MVJCE CURRICULUM

FOR

COMPUTER SCIENCE & ENGINEERING(Scheme 2020)

IV SEMESTER

Course Title	**OPERATIONS RESEARCH, NUMERICAL AND STATISTICAL METHODS**	Semester	IV
Course Code	MVJ20MCS41	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	**Exam. Duration**	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)
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)
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)
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)
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)
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.
CO5	Fit a suitable curve by the method of least squares and determine the lines of regression for a

	set of statistical data.
Text Books:	
1.	B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition, 2013.
2.	Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley –India publishers, 10thedition,2014.

Reference Books:	
1.	Ramana B. V., "Higher Engineering Mathematics", Tata Mc Graw –Hill, 2006.
2.	Bali N. P. & Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 8th Edition
3	Jain R. K. & Iyengar S.R.K., Advanced Engineering Mathematics, Narosa Publishing House, 2002.
4	S. D. Sharma, "Operations Research", Kedar Nath and Ram NathPublishers, Seventh Revised Edition 2014.

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	-	3	-	-	-	-	-	-	-	1	1	-
CO2	3	2	-	3	-	-	-	-	-	-	-	-	-	1
CO3	3	3	-	2	-	-	-	-	-	-	-	-	2	-
CO4	2	3	-	3	-	-	-	-	-	-	-	1	-	-
CO5	3	3	-	3	-	-	-	-	-	-	-	1	2	-

High–3, Medium–2, Low–1

Course Title	**ANALYSIS AND DESIGN OF ALGORITHMS**	Semester	04

Course Code	MVJ20CS42	CIE	50
Total No. of Contact Hours	50	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 3 : 2 : 0)	Total	100
Credits	4	**Exam. Duration**	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 (Ω), Theta notation (Θ), 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/

Module–4	L3,L4 , L6	**Hours 10**

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.

Laboratory Sessions/ Experimental learning: Solving real time problems using Dynamic Programming.

Applications: Computer Networks.

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

Module–5	L4,L5 ,L6	**Hours 10**

Backtracking: 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.

LC Programme and Bound solution : FIFO Programme and Bound solution. NP–Complete and NP–Hard problems: Basic concepts, non–deterministic algorithms, P, NP, NP–Complete, and NP–Hard classes.

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

Applications: To solve puzzles such as crosswords, Sudoku etc.

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

Course Outcomes:

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.

Text Books:

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.

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

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:

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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

Course Title	**SOFTWARE ENGINEERING**	Semester	04
Course Code	MVJ20CS43	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	**Exam. Duration**	3 Hours

Course objective is to: ***The students will be able to***

- Understand principles, concepts, methods, and techniques of the software engineering approach to producing quality software (particularly for large, complex systems).
- Impart skills in the design and implementation of efficient software systems across disciplines.
- Familiarize engineering practices and standards used in developing software products and components.
- Gather knowledge on various software testing, maintenance methods.

Module–1	L1,L2, L3	**Hours 8**

FUNDAMENTALS OF SOFTWARE ENGINEERING AND REQUIREMENTS ENGINEERING: Software Engineering Fundamentals; Software processes: Software life–cycle models; Software requirements and specifications: Requirements elicitation; Requirements analysis modeling techniques; Functional and non–functional requirements; User requirements, System requirements, requirement validation and software requirement specification document. Prototyping – Basic concepts of formal specification techniques.

Laboratory Sessions/ Experimental learning:

To write the SRS for the given real time application using report writing tools.

Applications: In Software development process.

Video link / Additional online information: https://nptel.ac.in/courses/106105182/

Module–2	L1,L2, L3	**Hours 8**

SOFTWARE DESIGN: Fundamental design concepts and principles; Design characteristics; System Models – Context, Behavioral, Data and, Object models, Architectural design– System structuring, Control models; Structured design; Object–oriented analysis and design; User interface design; Design for reuse; Design patterns;

Laboratory Sessions/ Experimental learning:

Draw a class diagram, object diagram, Use case diagram, Sequence diagram and activity diagram for the given real time application using rational rose tool.

Applications: In Software development process.

Video link / Additional online information:

https://www.coursera.org/lecture/client-needs-and-software-requirements/3-2-4-use-cases-bZNCr

Module–3	L1,L2, L3	**Hours 8**

SOFTWARE VALIDATION AND MAINTENANCE :

Software validation: Validation planning; Testing fundamentals, including test plan creation and test case generation; Black–box and white–box testing techniques; Unit, integration, validation, and system testing; Object–oriented testing; Inspections.

Software evolution: Software maintenance; Characteristics of maintainable software; Reengineering; Legacy systems; Software reuse.

Laboratory Sessions/ Experimental learning:

Using Selenium IDE write a test suite containing minimum 4 test cases. **Applications:** In Software development process. **Video link / Additional online information:** https://www.youtube.com/watch?v=T3q6QcCQZQg		
Module–4	L1,L2, L3	**Hours 8**
COMPONENT BASED SOFTWARE ENGINEERING : Engineering of Component–Based Systems; The CBSE Process; Domain Engineering; Component–Based Development; Classifying and Retrieving Components; Economics of CBSE **Laboratory Sessions/ Experimental learning:** Create a project using MS projects for any real time scenario. **Applications:** In Software development process. **Video link / Additional online information:** https://youtu.be/tIZ1dg4pxCE		
Module–5	L1,L2, L3	**Hours 8**
SOFTWARE QUALITY PROCESS IMPROVEMENT : Overview of Quality management and Process Improvement; Overview of SEI –CMM, ISO 9000, CMMI, PCMM, TQM and Six Sigma; overview of CASE tools. Software tools and environments: Programming environments; Project management tools; Requirements analysis and design modelling tools; testing tools; Configuration management tools; **Laboratory Sessions/ Experimental learning:** Estimation of test coverage metrics using manual test metrics. **Applications:** In Software development process. **Video link / Additional online information:** https://nptel.ac.in/courses/110105039/		

Course Outcomes:	
CO1	Comprehend software development life cycle and Prepare SRS document for a project
CO2	Apply software design and development techniques
CO3	Identify verification and validation methods in a software engineering project
CO4	Apply on Component based software development process.
CO5	Involve in continuous learning to solve issues of process and software product using the advanced CASE tools and techniques.

Text Books:	
1	Ian Sommerville, "Software Engineering", 9th Edition, Addison– Wesley, 2011
2	R. S. Pressman, Software Engineering, a practitioner's approach, McGraw Hill,7th Edition, 2010
Reference Books:	
1	Rajib Mall, "Fundamentals of Software Engineering", PHI Publication, 3rd edition, 2009
2	Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.

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	2	2	2	2	2	-	-	1	2	2	2	-	2	-
CO2	2	2	2	2	2	1	-	1	2	2	2	1	2	2
CO3	2	2	2	2	2	1	-	1	2	2	2	-	3	-
CO4	1	2	2	2	2	1	-	1	2	2	2	1	2	2
CO5	1	2	2	1	2	1	2	1	2	2	2	2	1	-

High–3, Medium–2, Low–1

Course Title	**PYTHON PROGRAMMING**	Semester	03
Course Code	MVJ20CS44	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3(L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	**Exam. Duration**	3 Hours

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

- Familiarize the students with the fundamentals and programming basics of Python Language

Module–1	L2	**Hours 8**

Prerequisites : Knowledge of C Programming is required

Introduction to Python: Features of python, Applications of python, Syntax, Comments, Indentations, Number types, Variables and Data Types, Operators, conditional statement, Loops in Python.

Python List: Create Python List, Access Python List, Slicing a Python List, slicing and dicing, Reassigning a Python List (Mutable), Reassigning the whole Python list, Deleting list and elements, Multidimensional Lists, List Operations, Built–in List Functions.		
Module–2	L2, L3	**Hours 8**
Python Tuple: Create a Python Tuple, Tuples Packing, Tuples Unpacking, Creating a tuple with a single item, Access Python Tuple, Slicing a Tuple, Deleting a Python Tuple, Reassigning Tuples, Tuple Functions Tuple Operations. **Python Dictionary:** Create a Dictionary, Dictionaries with mixed keys, Access a Python Dictionary, Delete Python Dictionary, In–Built Functions on a Python Dictionary, In–Built Methods on a Python Dictionary, Dictionary Operations.		
Module–3	L2, L3	**Hours 8**
Python Function: User–Defined Functions in Python, Python Built–in Functions, Python Lambda Expressions, Recursion Function, Range function. **Python Method:** Introduction to Method, __init_(), Self Parameter, Functions vs Method, Magic Methods		
Module–4	L2, L3	**Hours 8**
Python Class: Introduction to Python Class, Defining a Python Class, Accessing Python Class Members Python Object Attributes Belonging to Python Class, Delete Python Class, Attribute, Inheritance, Multiple inheritance.		
Module–5	L2	**Hours 8**
File Handling In Python: Read and Write File, Open File, Close File, File Methods, Data Base connections.		

Course Outcomes:	
CO1	Understand data types (like character strings, integers, and real numbers)and the Operations that can be Applied to each data type.
CO2	Write programs that get input, perform calculations, and provide output (using Conditional logic, loops, Functions).
CO3	Write well designed and well documented programs that are easily maintainable
CO4	Analyze String Formatting Options.
CO5	Enjoy the art and science of computer files using python.

Text Books:	
1	Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser Data Structures and Algorithms in PythonJohn Wiley & Sons, Incorporated.
2	Frank Kane (2017)Hands–On Data Science and Python Machine Learning 1st Edition, Kindle Edition.

Reference Books:

1	Mark Smart,(2018), Introduction to Data Science with Python: Basics of Numpy and Pandas.
2	VK Jain,Data Science & Analytics, Khanna Book Publishing ;edition (2018)

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	3	3	2	2	-	-	-	-	-	-	-	1	2	-
CO2	3	3	2	2	-	-	-	-	-	-	-	1	2	-
CO3	3	3	3	2	-	-	-	-	-	-	-	1	2	-
CO4	3	3	2	2	-	-	-	-	-	-	-	1	2	-
CO5	3	3	3	2	-	-	-	-	-	-	-	1	1	2

High–3, Medium–2, Low–1

Course Title	**MICRO CONTROLLER AND EMBEDDED SYSTEMS**	Semester	04
Course Code	MVJ20CS45	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3(L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	**Exam. Duration**	3 Hours

Course objective is to: ***The students will be able to***

- Explain the fundamentals of ARM based system, basic hardware components, selection methods and attributes of an ARM Controller.
- Program ARM controller using the various instructions.
- Explain the fundamentals of Exception, Interrupt Handling and Memory Management Unit of ARM Controller.
- Identify the Embedded System Design applications.
- Explain the real time operating system for the embedded system design.

Module–1	L1,L2, L3	**Hours 8**

Arm Embedded Systems

Prerequisites: **ARM DESIGN PHILOSOPHY,ARM DATAFLOW MODEL**

Microprocessors versus Microcontrollers, ARM Embedded Systems: The RISC design philosophy,

The ARM Design Philosophy, Embedded System Hardware, Embedded System Software.

ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table , Core Extensions

Activity:1.Comparision of Microprocessor and Microcontroller hardware Model

2.Comparing the Microprocessor and Microcontroller Software Model

Module–2	L1,L2, L3	**Hours 8**

ARM Instruction Set and Programming

Prerequisites: **ARM INSTRUCTION SET,ARM ASSEMBLY PROGRAMMING**

Introduction to the ARM Instruction Set : Data Processing Instructions , Programme Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants

ARM programming using Assembly language: Writing Assembly code, Profiling and cycle counting, instruction scheduling

Activity: 1.Writing ARM Assembly program for Embedded System Applications

Module–3	L1,L2, L3	**Hours 8**

Interrupt and Memory Management Unit:

*Prerequisites :*Interrupt, Exception, **Memory Management unit**

Exception, Interrupt Handling : Exception handling, Interrupts, Interrupt handling Schemes

Memory Management Unit : The Memory Hierarchy and Cache Memory, Cache Architecture, Cache Policy, Moving from MPU to an MMU, How Virtual Memory Works, Details of ARM MMU

Activity:

1) Use of External interrupt0 to turn ON/OFF led connected to Pin P1.25 of ARM Processor.
2) Use of Software Interrupt SWI instruction in programming.
3) Calculating physical memory address from logical address.

Module–4	L1,L2, L3	**Hours 8**

Prerequisites: Embedded systems ,Embedded Applications

Embedded System Components: Embedded Vs General computing system, History of embedded systems, Classification of Embedded systems, Major applications areas of embedded systems, purpose of embedded systems

Core of an Embedded System including all types of processor/controller, Memory, Sensors, Actuators, LED, 7 segment LED display, stepper motor, Keyboard, Push button switch, Communica tion Interface (on board and external types), Embedded firmware, Other system components.

Activity:Case Study – Digital Clock, Battery operated Smartcard Reader

Module–5	L1,L2, L3	**Hours 8**

Prerequisites: Real time operating system

Real Time Operating System (RTOS) based Embedded System Design:

Operating System basics, Types of operating systems, Task, process and threads (Only POSIX Threads with an example program), Thread pre–emption, Multiprocessing and Multitasking, Task

Communication (without any program), Task synchronization issues Racing and Deadlock, Concept of Binary and counting semaphores (Mutex example without any program), How to choose an RTOS **Activity:** Case Study: Automated Meter Reading System (AMR) and Digital Camera, Real time concepts

Course outcomes:	
CO1	Describe the architectural features and instructions of ARM microcontroller
CO2	Develop Assembly Programs in ARM for Embedded applications.
CO3	Describe the fundamentals of Exception, Interrupt Handling and Memory Management Unit of ARM Controller
CO4	Interface external devices and I/O with ARM microcontroller.
CO5	Demonstrate the need of real time operating system for embedded system applications

Text Books:	
1	Andrew N Sloss, Dominic Symes and Chris Wright, ARM system developer's guide, Elsevier, Morgan Kaufman publishers, 2008.
2	Shibu K V, "Introduction to Embedded Systems", Tata McGraw Hill Education, Private Limited, 2nd Edition.

Reference Books:	
1	Raghunandan.G.H, Microcontroller (ARM) and Embedded System, Cengage learning Publication, 2019
2	The Insider's Guide to the ARM7 Based Microcontrollers, Hitex Ltd., 1st edition, 2005.
3	Raj Kamal, Embedded System, Tata McGraw–Hill Publishers, 2nd Edition, 2008.

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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

Course Title	**ARTIFICIAL INTELLIGENCE**	Semester	04
Course Code	MVJ20CS46	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	**Exam. Duration**	3 Hours

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

- Describe the basic principles, techniques, and applications of Artificial Intelligence
- Analyze and explain different AI learning methods.
- Compare and contrast different AI techniques available.

Module–1	L1,L2	**Hours 8**

INTRODUCTION: What Is AI? The Foundations of Artificial Intelligence ,The History of Artificial Intelligence, The State of the Art .

Intelligent Agents : Agents and Environments ,Good Behavior: The Concept of Rationality ,The Nature of Environments, The Structure of Agents. Knowledge Representation Issues, Using Predicate Logic, Representing knowledge using Rules.

Experimental Learning: Implementation of Relational and Inheritable Knowledge

Video Links

- https://www.youtube.com/watch?v=3MW3ICnkQ9k

Module–2	L1,L2 , L3	**Hours 8**

PROLOG– The natural Language of Artificial Intelligence: Introduction, Converting English to Prolog Facts and Rules, Goals, Prolog Terminology, Variables, Control Structures, Arithmetic operators, Matching in Prolog, Backtracking, Cuts, Recursion, Lists, Dynamic databases, Input/Output and Streams

Using Predicate Logic: Representing simple facts in logic, representing instance and ISA relationships, Computable Functions and Predicates, Resolution, Natural Deduction.

Experimental Learning:

Implementing programs in PROLOG to solve problems of Predicate Logic

Video Links:

- https://www.youtube.com/watch?v=pzUBrJLIESU
- https://www.youtube.com/watch?v=2juspgYR7as
- https://www.youtube.com/watch?v=h9jLWM2lFr0
- https://www.youtube.com/watch?v=-v1K9AnkAeM

Module-3	L1 , L2 , L3	**Hours 8**

Heuristic search techniques: Generate and test, Hill Climbing, Best First Search, Problem Reduction, Constraint Satisfaction, Means-ends Analysis.

Weak Slot- and- **Filler Structures:** Semantic Nets ,Frames.

Strong slot-and Filler Structures- Conceptual Dependency, Scripts.

Experimental Learning :

Program to implement Best first Search, A*, AO* algorithm

Video Links:

- https://www.youtube.com/watch?v=ieZr_TpRwnQ
- https://www.youtube.com/watch?v=lCrHYT_EhDs

Module-4	L1,L2 ,L3	**Hours 8**

Game Playing : Overview, Minimax Search Procedure, Adding alpha beta cut off, Additional Refinements, Iterative Deepening, References on Specific games.

Learning: What is learning?, Forms of learning, Rote learning, learning by taking advice, Learning in problem solving, Induction leaning, Explanation based learning, Discovery, Analogy, Formal learning Theory, Neural Network Learning.

Experimental Learning :

Real time problem solving using Game Playing

Video Links:

- https://www.youtube.com/watch?v=_i-lZcbWkps
- https://www.youtube.com/watch?v=l-hh51ncgDI

Module-5	L1,L2 ,L3	**Hours 8**

Natural Language Processing: Syntactic Processing, Semantic Analysis, Discourse and Pragmatic processing, Statistical Natural language processing and Spell checking.

Genetic Algorithms: A peek into the biological world, Genetic Algorithms(GAs),Significance of genetic operators, termination parameters, niching and speciation, evolving neural network, theoretical grounding.

Experimental Learning :

Program to implement spell checking problem

Video Links:

- https://www.youtube.com/watch?v=zG8AJhVy5NY
- https://www.youtube.com/watch?v=Z_8MpZeMdD4

Course Outcomes:	
CO1	Identify AI based problems and understand Intelligent agents
CO2	Apply predicate logic and heuristic techniques to solve AI problems.
CO3	Understand the different representation of knowledge.
CO4	Understand the concepts of learning and Natural Language Processing.
CO5	Understand Genetic Algorithms and solve AI problems using PROLOG.

Text Books:	
1	Artificial Intelligence: A Modern Approach, Stuart Rusell, Peter Norving, Pearson Education 2nd Edition.
2	E. Rich , K. Knight & S. B. Nair – Artificial Intelligence, 3/e, McGraw Hill.
Reference Books:	
1	Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems Prentice Hal of India.
2	G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem Solving", Fourth Edition, Pearson Education, 2002.
3	N.P. Padhy "Artificial Intelligence and Intelligent Systems" , Oxford University Press-2015

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	2	3	1	2	-	-	-	-	-	-	-	2	1	-
CO2	3	3	2	3	1	-	-	-	-	-	-	2	2	2
CO3	3	3	2	3	1	-	-	-	-	-	-	2	3	-
CO4	3	3	2	3	2	-	-	-	-	-	-	2	3	-
CO5	3	3	2	3	2	-	-	-	-	-	-	2	3	1

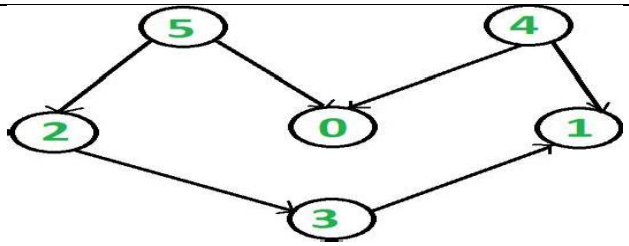
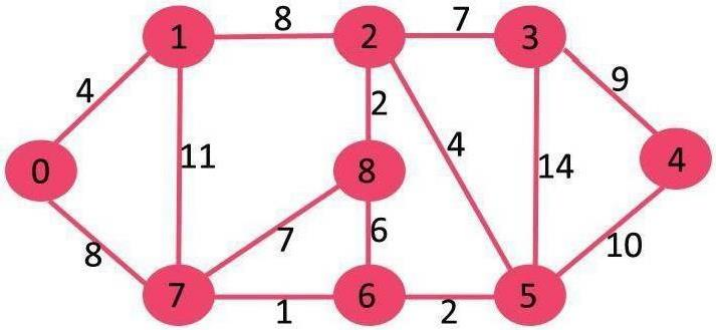
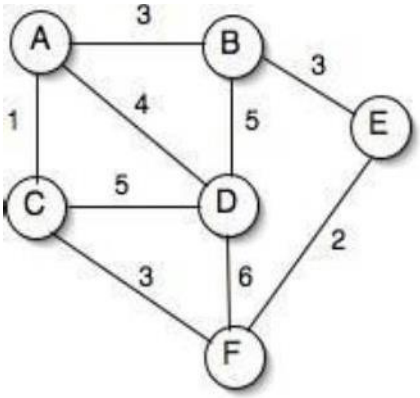
High–3, Medium–2, Low–1

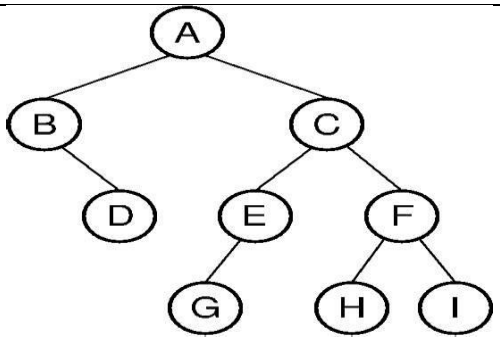
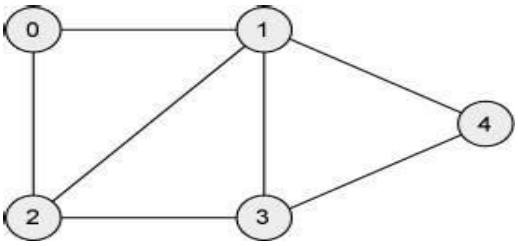
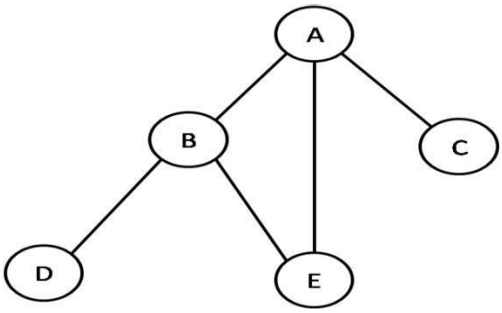
Course Title	**ANALYSIS AND DESIGN OF ALGORITHMS LAB USING** PYTHON	Semester	04
Course Code	MVJ20CSL47	CIE	50
Total No. of Contact Hours	30	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 0 : 2 : 2)	Total	100
Credits	2	**Exam. Duration**	3 Hours

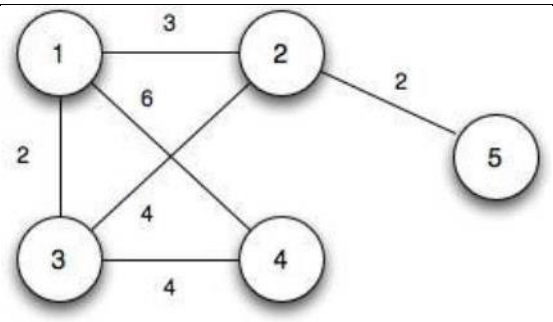
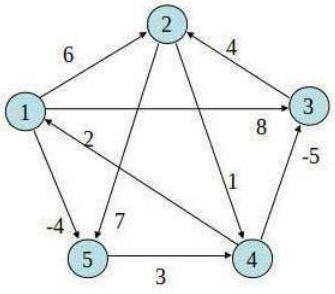
Course objective is to: ***This course will enable students to***

- Learn how to analyze a problem and design the solution for the problem.
- Design and implement efficient python programming for a specified application.
- Identify and apply the suitable algorithm for the given real world problem.

S No	**Experiment Name**	**RBT** Level	Hours
1	Sort a given set of elements using the quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the 1st to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.	L3	3
2	Implement merge sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.	L3	3
3	a) Obtain the Topological ordering of vertices in a given digraph.	L3	3

	 b) Compute the transitive closure of a given directed graph using Warshall's algorithm.		
4	Implement 0/1 Knapsack problem using Dynamic Programming.	L3	3
5	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.  	L3	3
6	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.  	L3	3
7	Perform various tree traversal algorithms for a given tree.	L3	3

			
8	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
9	Find a subset of a given set S = {sl, s2,....,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1, 2, 6} and {1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.	L3	3
10	Implement any scheme to find the optimal solution for the Travelling Sales Person problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.	L3	3
11	Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.	L3	3

			
12	Implement All–Pairs Shortest Paths Problem using Floyd's algorithm.  1 2 3 4 5 1 0 6 8 ∞ -4 2 ∞ 0 ∞ 1 7 3 ∞ 4 0 ∞ ∞ 4 2 ∞ -5 0 ∞ 5 ∞ ∞ ∞ 3 0	L3	3
13	Implement N Queen's problem using Back Tracking.	L3	3

Course Outcomes:	
CO1	Understand the basic concepts of python and Implement Quick sort, Merge sort and Warshall's algorithm.
CO2	Implement Dynamic Programming algorithm for the 0/1 Knapsack problem and greedy algorithm for job sequencing with deadlines.
CO3	Implement Dijkstra's, Prim's, Kruskal's algorithm on spanning tree.
CO4	Implement Tree Traversal and Graph Traversals techniques using BFS and DFS.
CO5	Implement Floyd's algorithm for the all pair's shortest path problem and N–queens problem.

Reference Books:	
1	Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education).
2	http://jeffe.cs.illinois.edu/teaching/algorithms/
3	Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser Data Structures and Algorithms in Python John Wiley & Sons, Incorporated.

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

Course Title	**MICRO CONTROLLER AND EMBEDDED SYSTEMS LAB**	Semester	04
Course Code	MVJ20CSL48	CIE	50
Total No. of Contact Hours	30	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 0 : 2 : 2)	Total	100
Credits	2	**Exam. Duration**	3 Hours

Course objective is to: ***The students will be able to***

- Demonstrate various real time application using ARM Microcontroller hardware
- Develop programming languages for any real time scenario using Arm Microcontroller

S No	**Experiment Name**	**RBT Level**	Hours
1	Write a program to find the sum of first 10 integer numbers.	L3	3
2	Write a program to find factorial of a number.	L3	3
3	Write a program to add an array of 16 bit numbers and store the 32 bit result in internal RAM	L3	3
4	Write a program to find the square of a number (1 to 10) using look–up table.	L3	3
5	Write a program to find the largest/smallest number in an array of 32	L3	3

	numbers.		
6	Write a program to arrange a series of 32 bit numbers in ascending/descending order	L3	3
7	Write a program to count the number of ones and zeros in two consecutive memory locations	L3	3
8	Write an ARM assembly program that checks if a 32−bit number is a palindrome. Assume that the input is available in r 3. The program should set r 4 to 1 if it is a palindrome, otherwise r 4 should have 0. A palindrome is a number which is the same when read from both sides. For example, 1001 is a 4 bit palindrome.	L3	3
9	Display "Hello World" message using Internal UART	L3	3
10	Interface and Control a DC Motor	L3	3
11	Interface a Stepper motor and rotate it in clockwise and anti−clockwise direction	L3	3
12	Interface a DAC and generate Triangular and Square waveforms.	L3	3
13	Display the Hex digits 0 to F on a 7−segment LED interface, with an appropriate delay in Between	L3	3
	STUDY EXPERIMENT Interface a 4x4 keyboard and display the key code on an LCD	L3	3

Course Outcomes:	
CO1	Develop and test Program using ARM7TDMI/LPC2148 for Real time Scenario's.
CO2	Conduct the experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision−4 tool/compiler and design Real time Embedded Applications.

Reference Books:	
1	Raghunandan.G.H, Microcontroller (ARM) and Embedded System, Cengage learning Publication, 2019
2	The Insider's Guide to the ARM7 Based Microcontrollers, Hitex Ltd., 1st edition, 2005.

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	3	-	-	3	-	3	2	1	-
CO2	3	3	2	-	3	3	-	-	3	-	3	2	2	2

High–3, Medium–2, Low–1

Course Title	**BALIKE KANNADA**	Semester	IV
Course Code	MVJ20BK39	CIE	50
Total No. of Contact Hours	14	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

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

Module–1	**L1 &** L2	1 Hour

Vyavharika Kannada: Necessity of learning a local language, Tips to learn the language with easy methods, Hints for correct and polite conversation, About Kannada language (Kannada Bhase)

Experiential Learning:

1. Listen to Kannada news and watch Kannada movies
2. Use online applications (apps) for faster learning.

Video Links: https://youtu.be/fd966GC8Yko		
Module–2	**L1 &** L2	**5** Hours
Kannada Alphabets And Pronounciation:Kannada Aksharamaale(Vowels, consonants & Unstructured consonants),Kannada stress letters, Kannada Khagunitha,Pronounciation (Swaragala Uchcharane,Vyanjangala Ucharane),Exercises Experiential Learning: 1.Based on the above topics Exercises Video Links: https://youtu.be/RuRmq7VyCaQ		
Module–3	**L1 &** L2	**5** Hours
Sambhasanegaagi Kannada Padagalu:Introduction,Ekaavachana Mattu Bhavuvachana,Linga (Gender),Prashnarthaka padagalu(Interrogative words),Viruddha Padagalu (Antonyms),Asamanjasa Ucharane (Inappropriate Pronunciations),Sankya vyavasthe (Numbers System) , List of Vegetables,Bhinnamshagalu (Fractions) ,Menu of famous food items in Karnataka , aahara Padarthgala hesaragalu (Names of the Food Items),Samay /Kalakke Sambhandhisida padagalu (Words Relating to Time),Dikkugalige sambhasidhisida padagalu(words Related to Directions),Manushyana Bhavanegalige sambhadhisida Padagalu (Words Related to Humen's Feelings and Emotions),Manushyana shareerada bhagagalu (Parts of the Human Body),Sambhandhisida sambhandhakke padagalu (Words Related to Relationship), Vasad stalakke sambhandhisida padagalu (Words Related to Place of Living), Saamanya Sambhasaneyalli bhalasuvantha Padagala Patti (List of Words used in the general communication) & Colors in Kannada Experiential Learning:1.Based on the above topics Exercises Video Links: https://youtu.be/PoQ9m16d7QA		
Module–4	**L1 &** L2	**8** Hours
Kannada Grammer in Conversations (Sambhasaneyalli Kannada Vyakarna):Introduction , Nouns (Naampadagalu), Pronoun (Sarvanaampadagalu) , Use of Pronouns in Kannada Sentences , Adjectives(Kannada nama Vishenegalu) , Kannada Verbs (Kriya Padagalu) , Adverbs in Kannada (Kriya Vishenegalu), Conjuctions in Kannada (Sanyaga) , Preposition in Kannada (Poorvabhavi). Experiential Learning: Questions constructing words in Kannada (Prashnarthaka Padagalu) Simple Communicative Sentences in Kannada Exercise for Practice Enquiry Questions Video Links: https://youtu.be/fd966GC8Yko		
Module–5	**L1 &** L2	1 Hour
Activies in Kannada (Kannadadalli Chatuvatikegalu): Activites Vocubulry		

(Shabdakosh),Conversation (Shambhasane)

Experiential Learning: Try to communicate with each other in Kannada

Video Links: https://youtu.be/fd966GC8Yko

Course outcomes:	
CO1	Understanding the advantage of learning a local language
CO2	Understanding the difference between pronunciation of English and Kannada
CO3	Understanding the word meaning in Kannada and frame the simple sentences if any difficulty can use any other language words to complete the conversation
CO4	Understanding the word meaning and frame the sentences and try to translate Kannada to English vise versa
CO5	Understanding the Kannada grammar and how to implement in Kannada sentences for communication

Text Books:	
1	Sankispta Kannada Nighantu (Parishkratha), Kannada sahitya Parishatha,Bangalore
2	Mysore vishwavidyalayada English Kannada Nighantu (Parishkratha) samputa (A inda Z varage)
3	Kacheri Kaipidi Dr .Ha .Ma. Nayak, Kannada Adhyana samsthe . Mysorevishwavidyalayada ,1974
Reference Books:	
1	Vyavharika Kannada Patya Pusthaka by L.Thimmesha

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

Course Title	**ADDITIONAL MATHEMATICS–II**	Semester	IV
Course Code	MVJ20MDSDIP41	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4	Total	100
Credits	-	**Exam. Duration**	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–Dimentional 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=PLMLsjhQWWlUqBoTCQDtYlloI -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/

Module-4	L1,L2,L3	8 Hrs.

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

Module-5	L1,L2	8 Hrs.

Partial Differential equation: 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.studyyaar.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, 43rd Edition, 2013.
2.	Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley –India publishers, 10thedition,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

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.

Module 1	L1	4 Hours

೧. ಕನ್ನಡ ಭಾಷೆ-ಸಂಕ್ಷಿಪ್ತ ವಿವರಣೆ.
ಶ್ರಾವಣ ಮತ್ತು ಬೆಲ್ಚಿಯ ಹಾಡು (ಕವನಗಳು), ಆಡಳಿತ ಭಾಷೆ ಕನ್ನಡ, ಆಡಳಿತ ಭಾಷೆಯ ಲಕ್ಷಣಗಳು, ಆಡಳಿತ ಭಾಷೆಯ ಪ್ರಯೋಜನಗಳು.

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.

Module 2	L1	4 Hours

೧. ೀಖನ ಚಿಹ್ನೆಗಳು ಮತ್ತು ಅವುಗಳ ಉಪಯೋಗ
ಪೂರ್ಣ ವಿರಾಮ, ಅಲ್ಪವಿರಾಮ, ವಿವರಣ, ಅರ್ಧವಿರಾಮ, ಪ್ರಶ್ನಾರ್ಥಕ, ಭಾವಸೂಚಕ, ಉದ್ಧರಣ, ಅವಾರಣ ಚಿಹ್ನೆಗಳು

೨. ಪತ್ರ ವ್ಯವಹಾರ.
ಅರ್ಜಿ, ಖಾಸಗಿ ಪತ್ರ, ವ್ಯವಹಾರಿಕ ಪತ್ರದ ಉದಾಹರಣೆಗಳು.

Module 3	L1	4 Hours

೧. ಆಡಳಿತ ಪತ್ರಗಳು.
ಸಾಮನ್ಯ ಪತ್ರಗಳು, ಸರ್ಕಾರಿ ಪತ್ರಗಳು, ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರಗಳು.

೨. ಸರ್ಕಾರದ ಆದೇಶ ಪತ್ರಗಳು
ಸರ್ಕಾರಿ ಆದೇಶದ ವಿವಧ ರೂಪಗಳು, ಸೂತ್ತೋಲೆ, ಕಛೇರಿ ಆದೇಶ ಪತ್ರ, ಅಧಿಸೂಚನೆ.

Module 4	L1	4 Hours

೧. ಂಕ್ಷಿಪ್ತ ಪ್ರಬಂಧರಚನೆ, ಪ್ರಬಂಧ ಮತ್ತು ಭಾಷಾಂತರ
ಪ್ರಬಂಧದ ವಿವಿಧ ಪ್ರಕಾರಗಳು, ಲಕ್ಷಣ ಮತ್ತು ಬರೆಯುವ ವಿಧಾನಗಳು, ಭಾಷಾಂತರದ ಪ್ರಯೋಜನಗಳು.

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-ಇಂಗ್ಲೀಷ್, ಕನ್ನಡ ಮತ್ತು ಸಂಸ್ಕೃತಿ ನಿರ್ದೇಶನಾಲಯ, ಬೆಂಗಳೂರು.
೩.	ಸಂಕ್ಷೀಪ್ತ ಕನ್ನಡ ಭಾಷೆಯ ಚರಿತ್ರೆ, ಎಂ. ಎಚ್ ಕೃಷ್ಣಯ್ಯ -೧೯೯೩, ಸುವಿದ್ಯಾ ಪ್ರಕಾಶನ, ಬೆಂಗಳೂರು.
೪.	ಆಡಳಿತ ಕನ್ನಡ, ಕನ್ನಡ ಅಭಿವೃದ್ಧಿ ಪ್ರಾಧಿಕಾರ ವಿಧಾನಸೌಧ, ಬೆಂಗಳೂರು-೫೬೦೦೧, ಮತ್ತು ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
೫.	ಕಂಪ್ಯೂಟರ್ –ತಂತ್ರಜ್ಞಾನ ಪದವಿವರಣ ಕೋಶ, ಟಿ.ಜಿ. ಶ್ರೀನಿಧಿ ಕನ್ನಡ ಅಭಿವೃದ್ಧಿ ಪ್ರಾಧಿಕಾರ ವಿಧಾನಸೌಧ, ಬೆಂಗಳೂರು-೫೬೦೦೧

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 ಸ್ಪೂರ್ತಿ, 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.