera.org/learn/machine-learning

**Marks Including Choice**

| Unit | Marks |
|---|---|
| I | 14 |
| II | 14 |
| III | 16 |
| IV | 16 |

# 5B18ICSC: Lab-6 : UNIX Shell Programming

| Semester | Course Code | Hours per Week | Exam Hours | Credits |
|---|---|---|---|---|
| 5 | 5B18ICSC | 4 | 3 | 2 |

## Course Outcome

CO 1: Understand basic UNIX commands
CO 2: Understand commands for file system organization, grep and handling files/users
CO 3: Apply shell programming concepts for solving simple problems
CO 4: Apply awk scripting for simple text processing tasks

## Exercises

1. Getting started with basic commands.
2. Familiarisation of commands for understanding file system organisation.
3. Familiarisation of commands for operations such as redirection, pipes, filters, job control, changing ownership/permissions.
4. Familiarisation of commands for comparing files.
5. Familiarise usage of *grep* command.
6. Write a shell script to show various system configurations like Home directory, current shell, Operating system information, Kernel information, current working directory, PATH variable contents.
7. Simple programs making use of shell conditional statements.
8. Simple programs making use of shell looping constructs.
9. Write a shell script to implement a menu-driven calculator.
10. Simple text processing programs using Awk.

*A command-line text editor should be used for writing programs. Students should be taught the usage of git. They should be encouraged to use online services like Gitlab/Github for uploading the programs written in the lab.*

## References


[1] Raymond, E. S. (2009). *The Art of UNIX Programming*, *3rd Edition*, Pearson Education.
[2] Wood, P., Kochan, S. G. (2016), *Shell Programming in Unix, Linux and OS X, 4th edition*, Pearson Education.
[3] The GNU Awk User's Guide - https://www.gnu.org/software/gawk/manual/gawk.html
[4] Kanetkar, Y. P. (2003), *UNIX Shell Programming, 1st Edition*, BPB Publications.
[5] Forouzan, B. A., Gilberg, R. F. (2003), *UNIX and Shell Programming, 1st Edition*, Cengage Learning India
[6] Das, S. (2017), *UNIX : Concepts and Applications, 4th Edition*, McGraw Hill Education.

# 5B19ICSC: Lab-7 : Machine Learning

| Semester | Course Code | Hours per Week | Exam Hours | Credits |
|---|---|---|---|---|
| 5 | 5B19ICSC | 4 | 3 | 3 |

## Course Outcome

CO 1: To implement programs to familiarise the usage of machine learning algorithms.
CO 2: Understand the usage of different types of dataset

## Exercises

1. Prepare a dataset of customer having the features date, price, product_id, quantity_purchased, serial_no, user_id,user_type, user_class, purchase_week and visualise the data with
    a. Plot diagram for Price Trends for Particular User, Price Trends for Particular User Over Time
    b. Create box plot Quantity and Week value distribution having parameters of quantity_purchased','purchase_week'
2. Write a program to Transforming Nominal Features, Transforming Ordinal Features and Encoding Categorical Features using one-hot Encoding Scheme
3. Write a program to implement Raw Measures such as Values, count, Binarization, Rounding, Interactions, Binning, Fixed-width binning,Quantile based binning and Mathematical Transformations such as Log transform, Box–Cox transform
4. Write a classification program for implementing logistic regression using wine dataset
5. Write a classification program for implementingSVM using MNIST dataset
6. Write a classification program for implementing Naïve Bayes algorithm using iris dataset
7. Write a classification program for implementing decision tree using pima-indians-diabetes dataset
8. Write a classification program for implementing kNN
9. Write a clustering program for implementing k Means , k-medoids and Hierarchical Clustering using Wisconsin Breast Cancer Dataset
10. Write a program to implement PCA
11. Write a program to evaluate Classification Model using different Evaluation Metrics
12. Write a program to evaluate a Clustering Model using different Evaluation Metrics

## References


[1] C. Bishop (2010), *Pattern Recognition and Machine Learning*, Springer.
[2] K. Murphy (2012), *Machine Learning: A Probabilistic Perspective*, MIT Press.
[3] Brett Lantz, *Machine Learning with R*, Packt Publishing, 2nd Edition.
[4] Tom Micheal (1997), *Machine Learning*, Mcgraw Hill
[5] Simon Rogers, Mark Girolami, *A First course in Machine Learning*, CRC Press, First Indian reprint, 2015.
[6] N. P. Padhy, *Artificial Intelligence and Intelligent Systems*, Oxford University Press, 1st Edition.
[7] E. Alpaydin, *Introduction to Machine Learning*, Prentice Hall of India (2005)
[8] T. Hastie, RT Ibrashiran and J. Friedman, *The Elements of Statistical Learning*, Springer 200

# Model Question Paper

## 5B14ICSC: Introduction to Artificial Intelligence

**Time: 3 Hours** **Max. Marks: 40**

### Part A: Short Answer

**Answer All Questions** **(6 x 1 = 6 Marks)**

1. What is Unification?
2. List out different searching strategies.
3. Write the steps following in NLP.
4. What is the use of equal predicates in LISP?
5. Define Agent.
6. What is Min-Max in Heuristic games?

### Part B: Short Essay

**Answer Any 6 Questions** **(6 x 2 = 12 Marks)**

7. What are the applications of AI?
8. Compare A* and AO* algorithms.
9. Explain prefix notation in LISP with Example.
10. Write genetic algorithm.
11. Write a short note on the Rule based expert system.
12. What is the difference between semantic network and conceptual graph
13. Write algorithm for Depth first Search.
14. What is the use of Alpha beta Pruning in Gaming?

### Part C: Essay

**Answer Any 4 Questions** **(4 x 3 = 12 Marks)**

15. Explain production system with Example.
16. What are the types of machine learning, Explain.
17. Define a relation using facts in PROLOG
18. Write a note on Constraint satisfaction problems with examples.
19. List and explain all genetic operators.
20. What are the types of Environment in an Agent based system?

### Part D: Long Essay

**Answer Any 2 Questions** **(2 x 5 = 10 Marks)**

21. Explain Best first searching algorithm with 8 puzzle problems.
22. What are the different knowledge representation mechanisms in AI?
23. Explain the importance of AI in Natural Language Processing.
24. Explain the Expert system and its components with a neat diagram.

# Model Question Paper

## 5B15ICSC: Software Engineering

**Time: 3 Hours** **Max. Marks: 40**

### Part A: Short Answer

**Answer All Questions** **(6 x 1 = 6 Marks)**

1. What are the major activities common to all software processes
2. Explain Internet software engineering.
3. Explain the incremental development model in software engineering
4. Explain user stories
5. Explain user testing
6. What are the major activities involved in configuration management

### Part B: Short Essay

**Answer Any 6 Questions** **(6 x 2 = 12 Marks)**

7. Explain redundancy and diversity in software engineering
8. What are the major approaches for process improvement
9. Explain major levels in the process maturity model
10. Explain the concept of test-first development
11. Differentiate between functional and non-functional requirements
12. What are the different architectural views?
13. What are the major open source licences?
14. Explain software reuse.

### Part C: Essay

**Answer Any 4 Questions** **(4 x 3 = 12 Marks)**

15. What are the three major stages in development testing
16. Explain the requirement elicitation techniques
17. What are the advantages of pair programming
18. What are the major software process activities
19. Differentiate between structural and dynamic models
20. Explain version management concepts

### Part D: Long Essay

**Answer Any 2 Questions** **(2 x 5 = 10 Marks)**

21. Explain software engineering ethics
22. Explain software validation techniques
23. Explain agile development techniques
24. Explain different UML diagrams

# Model Question Paper

## 5B16ICSC: UNIX Shell Programming

**Time: 3 Hours** **Max. Marks: 40**

### Part A: Short Answer

**Answer All Questions** **(6 x 1 = 6 Marks)**

1. Explain UNIX philosophy
2. Explain how to change file permissions
3. Explain the usage of echo command
4. Explain the need of grep command
5. Give examples of shells available under UNIX
6. What is the major use of AWK language

### Part B: Short Essay

**Answer Any 6 Questions** **(6 x 2 = 12 Marks)**

7. Explain how command line arguments can be given in shell
8. Explain the history of UNIX
9. Write a shell script which moves files from one directory to another
10. Write an AWK program to print odd numbers in a file (write the assumptions made)
11. Explain the command to print the current working directory
12. Explain the concept of pipes
13. Explain shell redirection operators
14. Explain how patterns are provided in AWK

### Part C: Essay

**Answer Any 4 Questions** **(4 x 3 = 12 Marks)**

15. Explain how to change file ownership
16. Explain the importance of documentation in Open Source software
17. Write a shell script to print odd numbers in a range
18. Explain the usage of command to list all the currently running processes
19. Explain how loops are used in shell
20. Differentiate between AWK BEGIN and END blocks

### Part D: Long Essay

**Answer Any 2 Questions** **(2 x 5 = 10 Marks)**

21. Explain different open source licences
22. Explain any five basic commands
23. Explain shell job control in detail
24. Explain different loops in AWK

# Model Question Paper

## 5B17ICSC: Introduction to Machine Learning

**Time: 3 Hours** **Max. Marks: 40**

### Part A: Short Answer

**Answer All Questions** **(6 x 1 = 6 Marks)**

1. What is Machine Learning?
2. What is a feature vector?
3. What is meant by Linear Regression?
4. Explain classification.
5. Describe clustering.
6. Explain precision

### Part B: Short Essay

**Answer Any 6 Questions** **(6 x 2 = 12 Marks)**

7. Compare machine learning with traditional programming.
8. Explain the numeric variables of a data.
9. Explain about Naïve Bayes Classification.
10. Explain the different methods to choose appropriate k values for K-NN.
11. Describe the different types of Data in Cluster Analysis.
12. Explain the storing condition for k means clustering.
13. Write a note on Confusion matrix.
14. Differentiate between Bagging and Boosting.

### Part C: Essay

**Answer Any 4 Questions** **(4 x 3 = 12 Marks)**

15. Write applications of Machine Learning.
16. Explain SVM with different kernels.
17. Differentiate between Hierarchical and Agglomerative Clustering
18. Differentiate between k means and K-medoids
19. Explain PCA with an example
20. Write a note on Cross validation Bootstrap sampling and its usages.

### Part D: Long Essay

**Answer Any 2 Questions** **(2 x 5 = 10 Marks)**

21. Explain different types of Learning with an example

22. Create Decision Trees for the following dataCross validation Bootstrap sampling

| Day | Weather | Temperature | Humidity | Wind | Play? |
|---|---|---|---|---|---|
| 1 | Sunny | Hot | High | Weak | No |
| 2 | Cloudy | Hot | High | Weak | Yes |
| 3 | Sunny | Mild | Normal | Strong | Yes |
| 4 | Cloudy | Mild | High | Strong | Yes |
| 5 | Rainy | Mild | High | Strong | No |
| 6 | Rainy | Cool | Normal | Strong | No |
| 7 | Rainy | Mild | High | Weak | Yes |
| 8 | Sunny | Hot | High | Strong | No |
| 9 | Cloudy | Hot | Normal | Weak | Yes |
| 10 | Rainy | Mild | High | Strong | No |

23. Explain density based methods for clustering
24. How to improve the model performance in machine learning