

# **IV SEMESTER**

<b>Course Title</b>	<b>OPERATIONS RESEARCH, NUMERICAL AND STATISTICAL METHODS</b>	<b>Semester</b>	IV
<b>Course Code</b>	MVJ20MCS41/MIS41	<b>CIE</b>	50
<b>Total No. of Contact Hours</b>	40	<b>SEE</b>	50
<b>No. of Contact Hours/week</b>	3 (L : T : P :: 3 : 0 : 0)	<b>Total</b>	100
<b>Credits</b>	3	<b>Exam. Duration</b>	3 HOURS

**Course objective is to:**

The purpose of this course is to make students well conversant with numerical methods to solve ordinary differential equations, complex analysis, sampling theory Operational research emerging in science and engineering.

**Module-1**

L1,L2,L3

**8 Hrs.**

**Numerical Methods-1 :** Numerical solution of Ordinary Differential Equations of first order and first degree: Modified Euler's method, Taylor's series method, Runge-Kutta method of fourth order, Predictor and Corrector method: Milne's Method and Adams-Bash forth Method.

**Application:** Solving Ordinary Differential Equations.

**Video Links:**

1. <http://nptel.ac.in/courses.php?disciplineID=111>
2. [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
3. <http://academicearth.org/>

**Module-2**

L1,L2,L3

**8 Hrs.**

**Numerical Methods-2:** Numerical solution of Ordinary Differential Equations of second order:Runge-Kutta method of fourth order, Predictor and Corrector method: Milne's Method and Adams Bash forth Method.

**Calculus of Variations:** Variation of function and Functional, variational problems. Euler's equation, Geodesics.

**Application:** Hanging chain problem.

**Video Links:**

1. <http://nptel.ac.in/courses.php?disciplineID=111>
2. [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
3. <http://academicearth.org/>

**Module-3**

L1,L2,L3

**8 Hrs.**

**Operations Research-1:** Introduction to Linear Programming Problem (LPP): Assumptions of LPP,

Formulation of LPP and Graphical method various examples. The simplex method, Big M method and dual simplex method.

**Application:** Graphical solution procedure.

**Video Links:**

1. <http://nptel.ac.in/courses.php?disciplineID=111>
2. [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
3. <http://academicearth.org/>

**Module-4**

L1,L2,L3

**8 Hrs.**

**Operations Research-2**

**The transportation problem:** Initial Basic Feasible Solution(IBFS) by North West Corner Rule method, Matrix Minima Method, Vogel's Approximation Method.

**Game Theory:** The formulation of two persons, zero sum games; saddle point, maxmin and minmax principle, Solving simple games-a prototype example, Games with mixed strategies.

**Application:** Transportation problem.

**Video Links:**

1. <http://nptel.ac.in/courses.php?disciplineID=111>
2. [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
3. <http://academicearth.org/>

**Module-5**

L1,L2,L3

**8 Hrs.**

**Statistical Methods**

**Correlation and Regression:** Correlation, Regression coefficients, line of regression problems.

**Curve fitting:** Fitting of the curves of the form  $y=ax+b$ ,  $y=ax^2+bx+c$ ,  $y=ae^{bx}$  by the method of least squares.

**Application:** Finding the best fit between two variables.

**Video Links:**

1. <http://nptel.ac.in/courses.php?disciplineID=111>
2. [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
3. <http://academicearth.org/>

**Course outcomes:**

CO1	Solve first and second order ordinary differential equation arising in flow problems using single step and multistep numerical methods.
CO2	Determine the extremals of functionals and solve the simple problems of the calculus of variations.
CO3	Solve the mathematical formulation of linear programming problem.
CO4	Solve the applications of transport problems and theory of games.



CO4	2	3	-	3	-	-	-	-	-	-	-	1	-	-
CO5	3	3	-	3	-	-	-	-	-	-	-	1	2	-

High-3, Medium-2, Low-1

<b>Course Title</b>	<b>ANALYSIS AND DESIGN OF ALGORITHMS</b>	<b>Semester</b>	04
<b>Course Code</b>	MVJ20AM42/MVJ20CS42	<b>CIE</b>	50
<b>Total No. of Contact Hours</b>	50	<b>SEE</b>	50
<b>No. of Contact Hours/week</b>	4 (L : T : P :: 3 : 1 : 0)	<b>Total</b>	100
<b>Credits</b>	4	<b>Exam. Duration</b>	3 Hours

**Course objective is to:** *This course will enable students to*

- Identify the importance of different asymptotic notation.
- Determine the complexity of recursive and non-recursive algorithms.
- Compare the efficiency of various design techniques like greedy method, backtracking etc.
- Apply appropriate method to solve a given problem.

**Module-1**

L1,L2 , L3

**Hours 10**

**Basic Concept of Algorithms:** Introduction-What is an Algorithm, Algorithm Specification, Analysis Framework, Performance Analysis: Space complexity, Time complexity. Asymptotic Notations: Big-Oh notation (O), Omega notation ( $\Omega$ ), Theta notation ( $\Theta$ ), and Little-oh notation (o), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples . Important Problem Types. Fundamental Data Structures.

**Applications:** developing computational tools and bioinformatics software, Mathematics.

**Video link / Additional online information (related to module if any):**

- <http://www.nptelvideos.com/video.php?id=1442>
- <https://nptel.ac.in/courses/106105085/>

**Module-2**

L2 , L3

**Hours 10**

**Simple Design Techniques – Brute force :** Selection sort, Bubble sort, Sequential Search and Brute-Force String Matching , Exhaustive search –Traveling Salesman problem, Knapsack problem , Assignment Problem.

**Divide and Conquer:** General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum , Merge sort, Quick sort , Strassen's matrix multiplication , Advantages and Disadvantages of divide and conquer.

**Applications:** power distribution (electrical field), Online shopping and delivery (real time)

**Video link / Additional online information (related to module if any):**

- <https://nptel.ac.in/courses/106102064/>
- <https://www.youtube.com/watch?v=MFfD57DTDQY>

**Module-3**

L2,L3 , L4

**Hours 10**

**Decrease and Conquer approach:** Topological Sort, Decrease-by-a-Constant-Factor Algorithms: Josephus Problem.

**Greedy Method:** General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines. Minimum cost spanning trees: Prim's Algorithm, Kruskal's Algorithm. Single source shortest paths: Dijkstra's Algorithm. Huffman Trees and Codes.

**Laboratory Sessions/ Experimental learning:** Solving real time problems using Greedy Technique.

**Applications:** Optimization Problems.

**Video link :** <https://nptel.ac.in/courses/106/106/106106131/>

<b>Module-4</b>	L3,L4 , L6	<b>Hours 10</b>
<p>Dynamic Programming: General method with Examples, Multistage Graphs. Transitive Closure: Warshall's Algorithm, All Pairs Shortest Paths: Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem, Bellman-Ford Algorithm , Travelling Sales Person problem , Reliability design.</p> <p><b>Laboratory Sessions/ Experimental learning:</b> Solving real time problems using Dynamic Programming.</p> <p><b>Applications:</b> Computer Networks.</p> <p><b>Video link:</b> <a href="https://nptel.ac.in/courses/106/106/106106131/">https://nptel.ac.in/courses/106/106/106106131/</a></p>		

<b>Module-5</b>	L4,L5 ,L6	<b>Hours 10</b>
<p><b>Backtracking:</b> General method, N-Queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles Programme and Bound: Assignment Problem, Travelling Sales Person problem, 0/1 Knapsack problem.</p> <p><b>LC Programme and Bound solution :</b> FIFO Programme and Bound solution. NP-Complete and NP-Hard problems: Basic concepts, non-deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes.</p> <p><b>Laboratory Sessions/ Experimental learning:</b> Solving real time problems using Backtracking Technique.</p> <p><b>Applications:</b> To solve puzzles such as crosswords, Sudoku etc.</p> <p><b>Video link:</b> <a href="https://nptel.ac.in/courses/106/106/106106131/">https://nptel.ac.in/courses/106/106/106106131/</a></p>		

<b>Course Outcomes:</b>	
CO1	Describe the need of algorithm and the notations used in design analysis.
CO2	Compare the efficiency of brute force, divide and conquer techniques for problem solving.
CO3	Ability to apply greedy algorithms, hashing and string matching algorithms.
CO4	Ability to design efficient algorithms using various design techniques.
CO5	Ability to apply the knowledge of complexity classes P, NP, and NP Complete and prove certain problems are NP-Complete.

<b>Text Books:</b>	
1	Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2rd Edition, 2009. Pearson.
2	Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.

<b>Reference Books:</b>	
1	Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education).
2	<a href="http://jeffe.cs.illinois.edu/teaching/algorithms/">http://jeffe.cs.illinois.edu/teaching/algorithms/</a>
3	Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press.

**CIE Assessment:**

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

**SEE Assessment:**

- i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.
- ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.
- iii. One question must be set from each unit. The duration of examination is 3 hours.

**CO-PO/PSO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	--	--	--	1	--	--	--	--	--	--	2	2	-
CO2	2	3	--	--	2	--	--	--	--	--	--	--	2	-
CO3	3	3	2	2	--	--	--	--	--	--	--	2	2	2
CO4	3	3	3	--	--	--	--	--	1	--	--	2	3	2
CO5	2	2	2	1	3	--	--	--	--	--	--	3	3	3

High-3, Medium-2, Low-1

<b>Course Title</b>	<b>DATABASE MANAGEMENT SYSTEM</b>	<b>Semester</b>	04
<b>Course Code</b>	MVJ20AM43	<b>CIE</b>	50
<b>Total No. of Contact Hours</b>	40 L : T : P :: 40 : 0 : 0	<b>SEE</b>	50
<b>No. of Contact Hours/week</b>	3	<b>Total</b>	100
<b>Credits</b>	3	<b>Exam. Duration</b>	3 Hours

**Course objective is to:** *This course will enable students to*

- Understand the basic concepts and the applications of database systems.
- Master the basics of SQL and construct queries using SQL.
- Understand the relational database design principles.
- Analyze the basic issues of transaction processing and concurrency control.
- Familiarize with database storage structures and access techniques.

<b>Module-1</b>	L1,L2 ,L3	<b>Hours 8</b>
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**Introduction to Database System Concepts:** Database-System Applications, Purpose of Database Systems, View of Data, Database Language, Database Design, Database Architecture, Database Users and Administrators.

**Introduction to the Relation Models and Database Design using ER Model:** Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages,

Relational Operations Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues, Extended E-R Features.

**Video link / Additional online information (related to module if any):**

- <https://nptel.ac.in/courses/106106093/>
- <https://nptel.ac.in/courses/106105175/>
- <https://www.youtube.com/watch?v=WSNqcYqByFk>

**Module-2**

L2, L3

**Hours 8**

**Introduction to SQL:** Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions Nested Sub queries, Modification of the Database.

**Intermediate and Advanced SQL:** Join Expressions, Views , Integrity Constraints, SQL Data Types, Authorization. Functions and Procedures, Triggers, Advanced Aggregation Features.

**Video link / Additional online information (related to module if any):**

- <https://nptel.ac.in/courses/106106093/>
- <https://nptel.ac.in/courses/106105175/>
- <https://www.youtube.com/watch?v=gGGHjYbQMvw>
- <https://www.youtube.com/watch?v=nc1yivH1Yac>
- <https://www.youtube.com/watch?v=64szTfLNu3o>

**Module-3**

L2,L3, L4

**Hours 8**

**Formal Relational Query Languages:** The Relational Algebra, The Tuple Relational Calculus, The Domain Relational Calculus.

**Schema Refinement and Normal Forms:** Introduction to Schema Refinement, Functional Dependencies - Reasoning about FDs, Normal Forms, Properties of Decompositions, Normalization, Schema Refinement in Database Design, Other Kinds of Dependencies.

**Video link / Additional online information (related to module if any):**

- <https://www.youtube.com/watch?v=64szTfLNu3o>
- <https://www.digimat.in/nptel/courses/video/106105175/L11.html>
- <https://www.youtube.com/watch?v=sjzlr0EsZL4>
- <https://nptel.ac.in/courses/106106093/>
- <https://nptel.ac.in/courses/106105175/>

**Module-4**

L3,L4 , L6

**Hours 8**

**Indexing and Hashing:** Basic Concepts, Ordered Indices, B+-Tree Index Files, B+-Tree Extensions, Multiple-Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered

Indexing and Hashing, Bitmap Indices.

**Transactions:** Transaction Concept, a Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels.

**Applications:** to optimize database design

**Video link / Additional online information (related to module if any):**

- <https://nptel.ac.in/courses/106106093/>
- <https://nptel.ac.in/courses/106105175/>
- <https://www.youtube.com/watch?v=YD8dhOmuVnY>

**Module-5**

L4,L5, L6

**Hours 8**

**Concurrency Control:** Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multi version schemes.

**Recovery System:** Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Nonvolatile Storage, ARIES, Remote Backup Systems.

**Video link / Additional online information (related to module if any):**

- <https://nptel.ac.in/courses/106106093/>
- <https://nptel.ac.in/courses/106105175/>
- <https://www.youtube.com/watch?v=5ammL5KU4mo>

**Course Outcomes:**

CO1	Identify, analyse and define database objects, enforce integrity constraints on a database using RDBMS.
CO2	Use Structured Query Language (SQL) for database manipulation.
CO3	Apply the concepts of Normalization and design database which possess no anomalies.
CO4	Describes storage and indexing like tree structured and Hash based indexing.
CO5	Develop application to interact with databases.

**Text Books:**

1	Abraham Silberschatz, Henry F. Korth, S. Sudarshan, —Database System Concepts, 6th Edition, Tata McGraw-Hill.
2	Raghu Rama Kirshna, Johannes Gehrke, —Database Management System, Tata McGraw Hill 3rd Edition.

**Reference Books:**

1	Database Systems, 6th edition, R Elmasri, Shamkant B. Navathe, Pearson Education.
2	Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning.
3	Introduction to Database Management, M. L. Gillenson and others, Wiley Student Edition.
4	Database Development and Management, Lee Chao, Auerbach publications, Taylor & Francis Group.

**CIE Assessment:**

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

**SEE Assessment:**

- i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.
- ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.
- iii. One question must be set from each unit. The duration of examination is 3 hours.

**CO-PO/PSO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3	3	2	3	-	-	-	1	-	-	2	2	-
CO2	3	3	3	2	2	-	-	-	1	-	-	2	1	-
CO3	3	3	3	2	2	-	-	-	1	-	-	2	2	2
CO4	2	3	3	2	2	-	-	-	1	-	-	2	2	3
CO5	2	3	3	3	3	-	-	-	2	-	-	2	-	1

High-3, Medium-2, Low-1

<b>Course Title</b>	<b>ARTIFICIAL INTELLIGENCE</b>	<b>Semester</b>	04
<b>Course Code</b>	MVJ20AM44	<b>CIE</b>	50
<b>Total No. of Contact Hours</b>	40	<b>SEE</b>	50
<b>No. of Contact Hours/week</b>	3 (L : T : P :: 3 : 0 : 0)	<b>Total</b>	100
<b>Credits</b>	3	<b>Exam. Duration</b>	3 Hours

**Course objective is to:** *This course will enable students to*

- Understand fundamental concepts in Artificial Intelligence.
- Understand the problem solving techniques and knowledge representation.
- Design intelligent components or programs to meet desired needs.
- Implement, and evaluate a computer-based intelligent systems.

**Module-1**

L1,L2 , L3

**Hours 8**

**Introduction:** AI problems, foundation of AI and history of AI, Intelligent agents: Agents and Environments, The concept of rationality, The nature of environments, Structure of agents, Problem solving agents, Problem formulation.

**Video link / Additional online information (related to module if any):**  
<http://nptel.ac.in/courses/106106126/>

**Module-2**

L2 , L3

**Hours 8**

**Knowledge Representation & Reasons:** Knowledge – Based Agents, The Wumpus world. **Propositional Logic:** Reasoning patterns in propositional logic - Resolution, Forward & Backward Chaining.

**Inference in First order logic:** Propositional vs. first order inference, Unification & lifting, Forward chaining, Backward chaining, Resolution.

**Video link / Additional online information (related to module if any):**  
<http://nptel.ac.in/video.php?subjectId=106105079>

**Module-3**

L2,L3, L4

**Hours 8**

**Searching:** Searching for solutions, uniformed search strategies – Breadth first search, depth first search, Depth limited search, Iterative deepening depth first search bi-direction search, Comparing uninformed search strategies. Search with partial information (Heuristic search), Greedy best first search, A\* search, Memory bounded heuristic search, Heuristic functions.

**Local search Algorithms:** Hill climbing, Simulated annealing search, Local beam search, Genetic algorithms.

**Video link / Additional online information (related to module if any):**<https://www.youtube.com/watch?v=6hmIKIWBVSI>

<b>Module-4</b>	L3,L4 , L6	<b>Hours 8</b>
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**Constrain satisfaction problems:** Backtracking search for CSPs local search for constraint satisfaction problems.

**Game Playing:** Games, Minimax algorithm, Optimal decisions in multiplayer games, Alpha-Beta pruning, Evaluation functions, Cutting of search.

**Video link / Additional online information (related to module if any):**<https://nptel.ac.in/courses/106/106/106106158/>

<b>Module-5</b>	L4,L5 , L6	<b>Hours 8</b>
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**Planning:** Classical planning problem, Language of planning problems, Expressiveness and extension, planning with state – space search, Forward state space search, Backward state space search, Heuristics for state space search, Partial order planning Graphs, Planning graphs

**Learning:** what is learning, Forms of learning, Inductive learning, Learning Decision Trees.

**Video link / Additional online information (related to module if any):**<https://www.youtube.com/watch?v=3C6ZLS-gfXU>

**Course Outcomes:**

CO1	Recognize the various types and working units of an expert systems.
CO2	Interpret the logic behind the building of knowledge base and knowledge representation.
CO3	Deploy Searching Techniques to design intelligent agents
CO4	Choose various Constraint Satisfaction Problem, Game Playing techniques to use in various intelligent system designs.
CO5	Apply suitable learning methodology while designing systems based on their applications.

**Text Books:**

1	Stuart Russel, Peter Norvig, (2009), Artificial Intelligence – A Modern Approach,3rd Edition, Pearson Education.
2	E.Rich and K.Knight, (2008), Artificial Intelligence , 3rd Edition, Tata McGraw Hill.

**Reference Books:**

1	Patterson, (2009), Artificial Intelligence and Expert Systems, 2nd Edition, PHI.
2	Giarrantana/ Riley, (2004), Expert Systems: Principles and Programming,4th Edition, Thomson.
3	Ivan Bratka, (2000), PROLOG Programming for Artificial Intelligence. 3rdEdition – Pearson Education.

**CIE Assessment:**

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- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

**SEE Assessment:**

- i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.
- ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.
- iii. One question must be set from each unit. The duration of examination is 3 hours.

**CO-PO/PSO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	-	1	1	2	-	-	-	-	-	1	-
CO2	3	3	3	3	2	-	-	-	-	-	-	-	-	-
CO3	1	-	-	1	1	-	2	3	3	3	3	-	2	-
CO4	3	3	2	2	2	-	-	-	-	-	-	3	-	-
CO5	3	3	3	3	3	2	-	-	3	3	3	3	2	1

High-3, Medium-2, Low-1

<b>Course Title</b>	<b>EMBEDDED SYSTEMS</b>	<b>Semester</b>	04
<b>Course Code</b>	MVJ20AM45	<b>CIE</b>	50

<b>Total No. of Contact Hours</b>	40	<b>SEE</b>	50
<b>No. of Contact Hours/week</b>	3 (L : T : P :: 3 : 0 : 0)	<b>Total</b>	100
<b>Credits</b>	3	<b>Exam. Duration</b>	3 Hours
<p><b>Course objective is to: <i>This course will enable students to</i></b></p> <ul style="list-style-type: none"> <li>• Learn the architecture and programming of ARM processor.</li> <li>• Become familiar with the embedded computing platform design and analysis.</li> <li>• Get thorough knowledge in interfacing concepts.</li> <li>• Design an embedded system and to develop programs.</li> </ul>			
<b>Module-1</b>		L1,L2 ,L3	<b>Hours 8</b>
<p><b>INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS :</b> Complex systems and micro processors– Embedded system design process –Design example: Model train controller- Instruction sets preliminaries – ARM Processor – CPU: programming input and output- supervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance- CPU power consumption.</p> <p><b>Activity:</b></p> <ul style="list-style-type: none"> <li>• Comparison of Microprocessor and Microcontroller hardware Model</li> <li>• Comparing the Microprocessor and Microcontroller Software Model</li> </ul>			
<b>Module-2</b>		L1,L2 ,L3	<b>Hours 8</b>
<p><b>EMBEDDED COMPUTING PLATFORM DESIGN :</b> The CPU Bus-Memory devices and systems– Designing with computing platforms – consumer electronics architecture – platform-level performance analysis – Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing.</p> <p><b>Activity:</b> Writing ARM Assembly program for Embedded System Applications</p>			
<b>Module-3</b>		L1,L2 ,L3	<b>Hours 8</b>
<p><b>SENSOR INTERFACING WITH ARDUINO:</b> Basics of hardware design and functions of basic passive components-sensors and actuators-Arduino code – library file for sensor interfacing-construction of basic applications.</p> <p><b>Activity:</b></p> <ul style="list-style-type: none"> <li>• Use of External interrupt0 to turn ON/OFF led connected to Pin P1.25 of ARM Processor.</li> <li>• Use of Software Interrupt SWI instruction in programming.</li> <li>• Calculating physical memory address from logical address.</li> </ul>			
<b>Module-4</b>		L1,L2 ,L3	<b>Hours 8</b>
<p><b>EMBEDDED FIRMWARE :</b> Reset Circuit, Brown-out Protection Circuit-Oscillator Unit – Real Time Clock-Watchdog Timer – Embedded Firmware Design Approaches and Development Languages.</p> <p><b>Case Study:</b> Digital Clock, Battery operated Smartcard Reader</p>			

<b>Module-5</b>		L1,L2 ,L3	<b>Hours 8</b>
<b>EMBEDDED C PROGRAMMING</b>			
Introduction-Creating _hardware delays‘using Timer 0 and Timer 1-Reading switches-Adding Structure to the code-Generating a minimum and maximum delay-Example: Creating a portable hardware delay- Timeout mechanisms-Creating loop timeouts-Testing loop timeouts- hardware timeouts-Testing a hardware timeout.			
<b>Case Study:</b> Automated Meter Reading System (AMR) and Digital Camera, Real time concepts			
<b>Course Outcomes:</b>			
CO1	Describe the architecture and programming of ARM processor.		
CO2	Explain the concepts of embedded systems.		
CO3	Understand the Concepts of peripherals and interfacing of sensors.		
CO4	Capable of using the system design techniques to develop firmware.		
CO5	Illustrate the code for constructing a system.		

<b>Text Books:</b>	
1	Marilyn Wolf, —Computers as Components – Principles of Embedded Computing System Design, Third Edition —Morgan Kaufmann Publisher (An imprint from Elsevier), 2012. (unit I & II).
2	<a href="https://www.coursera.org/learn/interface-with-arduino#syllabus">https://www.coursera.org/learn/interface-with-arduino#syllabus</a> (Unit III) 3 .Michael J. Pont, —Embedded C, 2 nd Edition, Pearson Education, 2008.(Unit IV & V).

<b>Reference Books:</b>	
1	Shibu K.V, —Introduction to Embedded Systems, McGraw Hill.2014.
2	Jonathan W.Valvano, —Embedded Microcomputer Systems Real Time Interfacing, Third Edition Cengage Learning, 2012.
3	Raj Kamal, —Embedded Systems-Architecture,programming and design, 3 edition,TMH.2015.
4	Lyla, —Embedded Systems, Pearson , 2013 6. David E. Simon, —An Embedded Software Primerl, Pearson Education,2000.

<b>CIE Assessment:</b>	
CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests	
<ul style="list-style-type: none"> <li>- Quizzes/mini tests (4 marks)</li> <li>- Mini Project / Case Studies (8 Marks)</li> <li>- Activities/Experimentations related to courses (8 Marks)</li> </ul>	
<b>SEE Assessment:</b>	

- i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.
- ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.
- iii. One question must be set from each unit. The duration of examination is 3 hours.

**CO-PO/PSO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	-	-	-	-	-	-	-	-	2	-
CO2	3	2	1	3	3	2	-	-	2	-	1	-	1	1
CO3	3	2	1	3	-	2	-	-	2	-	-	-	2	-
CO4	3	3	2	3	3	2	-	-	2	2	2	-	1	2
CO5	3	2	3	3	3	2	-	-	2	2	2	2	1	1

High-3, Medium-2, Low-1

<b>Course Title</b>	<b>OBJECT ORIENTED CONCEPTS</b>	<b>Semester</b>	04
<b>Course Code</b>	MVJ20AM46	<b>CIE</b>	50
<b>Total No. of Contact Hours</b>	40	<b>SEE</b>	50
<b>No. of Contact Hours/week</b>	3 (L : T : P :: 3 : 0 : 0)	<b>Total</b>	100
<b>Credits</b>	3	<b>Exam. Duration</b>	3 Hours

**Course objective is to:** *This course will enable students to*

- Learn fundamental features of object oriented language and JAVA
- Set up Java JDK environment to create, debug and run simple Java programs.
- Create multi-threaded programs and event handling mechanisms.
- Introduce event driven Graphical User Interface (GUI) programming using applets and swings.

**Module-1**

L1,L2, L3

**Hours 8**

**Introduction to Object Oriented Concepts:** A Review of structures, Procedure–Oriented Programming system, Object Oriented Programming System, Comparison of Object Oriented Language with C, Console I/O, variables and reference variables, Function Prototyping, Function Overloading.

**Class and Objects:** Introduction, member functions and data, objects and functions.

**Applications:** Develop a good program and connecting it with the real world

**Video Link:** <https://nptel.ac.in/courses/106/105/106105191/>

**Module-2**

L1,L2, L3

**Hours 8**

**Class and Objects (contd):** Objects and arrays, Namespaces, Nested classes, Constructors, Destructors.

**Introduction to Java:** Java’s magic: the Byte code; Java Development Kit (JDK); the Java Buzzwords, Object-oriented programming; Simple Java programs. Data types, variables and arrays, Operators, Control Statements.

**Applications:** Arrays in mathematical vectors, matrices.

**Video Link:** <https://nptel.ac.in/courses/106/105/106105191/>

**Module-3**

L1,L2 ,L3

**Hours 8**

**Classes, Inheritance, Exception Handling**

**Classes:** Classes fundamentals; Declaring objects; Constructors, this keyword, garbage collection.

**Inheritance:** inheritance basics, using super, creating multi level hierarchy, method overriding. **Exception handling:** Exception handling in Java.

**Applications:** Inheritance in Banking Sectors

**Video Link:** <https://nptel.ac.in/courses/106/105/106105191/>

**Module-4**

L1,L2 ,L3

**Hours 8**

**Packages and Interfaces:** Packages, Access Protection, Importing Packages. Interfaces.

**Multi Threaded Programming:** Multi Threaded Programming: What are threads? How to make the classes threadable ; Extending threads; Implementing runnable; Synchronization; Changing

**Applications:** Multithreads in Browsers, Servers

**Video Link:**<https://nptel.ac.in/courses/106/105/106105191/>

**Module-5**

L1,L2 ,L3

**Hours 8**

**Event Handling:** Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; Inner classes.

**Swings:** Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; JLabel and ImageIcon; JTextField; The Swing Buttons; JTabbedPane; JScrollPane; JList; JComboBox; JTable.

**Applications:** AWT , GUI Applications

**Video Link:** <https://freevideolectures.com/course/4227/nptel-programming-in-java/43>

**Course Outcomes:**

CO1	Explain the object-oriented concepts and JAVA.
CO2	Develop computer programs to solve real world problems in Java.
CO3	Illustrate the use of classes, Exceptions and distinguish the usage of different types of Inheritance and constructors in real world.
CO4	Demonstrate the use of packages and to create multi-threaded programs.
CO5	Develop simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles using swings.

**Text Books:**

1	Sourav Sahay, Object Oriented Programming with C++ , 2nd Ed, Oxford University Press,2006.
2	Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007.

**Reference Books:**

1	Mahesh Bhavde and Sunil Patekar, "Programming with Java", First Edition, Pearson Education,2008, ISBN:9788131720806.
2	Herbert Schildt, The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003.
3	Stanley B.Lippmann, Josee Lajore, C++ Primer, 4th Edition, Pearson Education, 2005.
4	Rajkumar Buyya,S Thamarasi selvi, xingchen chu, Object oriented Programming with java, Tata McGraw Hill education private limited.
5	Richard A Johnson, Introduction to Java Programming and OOAD, CENGAGE Learning.
6	E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies.

**CIE Assessment:**

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

**SEE Assessment:**

- i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.
- ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.
- iii. One question must be set from each unit. The duration of examination is 3 hours.

**CO-PO/PSO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	-	-	-	-	-	-	-	3	2	-
CO2	3	3	1	-	-	-	-	-	-	-	-	3	2	-
CO3	3	3	1	2	-	-	-	-	-	1	-	3	2	3
CO4	3	3	3	3	-	-	-	2	2	2	-	3	2	-
CO5	3	3	3	3	-	-	2	2	3	2	-	3	2	3

High-3, Medium-2, Low-1

<b>Course Title</b>	<b>ANALYSIS AND DESIGN OF ALGORITHMS LAB</b>	<b>Semester</b>	04
<b>Course Code</b>	MVJ20AML47/MVJ20CSL47	<b>CIE</b>	50
<b>Total No. of Contact Hours</b>	30	<b>SEE</b>	50
<b>No. of Contact Hours/week</b>	3 (L : T : P :: 0 : 2 : 2)	<b>Total</b>	100
<b>Credits</b>	2	<b>Exam. Duration</b>	3 Hours

**Course objective is to: *This course will enable students to***

- Employ various design strategies for problem solving.
- Provide exposure to measure and compare the performance of different algorithms.
- Provide design and implement various Concepts in JAVA.

S No	Experiment Name	RBT Level	Hours
1	Write a recursive program to a. Solve Towers-of-Hanoi problem    b.GCD	L3	3
2	Write a Java program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working.	L3	3
3	Implement Recursive Binary search and Linear search and determine the time required	L3	3

	to search an element. Repeat the experiment for different values of N and plot a graph of the time taken versus N.		
4	Given a set of N integer elements which is to be sorted using Selection Sort technique. Write the program using C language as well as in Java for different values of N and observe the total time taken to sort the elements in both the languages.	L3	3
5	Write program to do the following: a. Print all the nodes reachable from a given starting node in a digraph using BFS method. b. Check whether a given graph is connected or not using DFS method.	L3	3
6	The Merge sort is one of the most common algorithms used to sort arrays. The class Merge sort implements this algorithm. However, there is a bug in the implementation of the method sort. Debug the previous implementation using the debugging options of your favourite IDE (e.g. eclipse), in order to find the error.	L3	3
7	Sort a given set of N integer elements using Quick Sort technique and Run the program for different values of N and record the time taken to sort.	L3	3
8	We are given a set of items, each with a weight and a value and we need to determine the number of each items to include in a collection so that the total weight is less than or equal to the given limit and the total value is as large as possible. Write a Java program by applying any reuse sub problem technique to find the solution.	L3	3
9	Suppose you're trying to find the shortest path from your house to various locations like Movie theatre, Gas Station, Grocery Store and Petrol pump. If we let various locations be vertices and the routes between them are edges, we can create a weighted graph representing the situation. Write a Java program to find the shortest path from your house (source) to the remaining locations.	L3	3
10	Write a Java program for the following Scenario, You have a business with several offices and you want to lease phone lines to connect them up with each other; and the phone company charges different amounts of money to connect different pairs of cities. You want a set of lines that connects all your offices with a minimum total cost and it should be a spanning tree.	L3	3
11	Develop a program in Java with a given set of vertices V in a weighted graph where each edge w (u,v) can be negative, find the shortest path weights d(s,v) from every source s to all vertices in the graph. If the graph contains negative cycle, report it.	L3	3
12	Given a set of cities and distance between every pair of cities, the problem is to find the shortest possible route that visits every city exactly once and returns to the starting point. Write a program to find the solution using dynamic programming method.	L3	3
13	Given a set of positive integers and an integer 's' write a program in Java to determine	L3	3

	whether there is any non-empty subset whose sum is 's'.		
14	Write a Java program to find a path that traverses all the vertices of the given graph G exactly once and then ends at the starting vertex in a connected undirected Graph G of $n$ vertices using backtracking principle.	L3	3
<b>Course Outcomes:</b>			
CO1	Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)		
CO2	Implement a variety of algorithms such as sorting, graph related, combinatorial, etc., in a high level language.		
CO3	Analyze and compare the performance of algorithms using language features.		
CO4	Apply and implement learned algorithm design techniques and data structures to solve real-world problems.		
CO5	Employ various design strategies for problem solving and implement various algorithms in JAVA .		

**Reference Books:**

1	Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education).
2	<a href="http://jeffe.cs.illinois.edu/teaching/algorithms/">http://jeffe.cs.illinois.edu/teaching/algorithms/</a>

**CIE Assessment:**

Regular Lab work :20

Record writing :5

Lab Tests(Minimum 2 tests shall be conducted for 15 marks and average of two will be taken)

Viva 10 marks

**SEE Assessment:**

Examinations will be conducted for 100 marks and scaled-down to 50. The weightage shall be,

- i. Writeup : 20 marks
- ii. Conduction : 40 marks
- iii. Analysis of results : 20 marks
- iv. Viva : 20

**CO-PO/PSO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	3	-	2	2	2	-
CO2	3	3	2	-	-	-	-	-	3	-	2	2	1	2
CO3	3	3	2	-	-	-	-	-	3	-	2	2	3	-

CO4	3	3	2	-	-	-	-	-	3	-	2	2	2	3
CO5	3	3	2	-	-	-	-	-	3	-	2	2	2	3

High-3, Medium-2, Low-1

<b>Course Title</b>	<b>DATABASE MANAGEMENT SYSTEM LAB</b>	<b>Semester</b>	04
<b>Course Code</b>	MVJ20AML48/MVJ20CSL48	<b>CIE</b>	50
<b>Total No. of Contact Hours</b>	30	<b>SEE</b>	50
<b>No. of Contact Hours/week</b>	3 (L : T : P :: 0 : 2 : 2)	<b>Total</b>	100
<b>Credits</b>	2	<b>Exam. Duration</b>	3 Hours

**Course objective is to:** *This course will enable students to*

- Learn to create and use a database.
- Be familiarized with a query language
- Have hands on experience on DDL Commands
- Have a good understanding of DML Commands and DCL commands
- Familiarize advanced SQL queries.
- Be Exposed to different applications

<b>S No</b>	<b>Experiment Name</b>	<b>RBT Level</b>	<b>Hours</b>
1	Creation of a database and writing SQL queries to retrieve information from the database.	L3	3
2	Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.	L3	3
3	Creation of Views, Synonyms, Sequence, Indexes, Save point.	L3	3
4	Creating an Employee database to set various constraints.	L3	3
5	Creating relationship between the databases.	L3	3
6	Study of PL/SQL block.	L3	3
7	Write a PL/SQL block to satisfy some conditions by accepting input from the user.	L3	3
8	Write a PL/SQL block that handles all types of exceptions.	L3	3
9	Creation of Procedures.	L3	3
10	Creation of database triggers and functions	L3	3
11	Mini project (Application Development using Oracle/ Mysql ) a) Inventory Control System.	L3	3

b) Material Requirement Processing. c) Hospital Management System. d) Railway Reservation System. e) Personal Information System. f) Web Based User Identification System. g) Timetable Management System. h) Hotel Management System		
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**Course outcomes:**

CO1	Design and implement a database schema for a given problem-domain
CO2	Populate and query a database
CO3	Create and maintain tables using PL/SQL.
CO4	Prepare reports.

**Reference Books:**

1	Silberschatz Korth and Sudharshan, Database System Concepts, 6th Edition, McGraw Hill, 2013.
2	Database Principles Fundamentals of Design, Implementation and Management, Cengage Learning 2012.

**CIE Assessment:**

Regular Lab work :20

Record writing :5

Lab Tests(Minimum 2 tests shall be conducted for 15 marks and average of two will be taken)

Viva 10 marks

**SEE Assessment:**

Examinations will be conducted for 100 marks and scaled-down to 50. The weightage shall be,

- i. Writeup : 20 marks
- ii. Conduction : 40 marks
- iii. Analysis of results : 20 marks
- iv. Viva : 20

**CO-PO/PSO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	3	-	2	2	2	-
CO2	3	3	2	-	-	-	-	-	3	-	2	2	1	2
CO3	3	3	2	-	-	-	-	-	3	-	2	2	3	-
CO4	3	3	2	-	-	-	-	-	3	-	2	2	2	3

High-3, Medium-2, Low-1

<b>Course Title</b>	<b>BALIKE KANNADA</b>	<b>Semester</b>	IV
<b>Course Code</b>	MVJ20BK39	<b>CIE</b>	50
<b>Total No. of Contact Hours</b>	20	<b>SEE</b>	50
<b>No. of Contact Hours/week</b>	1 ( L: T: P 1:0:0)	<b>Total</b>	100
<b>Credits</b>	1	<b>Exam. Duration</b>	3 Hrs

**Course objective :** This course will enable students to understand Kannada and communicate in Kannada language

- Vyavharika Kannada –Parichaya (Introduction to Vyavharika kannada )
- Kannada Aksharamaale haagu uchcharane(Kannada Alphabets and Pronunciation.
- Sambhashanegaagi Kannada Padagalu (Kannada Vocubulary for Communication).
- Kannada Grammer in Conversations(Sambhasaneyalli Kannada Vyakarana)
- Activities in Kannada

#### **CHAPTER-1**

Vyavharika Kannada –Parichaya (Introduction to Vyavharika kannada )

#### **CHAPTER-2**

Kannada Aksharamaale haagu uchcharane(Kannada Alphabets and Pronunciation

#### **CHAPTER-3**

Sambhashanegaagi Kannada Padagalu (Kannada Vocubulary for Communication)

#### **CHAPTER-4**

Kannada Grammer in Conversations(Sambhasaneyalli Kannada Vyakarana)

#### **CHAPTER-5**

Activities in Kannada

#### **CIE Assessment:**

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

#### **SEE Assessment:**

- Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the

whole syllabus.

ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain subdivisions, each carrying 16 marks. Students have to answer five full questions.

iii. One question must be set from each unit. The duration of examination is 3 hours.

<b>Course Title</b>	<b>ADDITIONAL MATHEMATICS-II</b>	<b>Semester</b>	04
<b>Course Code</b>	MVJ20MATDIP41	<b>CIE</b>	50
<b>Total No. of Contact Hours</b>	40	<b>SEE</b>	50
<b>No. of Contact Hours/week</b>	4	<b>Total</b>	100
<b>Credits</b>	-	<b>Exam. Duration</b>	3 HOURS

**Course objective is to:** This course viz., aims to prepare the students:

To familiarize the important tools Linear Algebra, differential Calculus, Beta and Gamma functions, 3-Dimensional Geometry and probability for analysing the engineering problems.

**Module-1**

L1,L2

8 Hrs.

**Linear Algebra:**

Introduction, Rank of a matrix-echelon form. Solution of system of linear equations – consistency. Gauss-elimination method and problems. Eigen values and Eigen vectors of square matrix of order two and Problems

**Video Link:**

- <https://www.math.ust.hk/~machas/matrix-algebra-for-engineers.pdf>
- <https://nptel.ac.in/content/storage2/courses/122104018/node18.html>

**Module-2**

L1,L2

8 Hrs.

**Differential calculus:**

Tangent and normal, both Cartesian and polar forms. Increasing and decreasing functions, Maxima and Minima for a function of one variable. Point of inflections and Problems.

**Beta and Gamma functions:**

Beta and Gamma functions, Relation between Beta and Gamma function-simple problems.

**Video Link**

- <https://www.youtube.com/watch?v=6RwOoPN2zqE>
- <https://www.youtube.com/watch?v=s6F5yjY6jWk&list=PLMLsJhQWWIUqBoTCQDtYlloI-o-9hxp11>
- <http://tutorial.math.lamar.edu/Classes/DE/IntroPDE.aspx>

**Module-3**

L1,L2

8 Hrs.

**Analytical solid geometry :**

Introduction –Directional cosine and Directional ratio of a line, Equation of line in space- different forms, Angle between two line, shortest distance between two line, plane and equation of plane in different forms and problems.

**Video Links:**

- <https://www.toppr.com/guides/maths/three-dimensional-geometry/>
- <https://www.toppr.com/guides/maths/three-dimensional-geometry/distance-between-skew-lines/>

<b>Module-4</b>	L1,L2,L3	8 Hrs.
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**Probability:**

Random variable, Discrete probability distribution, Mean and variance of Random Variable, Theoretical distribution- Binomial distribution, Mean and variance Binomial distribution -Problems. Poisson distribution as a limiting case of Binomial distribution, Mean and variance of Poisson distribution.

Normal Distribution-Basic properties of Normal distribution –standard form of normal distribution and Problems

**Video Links:**

- <https://nptel.ac.in/courses/111/105/111105041/>
- <https://www.mathsisfun.com/data/probability.html>

<b>Module-5</b>	L1,L2	8 Hrs.
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**Partial Differential equation:** Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only.

**Video Link:**

- <http://tutorial.math.lamar.edu/Classes/DE/IntroPDE.aspx>
- <https://www.studyjaar.com/index.php/module-video/watch/233-cauchys-legendres-de-a-method-of-variation-of-parameters>

**Course Outcomes:**

CO1	Apply the knowledge of Matrices to solve the system of linear equations and to understand the concepts of Eigen value and Eigen vectors for engineering problems.
CO2	Demonstrate various physical models ,find Maxima and Minima for a function of one variable., Point of inflections and Problems .Understand Beta and Gamma function
CO3	Understand the 3-Dimensional geometry basic, Equation of line in space- different forms, Angle between two line and studying the shortest distance.
CO4	Concepts of Probability related to engineering applications.
CO5	Construct a variety of partial differential equations and solution by exact methods.

**Reference Books:**

1.	B.S. Grewal, “Higher Engineering Mathematics” Khanna Publishers, 43 <sup>rd</sup> Edition, 2013.
2.	Erwin Kreyszig, “Advanced Engineering Mathematics”, Wiley-India publishers, 10 <sup>th</sup> edition, 2014.

3	Ramana B. V., "Higher Engineering Mathematics", Tata Mc Graw-Hill, 2006.
4	G. B. Gururajachar: Calculus and Linear Algebra, Academic Excellent Series Publication, 2018-19

**CIE Assessment:**

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes/mini tests (10 marks)
- Assignment (10 marks)

**SEE Assessment:**

- i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.
- ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.
- iii. One question must be set from each unit. The duration of examination is 3 hours.

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

High-3, Medium-2, Low-1

Course Title	SAMSKRUTHIKA KANNADA	Semester	04
Course Code	MVJ20SK39	CIE	50
Total No. of Contact Hours	20	SEE	50
No. of Contact Hours/week	1 (L: T: P 1:0:0)	Total	100
Credits	1	Exam. Duration	2 Hrs

**Course Objective :** This course will enable students to understand Kannada and communicate in Kannada language

- Samskruthika Kannada –Parichaya (Introduction to Adalitha kannada )
- Kannada Kavyagala parichaya (Kannada D Ra Bendre, Siddalingaiha)
- Adalithdalli Kannada Padagalu (Kannada Kagunitha Balake, Patra Lekhana, Prabhandha)
- Kannada Computer Gnyana (Kannada Shabdha Sangraha, Computer Paribashika padagalu)
- Activities in Kannada.

<b>Module 1</b>	L1	4 Hours
<p>೧. ಕನ್ನಡ ಭಾಷೆ-ಸಂಕ್ಷಿಪ್ತ ವಿವರಣೆ. ಶಾವಣ ಮತ್ತು ಬೆಳ್ಳಿಯ ಹಾಡು (ಕವನಗಳು), ಆಡಳಿತ ಭಾಷೆ ಕನ್ನಡ, ಆಡಳಿತ ಭಾಷೆಯ ಲಕ್ಷಣಗಳು, ಆಡಳಿತ ಭಾಷೆಯ ಪ್ರಯೋಜನಗಳು.</p> <p>೨. ಭಾಷಾ ಪ್ರಯೋಗದಲ್ಲಾಗುವ ಲೋಪದೋಷಗಳು ಮತ್ತು ಅವುಗಳ ನಿವಾರಣೆ ಕಾಗುಣಿತದ ತಪ್ಪು ಬಳಕೆ ಹಾಗೂ ಅವುಗಳ ನಿವಾರಣೆ, ಅಲ್ಪಪ್ರಾಣ ಮತ್ತು ಮಹಾಪ್ರಾಣ, ವಿಶೇಷಣ ಹಾಗೂ ವಿಶೇಷ್ಯ, ನಾಮಪದಗಳು, ಗೌರವ ಸೂಚಕಗಳ ಬಳಕೆ, ಅನಾವಶ್ಯಕ ಲಿಂಗ ಸೂಚಕ.</p>		
<b>Module 2</b>	L1	4 Hours
<p>೧. ಲೇಖನ ಚಿಹ್ನೆಗಳು ಮತ್ತು ಅವುಗಳ ಉಪಯೋಗ ಪೂರ್ಣ ವಿರಾಮ, ಅಲ್ಪವಿರಾಮ, ವಿವರಣ, ಅರ್ಧವಿರಾಮ, ಪ್ರಶ್ನಾರ್ಥಕ, ಭಾವಸೂಚಕ, ಉದ್ಧರಣ, ಅವಾರಣ ಚಿಹ್ನೆಗಳು</p> <p>೨. ಪತ್ರ ವ್ಯವಹಾರ. ಅರ್ಜಿ, ಖಾಸಗಿ ಪತ್ರ, ವ್ಯವಹಾರಿಕ ಪತ್ರದ ಉದಾಹರಣೆಗಳು.</p>		
<b>Module 3</b>	L1	4 Hours
<p>೧. ಆಡಳಿತ ಪತ್ರಗಳು. ಸಾಮನ್ಯ ಪತ್ರಗಳು, ಸರ್ಕಾರಿ ಪತ್ರಗಳು, ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರಗಳು.</p> <p>೨. ಸರ್ಕಾರದ ಆದೇಶ ಪತ್ರಗಳು ಸರ್ಕಾರಿ ಆದೇಶದ ವಿವರ ರೂಪಗಳು, ಸೂಕ್ತೋಲೆ, ಕಛೇರಿ ಆದೇಶ ಪತ್ರ, ಅಧಿಸೂಚನೆ.</p>		
<b>Module 4</b>	L1	4 Hours
<p>೧. 'ಂಕ್ಷಿಪ್ತ ಪ್ರಬಂಧರಚನೆ, ಪ್ರಬಂಧ ಮತ್ತು ಭಾಷಾಂತರ ಪ್ರಬಂಧದ ವಿವಿಧ ಪ್ರಕಾರಗಳು, ಲಕ್ಷಣ ಮತ್ತು ಬರೆಯುವ ವಿಧಾನಗಳು, ಭಾಷಾಂತರದ ಪ್ರಯೋಜನಗಳು.</p>		

೨. ಕನ್ನಡ ಶಬ್ದಸಂಗ್ರಹ

ಜೋಡುನುಡಿ, ಅನುಕರಣವಾಚಿಗಳು, ಸಮಾನಾರ್ಥಕ ಪದಗಳು, ನಾನಾರ್ಥಗಳು, ವಿರುದ್ಧ ಪದಗಳು, ತತ್ಸಮ-ತದ್ಭವಗಳು, ನುಡಿಗಟ್ಟು, ದ್ವಿರುಕ್ತಿ

Module 5

L1

4 Hours

ಕಂಪ್ಯೂಟರ್ ಹಾಗೂ ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನಕನ್ನಡ ಕೀಲಿಮಣೆ, ಕನ್ನಡ ಟೈಪಿಂಗ್.

ಪಾರಿಭಾಷಿಕ ಆಡಳಿತ ಕನ್ನಡ ಪದಗಳು ಮತ್ತು ತಾಂತ್ರಿಕ/ಕಂಪ್ಯೂಟರ್ ಪಾರಿಭಾಷಿಕ ಪದಗಳು.

ಪದಕೋಶ ಕೈಪಿಡಿ: ಕನ್ನಡದಿಂದ ಇಂಗ್ಲಿಷ್‌ಗೆ, ಇಂಗ್ಲಿಷ್‌ನಿಂದ ಕನ್ನಡಕ್ಕೆ.

ಆಕರ ಗ್ರಂಥ

೧. ಆಡಳಿತ ಕನ್ನಡ (ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡದೊಂದಿಗೆ) -ಡಾ. ಎಂ ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ ಕೇಶವಮೂರ್ತಿ

ಗ್ರಂಥ ಋಣ

೧. ಕನ್ನಡ ನಿಘಂಟು (ಪರಿಷ್ಕೃತ), ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್, ಬೆಂಗಳೂರು.

೨. ಕಾನೂನು ಪದಕೋಶ (ಪರಿಷ್ಕೃತ) ಕನ್ನಡ-ಇಂಗ್ಲಿಷ್, ಕನ್ನಡ ಮತ್ತು ಸಂಸ್ಕೃತಿ ನಿರ್ದೇಶನಾಲಯ, ಬೆಂಗಳೂರು.

೩. ಸಂಕ್ಷಿಪ್ತ ಕನ್ನಡ ಭಾಷೆಯ ಚರಿತ್ರೆ, ಎಂ. ಎಚ್ ಕೃಷ್ಣಯ್ಯ -೧೯೯೩, ಸುವಿದ್ಯಾ ಪ್ರಕಾಶನ, ಬೆಂಗಳೂರು.

೪. ಆಡಳಿತ ಕನ್ನಡ, ಕನ್ನಡ ಅಭಿವೃದ್ಧಿ ಪ್ರಾಧಿಕಾರ ವಿಧಾನಸೌಧ, ಬೆಂಗಳೂರು-೫೬೦೦೦೧, ಮತ್ತು ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.

೫. ಕಂಪ್ಯೂಟರ್ -ತಂತ್ರಜ್ಞಾನ ಪದವಿವರಣ ಕೋಶ, ಟಿ.ಬಿ. ಶ್ರೀನಿಧಿ ಕನ್ನಡ ಅಭಿವೃದ್ಧಿ ಪ್ರಾಧಿಕಾರ ವಿಧಾನಸೌಧ, ಬೆಂಗಳೂರು-೫೬೦೦೦೧

ಕಲಿಕೆಯ ಫಲಿತಾಂಶಗಳು

೧. ಕನ್ನಡ ಕವಿಗಳ ಪರಿಚಯ, ಕನ್ನಡ ಭಾಷಾ ಶ್ರೀಮಂತಿಕೆ ಹಾಗೂ ಸಾಹಿತ್ಯದ ಒಲವು, ಕನ್ನಡ ಬರವಣಿಗೆಯಲ್ಲಿನ ಶುದ್ಧತೆ.

೨. ಲೇಖನ ಚಿಹ್ನೆಗಳ ಪರಿಚಯ ಹಾಗೂ ಅವುಗಳ ಉಪಯೋಗ, ಪತ್ರ ವ್ಯವಹಾರದ ಅರಿವು.

೩. ಸರ್ಕಾರಿ ಪತ್ರಗಳು ಹಾಗೂ ಅವುಗಳ ಮಾಧರಿಗಳ ಪರಿಚಯ.

೪. ಶ್ರೇಷ್ಠ ವ್ಯಕ್ತಿಗಳ ಜೀವನ ಶೈಲಿಯ ಪರಿಚಯ ಹಾಗೂ ಸ್ಫೂರ್ತಿ, ಭಾಷಾಂತರದ ಮೌಲ್ಯದ ಅರಿವು.

೫. ತಂತ್ರಜ್ಞಾನದಲ್ಲಿ ಕನ್ನಡದ ಭಾಷ ಬಳಕೆ.

CIE Assessment:

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation.

Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

SEE Assessment:

i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory

and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.

ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.

iii. One question must be set from each unit. The duration of examination is 2 hours.