

*B. N. M. Institute of Technology*

An Autonomous Institution under VTU

**Department of Information Science & Engineering**

# **Syllabus**

**Semester: III****Course: Fourier Transform, Numerical Methods and Linear Algebra****Course Code: 21MAI131**

<b>L:T:P:J</b>	<b>2:2:0:0</b>	<b>CIA</b>	<b>:</b>	<b>50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>:</b>	<b>50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration</b>	<b>:</b>	<b>03 Hours</b>

Course Learning Objectives: The students will be able to

1. Have an insight into Fourier series, Fourier transforms.
2. Develop knowledge of solving ODE's arising in engineering applications, using numerical methods.
3. Develop knowledge Fundamentals of logic and Relations, Vector Spaces & Linear Transformation arising in engineering.

<b>Module-1: Fourier Series &amp; Fourier Transforms</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
Fourier series: Periodic functions, Introduction to Fourier Series, Dirichlet's condition. Problems on Fourier series over $(-\infty, \infty)$ . Fourier Transforms: Introduction to infinite Fourier transform, Fourier sine and cosine transform and properties, problems on infinite Fourier transform, Discrete & Fast Fourier Transform Self-study: Applications of Fourier Transform in Engineering.	<b>L : 04</b> <b>T : 04</b>	<b>Apply</b>
<b>Module-2: Numerical Solutions of Ordinary Differential Equations</b>		
Numerical solution of ordinary differential equations of first order- Taylor series method, Euler's method, Modified Euler's method, Runge-Kutta method of fourth order, Milne's predictor and corrector methods (without proof) Numerical solution of second order ordinary differential equation using Runge- Kutta method of fourth order. Self-study: Solution of first order ordinary differential equation using Adam-Bashforth predictor and corrector methods.	<b>L : 04</b> <b>T : 04</b>	<b>Apply</b>
<b>Module-3: Fundamentals of logic and Relations</b>		
Fundamentals of logic: Basic connectives and truth tables, logic equivalence - the laws of logic, logical implication- rules of inference and Quantifiers. Relations: First-order linear recurrence relation, second order linear homogenous recurrence relation with constant coefficients. Self-study: Applications of Quantifiers.	<b>L : 04</b> <b>T : 04</b>	<b>Apply</b>
<b>Module-4: Vector Spaces &amp; Linear Transformation</b>		
Vector Spaces: Introduction to vector spaces- illustrative examples, subspaces, linear dependence, basis and dimension, coordinate vectors. Linear transformations: Linear transformations, algebra of transformations, representation of transformations by matrices, Rank-nullity theorem (without proof). Self-study: Linear transformation- Projection.	<b>L : 04</b> <b>T : 04</b>	<b>Apply</b>
<b>Module-5: Inner Product Spaces</b>		
Inner Product Spaces: Introduction to Inner product spaces, Orthogonal and orthonormal bases, Gram-Schmidt process, QR-factorization, Eigen values and Eigen vectors (recapitulation), diagonalization of a matrix (symmetric matrices), singular value decomposition. Self-study: Singular value decomposition applied to digital image processing.	<b>L : 04</b> <b>T : 04</b>	<b>Apply</b>

Course Outcomes: After completing the course, the students will be able to	
CO 1:	Apply Fourier series & Transform concepts in Data visualization and Cryptography.
CO 2:	Solve first and second order ordinary differential equations arising in engineering problems using single-step and multistep numerical methods.
CO 3:	Communicate the basic concepts of logic and their relevance for computer science engineering.
CO 4:	Apply the knowledge of vector spaces and Linear transform for solving problems in arising in image processing.
CO 5:	Compute orthogonal and orthonormal bases vectors and decomposition of a symmetric matrix using standard technique.

### Assessment Process (both CIA and SEA)- Professional Core Course (PCC)

PCL	CIA	SEA	CIA (50)			SEA (50)	
			I	II	III	Theory exam will be conducted for 100 marks and reduced to 50 marks. (The question paper will have 9 full questions each of 20 marks. Students have to answer 5 full questions.)	
Conduction	50	50	Written Assessments	30	30		30
			Assignment	Average of 3 Assessments – 30 Marks			
			Quizzes/Seminars/ Group discussion	10 Marks			
				Total – 50 Marks			Total – 50 Marks

#### i) SEA: 50%

There will be two questions with internal choice from each module, except module-2. One full question from module-2 without internal choice. The question paper will have 9 full questions each of 20 marks. Students have to answer 5 full questions.	20 Marks x 5
Total	100 marks reduced to 50 marks

#### ii) CIA: 50%

Three Assessments - each of 30 Marks (Question no. 1 to 4, 6 and 7 are with internal choice and 5th question will be without choice)	Average of 3 Assessments – 30 Marks
Assignments	10 Marks
Quizzes/Seminars/ Group discussion	10 Marks
Total	50 Marks

**Note:** To take up Semester End Assessment (SEA), minimum passing marks for CIA is 40% of maximum marks i.e. 20 marks out of 50 marks.

### Reference Books:

1. E. Kreyszig: "Advanced Engineering Mathematics", John Wiley & Sons, 10<sup>th</sup> Edition (Reprint), 2016.
2. B. S. Grewal: "Higher Engineering Mathematics", Khanna Publishers, 44<sup>th</sup> Ed., 2017.
3. H. K. Dass, "Advanced Engineering Mathematics" S. Chand publication.
4. C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics", 6<sup>th</sup> Edition, 2. McGraw-Hill Book Co., New York, 1995.
5. James Stewart: "Calculus — Early Transcendentals", Cengage Learning India Private Ltd., 2017.
6. B. V. Ramana: "Higher Engineering Mathematics" 11<sup>th</sup> Edition, Tata McGraw-Hill, 2010.
7. Srimanta Pal & Subobh C Bhunia: "Engineering Mathematics", Oxford University Press, 3<sup>rd</sup> Reprint, 2016.
8. David C. Lay, Steven R. Lay and J. J. McDonald "Linear Algebra and its applications", 3<sup>rd</sup> Edition, Pearson Education Ltd., 2017.
9. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics, 5<sup>th</sup> Edition, Pearson Education 2004.

**Web links and Video Lectures:**

1. <https://nptel.ac.in/courses/111106111>
2. <https://www.digimat.in/nptel/courses/video/111105038/L01.html>
3. <https://archive.nptel.ac.in/courses/111/107/111107058/>
4. <https://archive.nptel.ac.in/courses/111/106/111106051/>
5. <https://www.youtube.com/watch?v=zvRdbPMEMUI>
6. <https://www.youtube.com/watch?v=cHNmT1-qurk>
7. [https://www.youtube.com/watch?v=ATqV\\_I8DCh0](https://www.youtube.com/watch?v=ATqV_I8DCh0)

<b>SEMESTER-III</b>			
<b>Course: OPERATING SYSTEMS</b>			
<b>CourseCode:21ISE132</b>			
<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA:</b>	<b>50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA:</b>	<b>50</b>
<b>Hours:</b>	<b>36</b>	<b>SEA Duration:</b>	<b>03 Hours</b>
<b>Course Learning Objectives: The students will be able to</b>			
<ol style="list-style-type: none"> <li>1. Introduce concepts and terminology used in OS</li> <li>2. To study the operations performed by OS as a resource manager</li> <li>3. To analyze the scheduling policies of OS and process concurrency and synchronization</li> <li>4. To apply the different memory management techniques</li> <li>5. To understand the goals and principles of protection</li> </ol>			
<b>Module-1</b>		<b>No. of Hours</b>	<b>Blooms cognitive Levels=</b>
<b>Introduction:</b> - What Operating Systems do, Computer System Organization, Computer System Architecture, Operating System Structure, Operating Systems Operations, Distributed Systems, Special- Purpose Systems, Computing Environments, Open-Source Operating Systems <b>Operating System Structures:</b> - Operating System Services, User Operating System Interface, System Calls, Types of System calls, System Programs, Operating System Structure, Virtual Machines, Operating-System Debugging, System Boot.		<b>L:08</b>	<b>Understand</b>
<b>Module-2</b>			
<b>Process Management:</b> - Process concept, Process Scheduling, Operations on Processes, Inter-process communication. <b>CPU Scheduling:</b> - Basic Concepts, Scheduling Criteria, Scheduling Algorithms: First-Come First Served Scheduling, Shortest-Job-First Scheduling, Priority Scheduling, Round-Robin Scheduling, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling, Multi-processor scheduling.		<b>L:07</b>	<b>Analyze</b>
<b>Module-3</b>			
<b>Process Synchronization:</b> -Background, The Critical Section Problem, Peterson's Solution, Semaphores, Classic problems of Synchronization, <b>Deadlocks:</b> System model, deadlock characterization, deadlock prevention, detection and avoidance, recovery from dead lock banker's algorithm.		<b>L:07</b>	<b>Apply</b>
<b>Module-4</b>			
<b>Memory Management:</b> Background, Swapping, Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation. <b>Virtual Memory:</b> -Background, Demand Paging, Page Replacement, Thrashing.		<b>L:07</b>	<b>Apply</b>
<b>Module-5</b>			
<b>File System Interface:</b> -File Concept, Access Methods File Sharing, Protection. <b>Mass Storage Structure:</b> -Overview of Mass-Storage Structure, Disk Structure, Disk Scheduling, Disk Management. <b>Protection:</b> -Goals of protection, Principles of protection, Access Matrix, Implementation of Access Matrix		<b>L:07</b>	<b>Apply</b>

<b>Course Outcomes: After completing the course, the students will be able to</b>	
<b>CO 1</b>	Describe features, types and design considerations of modern operating system.
<b>CO 2</b>	Analyze & Apply the various concepts of process and scheduling algorithms.
<b>CO 3</b>	Apply the concepts of synchronization and deadlocks and different ways to handle deadlocks
<b>CO 4</b>	Explain memory management techniques and apply various page replacement algorithms
<b>CO 5</b>	Describe the design considerations of file system and solve various disk scheduling algorithms

### Marks Distribution for Assessment

<b>CIA (50)</b>	<b>Components</b>	<b>Description</b>	<b>Marks</b>
	Written Test	<ul style="list-style-type: none"> <li>Total Number of Test :03</li> <li>Each Theory test will be conducted for 30 marks</li> <li>Average of 3 tests = 30 Marks</li> </ul>	<b>30</b>
	Assignments	Assignment or any course suggested by faculty	<b>10</b>
	Quiz	Average of two rounds of quiz of 10 marks each after 1 <sup>st</sup> and 2 <sup>nd</sup> assessment.	<b>10</b>
		<b>Total CIA</b>	<b>50</b>
<b>SEA (50)</b>	Written Exam	<ul style="list-style-type: none"> <li>Theory exam will be conducted for 100 marks and scaled down to 50 marks.</li> <li>The Question paper will have 9 full questions each of 20 marks. Students have to answer 5 full questions.</li> </ul>	<b>50</b>
		<b>Total Marks for the Course</b>	<b>100</b>

### Reference Books:

1. **“Operating System Concepts”** by Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, John Wiley & Sons, Inc., 9th Edition., 2016.
2. **“Operating System: Internals and Design Principles”** by William Stallings, Prentice Hall, 9th Edition, Pearson, 2018.
3. **“Modern Operating System”** by Andrew S. Tanenbaum, Prentice Hall, 3<sup>rd</sup> Edition, 2016.
4. Ann McHoes Ida MFylnn, Understanding Operating System, Cengage Learning, 6th Edition
5. D.MDhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw-Hill, 2013.
6. P.C.P.Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition PHI (EEE), 2014.

### Web links and Video Lectures:

1. <https://academicearth.org/>
2. <https://archive.nptel.ac.in/courses/106/105/106105214/>

<b>SEMESTER – III</b>			
<b>COMPUTER ORGANIZATION</b>			
<b>Course Code 21ISE133</b>			
<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA Marks</b>	<b>50</b>
<b>Credits</b>	<b>3</b>	<b>SEA Marks</b>	<b>50</b>
<b>Hours</b>	<b>36</b>	<b>SEA Duration</b>	<b>3</b>
<b>Course Learning Objectives:</b> Computer Organization course will enable students to:			
<ul style="list-style-type: none"> <li>• Provide foundational instructions to the fundamental concepts of computers and Instruction set .</li> <li>• Cultivate a sense of familiarity to the concepts of basic Input/Output.</li> <li>• Teach the concepts of Memory system and cache memory.</li> <li>• Cultivate clear thinking in performing Arithmetic, Multiplication, division and Floating-point number operations in computer.</li> <li>• Describe the working of parallel computer architecture.</li> </ul>			
<b>Module – 1 : Basic Structure of Computers and Machine Instructions and Programs</b>		<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
<b>Basic Structure of Computers:</b> Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. <b>Machine Instructions and Programs:</b> Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Basic Input and Output Operations, Encoding of Machine Instructions.		<b>L:8</b>	<b>Understand</b>
<b>Module – 2:Input/Output Organization</b>			
<b>Input/Output Organization:</b> Accessing I/O Devices, Interrupts - Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Exceptions. Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces – PCI Bus, USB.		<b>L:7</b>	<b>Understand</b>
<b>Module – 3: Memory System</b>			
<b>Memory System:</b> Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations. <b>Arithmetic:</b> Numbers, Arithmetic Operations and Characters.		<b>L:7</b>	<b>Understand</b>
<b>Module – 4: Arithmetic</b>			
<b>Arithmetic:</b> Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division. <b>Basic Processing Unit:</b> Some Fundamental Concepts, Execution of a Complete Instruction.		<b>L:7</b>	<b>Apply</b>
<b>Module – 5 : Basic Processing Unit and Parallel Computer</b>			
<b>Basic Processing Unit:</b> Multiple Bus Organization, Hard-wired Control, Micro programmed Control. <b>Introduction:</b> Classical Use of Parallelism, Parallelism in Today’s Hardware, Basic Concepts. <b>Parallel Computer Architecture:</b> Processor Architecture and Technology Trends, Lynn’s Taxonomy of Parallel Architectures, <b>Memory Organization of Parallel Computers:</b> Computers with Distributed Memory Organization, Computers with Shared Memory Organization, <b>Thread-Level Parallelism:</b> Simultaneous Multithreading, Multicore Processors.		<b>L:7</b>	<b>Analyze</b>

<b>Course outcomes:</b> The students should be able to:	
CO1	Understand and explore the fundamental concepts of computers and Instruction set.
CO2	Understand the concepts of basic Input/Output.
CO3	Understand the concepts of Memory system and cache memory.
CO4	Make use of Arithmetic, Multiplication and division operations in computer.
CO5	Analyze the working of parallel computer architecture.

### Marks Distribution for Assessment

CIA (50)	Components	Description	Marks
	Written Test	<ul style="list-style-type: none"> <li>Total Number of Test :03</li> <li>Each Theory test will be conducted for 30 marks</li> <li>Average of 3 tests = 30 Marks</li> </ul>	<b>30</b>
	Assignments	Assignment or any course suggested by faculty	<b>10</b>
	Quiz	Average of two rounds of quiz of 10 marks each after 1 <sup>st</sup> and 2 <sup>nd</sup> assessment.	<b>10</b>
		<b>Total CIA</b>	<b>50</b>
<b>SEA (50)</b>	Written Exam	<ul style="list-style-type: none"> <li>Theory exam will be conducted for 100 marks and scaled down to 50 marks.</li> <li>The Question paper will have 9 full questions each of 20 marks. Students have to answer 5 full questions.</li> </ul>	<b>50</b>
		<b>Total Marks for the Course</b>	<b>100</b>

### Reference Books:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5th Edition, Tata McGraw Hill, 2002.
2. Parallel Programming for Multicore and Cluster Systems, Thomas Rauber, Gudula Runger, 2nd Edition, Springer, 2013.
3. William Stallings: Computer Organization & Architecture, 9<sup>th</sup> Edition, Pearson, 2015



<b>SEMESTER–III</b>			
<b>Course: DATA STRUCTURES USING C</b>			
<b>Course Code: 21ISE134</b>			
<b>L:T:P:J</b>	<b>3:0:2:0</b>	<b>CIA:</b>	<b>50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA:</b>	<b>50</b>
<b>Hours:</b>	<b>48</b>	<b>SEA Duration:</b>	<b>03 Hours</b>
<b>Course Learning Objectives: The students will be able to</b>			
<ol style="list-style-type: none"> <li>1. To provide the knowledge of basic data structures and their implementations.</li> <li>2. To understand importance of data structures in context of writing efficient programs.</li> <li>3. To develop skills to apply appropriate data structures in problem solving.</li> </ol>			
<b>Module-1</b>		<b>No. of Hours</b>	<b>Blooms cognitive Levels</b>
<b>Introduction:</b> Data Structures, Classifications (Primitive & Non-Primitive), Multidimensional Arrays. Strings Pattern Matching algorithms – KMP Algorithm, Rabin- Karp algorithm, Boyer Moore Algorithm. List of programs (not limited to): (1 to 6)		<b>L:05 P:04</b>	<b>Apply</b>
<b>Module-2</b>			
<b>Stacks:</b> Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. <b>Queues:</b> Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Dequeues, Priority Queues, A Mazing Problem. Multiple Stacks and Queues. List of programs (not limited to): (7 to 14)		<b>L:05 P:04</b>	<b>Analyze</b>
<b>Module-3</b>			
<b>Linked Lists:</b> Definition, Representation of linked lists in Memory, Memory allocation. Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, and header linked lists. Linked Stacks and Queues. Applications of Linked lists – Polynomials, Sparse matrix representation. List of programs (not limited to): (15 to 18)		<b>L:06 P:04</b>	<b>Analyze</b>
<b>Module-4</b>			
<b>Trees:</b> Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, postorder, preorder; Additional Binary tree operations. Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression List of programs (not limited to): (19 to 22)		<b>L:06 P:04</b>	<b>Analyze</b>
<b>Module-5</b>			
<b>File Structures:</b> Primary Indexing, Secondary Indexing, B-Trees, B+ Trees, Hashing with collision resolution List of programs (not limited to): (23to 27)		<b>L:06 P:04</b>	<b>Apply</b>
<b>Course Outcomes: After completing the course, the students will be able to</b>			
<b>CO 1</b>	<b>Understanding</b> of fundamental Data Structures including linked-lists, trees, binary search trees, stacks, queues, priority queues.		
<b>CO 2</b>	<b>Identify</b> the appropriate data structure in context of solution for the given problem.		
<b>CO 3</b>	<b>Develop</b> programming skills which require to solve given problem.		
<b>CO 4</b>	<b>Apply</b> computational thinking to a diverse set of problems and disciplines		

### Marks Distribution for Assessment

CIA (50)	Components	Description	Marks
	Written Test	<ul style="list-style-type: none"> <li>• Total Number of Test: 03</li> <li>• Each Theory test will be conducted for 30 marks</li> <li>• Average of 3 tests = 30 Marks</li> </ul>	<b>30</b>
	Practical	<ul style="list-style-type: none"> <li>• Total number of Test: 02 [Part-A (Moduel-1 and 2) and Part-B (Model 3, 4 and 5)]</li> <li>Each Labe test will be conducted for 50 marks and scaled down to 10</li> <li>Average of 2 tests – 10 Marks</li> <li>• Laboratory conduction is to be evaluated every week. Conducted &amp; Viva = 5 Marks</li> <li>Lab Record – 5 Marks</li> </ul>	<b>10</b>
	<b>Total CIA</b>		<b>50</b>
<b>SEA (50)</b>	Practical Exam	<ul style="list-style-type: none"> <li>• Students are allowed to pick one experiment from Part – A and one experiment fro PART – B.</li> <li>• Mark Distribution: Total 100 marks</li> <li>Part – A: 40 Marks (Functions: 6, Execution: 28, Viva: 6)</li> <li>Part – B: 60 Marks (Functions: 6, Execution: 42, Viva: 9)</li> <li>• Scaled down to 50 marks</li> </ul>	<b>50</b>
	<b>Total Marks for the Course</b>		<b>100</b>

#### ReferenceBooks:

1. Ellis Horowitz and SartajSahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014.
2. Data Structures: A Pseudocode Approach with C by Richard.F.Gilberg, Behrouz.A.Forouzan, 2nd edition 2007.
3. Michael J. Folk, Bill Zoellick, Greg Riccardi:File Structures-An Object Oriented Approach with C++, 3rd Edition, Pearson Education, 1998.
4. Introduction to Algorithms by T. H Cormen, C. E. Leiserson and R. L. Rivest, 2<sup>nd</sup> Edition, Prentice Hall India 2009.
5. VarshaH.Patil, “Data Structures Using C++”, Oxford University Press, 1<sup>st</sup> Edition, ISBN-10: 0-19-806623-6, ISBN-13: 978-0-19-806623-1, 2012
6. Data Structures using C and C++ by YedidyahLangsam and Moshe J. Augenstein and Aaron M.Tenanbaum, PHI / Pearson 2008 Reprint.(Latest Edition).
7. Introduction to the design and analysis of algorithms by Anany Levitin, Pearson Education, 2005. (Latest Edition).
8. Data Structures and Program Design by C R.Kruse, C.L Tondo and B.Leung, Second Edition, Pearson Education, 2007. (Latest Edition)

#### Possible list of practical's:

<b>1</b>	Write a C program to create a text file.
<b>2</b>	Write a C program to move the file pointer to the specific location.
<b>3</b>	Implement KMP pattern matching algorithm for a given main string and pattern
<b>4</b>	Implement Rabin-Karp pattern matching algorithm for a given main string and pattern
<b>5</b>	Implement Boyer-Moore pattern matching algorithm for a given main string and pattern
<b>6</b>	The document contains a 100 pages and end user wants to search for a word in the 100page document. Which string matching algorithm is efficient and justify your answer.

7	Program to implement stack operations (push, pop, and display) using static array and also on dynamic array and compare the performance
8	Program to implement multiple stacks in single array.
9	Program to convert infix expression into postfix.
10	Program to convert given infix expression into prefix notation.
11	Program to evaluate given postfix expression.
12	Use stacks to solve a maze problem
13	Program to implement queue operations using static arrays and on dynamic arrays and compare the performance
14	Program to implement circular queue operations using arrays and on dynamic arrays and compare the performance
15	Program to create single linked list and implement its operations with and without header nodes I. Insert (front and rear end) ii. Delete. (Front and rear end) iii. Search. iv. Reverse.
16	Implement DLL as a stack and also as a queue
17	Create 2 CLL of sparse polynomials and perform addition on these 2 polynomials. Represent the resulting polynomial in a CLL
18	Implement multiple stacks and multiple queues in a singly linked list
19	Implement the following operations on Binary tree: - A. Count the number of nodes in the binary tree B. Count the leaf nodes C. Check if 2 trees are equal D. Perform Tree Traversals namely in-order, pre-order, post-order and level order.
20	Create a Binary search Tree for a set of integer values, perform deletion of a key and searching for a key
21	Create a threaded binary tree and Insert to the right of given node, insert to the left of a given node, Perform threaded tree traversals
22	Create a max heap and min heap of integers, display the values and perform deletion operations'
23	Write a program to implement simple index on primary key for a file. Implement add (), search (), delete () using the index.
24	Write a program to implement index on secondary key, the name, for a file. Implement add (), search (), delete () using the secondary index.
25	Program to implement B Tree on a given set of keys
26	Program to implement B+ Tree on a given set of keys
27	Program for implementation for hashing with collision resolution

<b>III Semester</b>				
<b>Object Oriented Programming using Java 21ISE135</b>				
<b>L:T:P:J</b>	<b>3:0:2:0</b>	<b>CIA Marks</b>	<b>50</b>	
<b>Credits</b>	<b>04</b>	<b>SEA Marks</b>	<b>50</b>	
<b>Total Number of Contact Hours</b>	<b>48</b>	<b>SEA Duration</b>	<b>03</b>	
<b>Course Learning Objectives:</b> This course will enable students to:				
<ul style="list-style-type: none"> <li>• Show competence in the use of the Java programming language in the development of small to medium-sized application programs that demonstrate professionally acceptable coding and performance standard</li> <li>• Understand the basic principles of the object-oriented programming</li> <li>• Demonstrate an introductory understanding of graphical user interfaces, multithreaded programming, and event-driven programming.</li> </ul>				
<b>Module – 1</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>		
<p><b>Basics of Java:</b> Features of Java, Byte Code and Java Virtual Machine, JDK, Data types, Operator, Control Statements – If , else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue.</p> <p><b>Array and String:</b> Single and Multidimensional Array, String class, String Buffer class, Operations on string, Command line argument, Use of Wrapper Class.</p> <p><b>Classes, Objects and Methods:</b> Class, Object, Object reference, Constructor, Constructor Overloading, Method Overloading, Recursion, Passing and Returning object form Method, new operator, this and static keyword, finalize() method, Access control, modifiers, Nested class, Inner class, Anonymous inner class, Abstract class.</p> <p><b>Programs: 01 to 10 , 15</b></p>	<b>L :06 P : 04</b>	<b>Apply</b>		
<b>Module – 2</b>	<p><b>Inheritance and Interfaces:</b> Use of Inheritance, Inheriting Data members and Methods, constructor in inheritance, Multilevel Inheritance – method overriding Handle multilevel constructors – super keyword, Stop Inheritance - Final keywords, Creation and Implementation of an interface, Interface reference, instance of operator, Interface inheritance, Dynamic method dispatch, Understanding of Java Object Class, Comparison between Abstract Class and interface, Understanding of System. out. print ln – statement.</p> <p><b>Programs: 11 to 14</b></p>	<b>L :06 P : 04</b>	<b>Apply</b>	
<b>Module – 3</b>	<p><b>Package:</b> Use of Package, CLASSPATH, Import statement, Static import, Access control</p> <p><b>Exception Handling:</b> Exception and Error, Use of try, catch, throw, throws and finally, Built in Exception, Custom exception, Throwable Class.</p> <p><b>Multithreaded Programming:</b> Use of Multithread programming, Thread class and Runnable interface, Thread priority, Thread synchronization, Thread communication, Deadlock</p> <p><b>Programs: 16 and 17</b></p>	<b>L : 05 P : 04</b>	<b>Apply</b>	
<b>Module – 4</b>	<p><b>IO Programming:</b> Introduction to Stream, Byte Stream, Character stream, Readers and Writers, File Class, File Input Stream, File Output Stream, Input Stream Reader</p> <p><b>Swings:</b> Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing</p>	<b>L : 05 P : 04</b>	<b>Apply</b>	

Application; Create a Swing JApplet; JLabel and ImageIcon; JTextField; The Swing Buttons; JTabbedPane; JScrollPane; JList; JComboBox; JTable. <b>Programs: 19 to 23</b>		
<b>Module – 5</b>		
<p><b>Servlet :</b> The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The javax. servlet Package; Reading Servlet Parameter; The javax. servlet. http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking. Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects</p> <p><b>The Concept of JDBC:</b> JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; Result Set; Transaction Processing; Metadata, Data types; Exceptions</p> <p><b>Programs: 24 and 25</b></p>	<b>L : 06 P : 04</b>	<b>Apply</b>

### Marks Distribution for Assessment

<b>CIA (50)</b>	<b>Components</b>	<b>Description</b>	<b>Marks</b>
	Written Test	<ul style="list-style-type: none"> <li>Total Number of Test :03</li> <li>Each Theory test will be conducted for 30 marks</li> <li>Average of 3 tests = 30 Marks</li> </ul>	<b>30</b>
	Practical	<ul style="list-style-type: none"> <li>Total number of Test: 02 [Part-A (Module-1 2, and Module 3 – Exception Handling) and part-B (Module 3 -Multi Threading, 4 and 5)]</li> <li>Each Lab test (2hrs in two batches) will be conducted for 50 marks and scaled down to 10</li> <li>Write up = 5 Marks; Execution = 15Marks and Viva = 5 Marks for each program</li> <li>2 Programs to execute – 1 from the executed set and 1 from the similar but new set of programs</li> <li>Average of 2 tests – 10 Marks</li> <li>Laboratory conduction is to be evaluated every week : Lab Record – 5 Marks for each program</li> <li>Completion of Code Tantra exercises</li> </ul>	<b>10</b>
		<b>Total CIA</b>	<b>50</b>
<b>SEA (50)</b>	Practical Exam	<ul style="list-style-type: none"> <li>Students are allowed to pick one experiment from Part – A and one experiment from PART – B. All new set of Programs</li> <li>Mark Distribution: Total 100 marks</li> <li>Part – A: 40 Marks (Write up:5, Execution:30, Viva:5)</li> <li>Part – B: 60 Marks (Writeup :10, Execution:45, Viva:5)</li> <li>Scaled down to 50 marks</li> </ul>	<b>50</b>
		<b>Total Marks for the Course</b>	<b>100</b>

### Possible list of practical exercises:

1. Write a program to convert rupees to dollar. 60 rupees=1 dollar.
2. Write a program that calculate percentage marks of the student if marks of 6 subjects are given.
3. Write a program to enter two numbers and perform mathematical operations on them.
4. Write a program to find length of string and print second half of the string.
5. Write a program to accept a line and check how many consonants and vowels are there in line.
6. Write a program to count the number of words that start with capital letters.
7. Write a program to find that given number or string is palindrome or not.
8. Create a class which asks the user to enter a sentence, and it should display count of each vowel type in the sentence. The program should continue till user enters a word "quit". Display the total count of each vowel for all sentences.
9. Write an interactive program to print a string entered in a pyramid form.
10. Write an interactive program to print a diamond shape.
11. Create a class called Student. Write a student manager program to manipulate the student information from files by using File Input Stream and File Output Stream
12. Refine the student manager program to manipulate the student information from files by using the Buffered Reader and Buffered Writer
13. Refine the student manager program to manipulate the student information from files by using the Data Input Stream and Data Output Stream. Assume suitable data
14. Program to define class and constructors. Demonstrate constructors.
15. Program to define class, methods and objects. Demonstrate method overloading.
16. Program to define inheritance and show method overriding.
17. Program to demonstrate Exception Handling.
18. Program to demonstrate Multithreading.
19. Program to demonstrate I/O operations.
20. Program to demonstrate Network Programming.
21. Program to demonstrate Applet structure and event handling.
22. Program to demonstrate Layout managers.
23. Write an Japplet to interface Audio Clip.
24. Write Servlet application to print current date & time
25. Write Servlet application to Demonstrate session tracking

### Reference Books :

1. The Complete Reference, Java 2 (Eleventh Edition), Herbert Schild, - TMH.
2. Java Fundamentals A comprehensive introduction By Herbert Schildt, Dale Skrien, McGraw Hill Education.
3. Programming with Java A Primer – E.Balaguruswamy, McGrawhill
4. Core Java Volume-I Fundamentals Horstmann & Cornell, - Pearson Education. - Eleventh Edition
5. Head First Java: A Brain-Friendly Guide, 3<sup>rd</sup> Edition- Kathy Sierra, Bert Bates

<b>SEMESTER – III</b>		
<b>WEB TECHNOLOGIES</b>		
<b>Course Code: 21ISE136</b>		
<b>L:T:P:J</b>	<b>0:0:2:2</b>	<b>CIA: 50</b>
<b>Credits:</b>	<b>02</b>	<b>SEA: 50</b>
<b>Hours:</b>	<b>24</b>	<b>SEE Duration:03</b>
<b>Course Learning Objectives:</b> This course()will enable students to:		
<ol style="list-style-type: none"> <li>1. Learn about HTML5, Java Script, Inheritance In java Script</li> <li>2. Learn about Scopes and Closures in java Script, Develop a Server side programming using java Script, Node.Js</li> <li>3. Implement CRUD Operation using SQL and Node.Js</li> <li>4. Develop a Client side Application using React Js</li> <li>5. Implement MERN Stack.</li> </ol>		
<b>Programs List: ( Not restricted to the list given)</b>		
<b>PART -A</b>		
1.	Design a web page that shows your class timetable using HTML table tag	
2.	Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the following problems: <ol style="list-style-type: none"> <li>a. Parameter: A string <b>Output:</b> The position in the string of the left-most vowel c.</li> <li>b. Parameter: A number <b>Output:</b> The number with its digits in the reverse order</li> </ol>	
3.	Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the following problems: <ol style="list-style-type: none"> <li>a. To check whether a string is palindrome or not.</li> <li>b. Fibonacci Sequence using Recursion.</li> </ol>	
4.	<ol style="list-style-type: none"> <li>1. Write a JavaScript to design a simple calculator to perform the following operations: Sum, product, difference and quotient.</li> <li>2. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.</li> </ol>	
5.	Write a JavaScript code that displays text “TEXT-GROWING” with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays “TEXT-SHRINKING” in BLUE color. Then the font size decreases to 5pt.	
6.	Create a Student registration form for job application and validate the form fields using JavaScript.	
7.	Develop a JavaScript program to shuffle deck of cards.	
8.	Write a JavaScript code to demonstrate Inheritance with the help of Banking Example.	
9.	Develop a Server side programming using java Script with the help of Node.js to perform following operations : <ol style="list-style-type: none"> <li>1. Access/Write a file on server.</li> <li>2. Process User Input</li> </ol>	
10.	Write a Program to implement CRUD Operation in SQL using Node.js	
11.	Write a Program to develop an Client side Application using React Js.	
12.	Write a Java Script Program to implement MERN Stack.	
<b>PART - B (Mini - Project) Not restricted to the list given</b>		
Develop a web application project using the languages and concepts learnt in exercises listed in part A with a good look and feel effects. You can use any web technologies and frameworks and databases. Sample Projects Include : <ol style="list-style-type: none"> <li>1. Food Ordering Website</li> <li>2. Online Purchase Store</li> </ol>		

3. Search Engine etc. 4. College website 5. Banking application 6. Blood donation application 7. Gaming application 8. Library management system 9. Chat application 10. Tourism website	
<b>Course outcomes:</b> The students will be able to:	
CO1	Create web pages with various media contents using HTML5.
CO2	Create a robust Client side validation with java script
CO3	Design dynamic data-driven Web sites using MongoDB Node.js
<b>Reference Books :</b>	
1. Web Application Design and Implementation: Apache 2, PHP5, MySQL, JavaScript, and Linux/UNIX Steven A. Gabarro, December 2006, c2007, Wiley-IEEE Computer Society Press. 2. Nate Murray, Felipe Coury, Ari Lerner and Carlos Taborda, “ng-book, The Complete Book on Angular 4” September 2016 3. Krasimir Tsonev, “Node.js by Example Paperback”, May 2015.	
<b>WEB links and Video Lectures</b>	
1. Web link for Angular4.0: <a href="https://angular.io/">https://angular.io/</a> 2. Web link for Node.js : <a href="https://nodejs.org/en/">https://nodejs.org/en/</a> 3. Web link for MongoDB: <a href="https://www.mongodb.com">https://www.mongodb.com</a>	

<b>Course Outcomes: After completing the course, the students will be able to</b>	
CO 1	Create web pages with various media contents using HTML5.
CO 2	Create a robust Client side validation with java script
CO 3	Design dynamic data-driven Web sites using MongoDB Node.js

### Marks Distribution for Assessment

	Components	Description	Marks
<b>CIA (50)</b>	Practical	Lab record – 05 Marks <b>Performance day wise</b> Conduction-07 Marks Viva- 03 Marks	<b>15</b>
		<b>Internal Lab. Test – 01</b> (one program from Part- A and front-end implementation of Mini-Project) Part-A (15 Marks) + Part-B (15 Marks) = 30 Marks (reduced to 15 Marks). <b>Part-A</b> Write-up- 03 Marks Conduction – 10 Marks Viva – 02 Marks <b>Part- B</b> Procedure- 03Marks Implementation- 05 Marks Demonstration- 05 Marks Viva- Voce- 02 Marks	<b>15</b>



		<p><b>Internal Lab. Test – 02:</b> includes one program from Part- A and mini- Project. Part-A (15 Marks) + Part-B (15 Marks) = 30 Marks (reduced to 15 Marks).</p> <p><b>Part-A</b> Write-up- 03 Marks Conduction – 10 Marks Viva – 02 Marks</p> <p><b>Part- B</b> Procedure- 03Marks Implementation- 05 Marks Demonstration- 05 Marks Viva- Voce- 02 Marks</p>	<b>15</b>
		Mini-Project Report – 05 Marks	<b>05</b>
		<b>Total CIA</b>	<b>50</b>
<b>SEA (50)</b>	Practical Exam	<ul style="list-style-type: none"> <li>• External lab examination: Students are allowed to pick one experiment from Part – A and PART – B mini project demonstration.</li> <li>• Mark Distribution: Total 100 Marks Part – A: 40 Marks (Write-up – 10 Marks, Conduction - 20 Marks, Viva-Voce – 10 Marks) Part – B: 60 Marks (Procedure – 10 Marks, Implementation- 20 Marks, Demonstration- 20 Marks, Viva-Voce – 10 Marks) Scaled down to 50 Marks</li> </ul>	<b>50</b>
		<b>Total Marks for the Course</b>	<b>100</b>

### Reference Books :

1. Web Application Design and Implementation: Apache 2, PHP5, MySQL, JavaScript, and Linux/UNIX  
Steven A. Gabarro, December 2006, c2007, Wiley-IEEE Computer Society Press.
2. Nate Murray, Fe9lipe Coury, Ari Lerner and Carlos Taborda, “ng-book, The Complete Book on Angular 4” September 2016 3. KrasimirTsonnev, “Node.js by Example Paperback”, May 2015.

**Semester: IV**

**Course: Statistics, Probability and Graph theory**  
**Course Code: 21MAT141B (Common to CSE, ISE, AIML)**

<b>L:T:P:J</b>	<b>2:2:0:0</b>	<b>CIA: 50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA: 50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration: 03 Hours</b>

**Course Learning Objectives:** The students will be able to

1 Provide an insight into applications of Graph Theory, Curve fitting & Statistical methods.

2 Develop the knowledge of probability, joint probability distribution and Queuing theory occurring in digital signal processing, design engineering and microwave engineering.

<b>Module-1: Curve fitting &amp; Statistical methods</b>		<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
<p><b>Curve Fitting:</b> Curve fitting by the method of least squares-fitting the curves of the form-  <math>y=ax+b</math>, <math>y =ax^b</math> and <math>y=ax^2+bx+c</math>.                      Introduction to Moments, Skewness, kurtosis and problems. Karl Pearson's coefficient of correlation and lines of regression.  <b>Self-study:</b> Rank correlation.</p>		<p><b>L: 04</b> <b>T: 04</b></p>	<p><b>Apply</b></p>
<b>Module-2: Probability Distributions &amp; Joint probability distribution</b>			
<p><b>Probability Distributions:</b> Review of basic probability theory. Discrete and continuous Random variables, probability mass/density functions (definitions only). Binomial, Poisson, exponential and normal distributions(without proof).  <b>Joint probability distribution:</b> Joint Probability distribution for two discrete random variables, expectation, covariance and correlation.  <b>Self study:</b> Applications of probability distribution in Engineering.</p>		<p><b>L: 04</b> <b>T: 04</b></p>	<p><b>Apply</b></p>
<b>Module-3: Markov Chain &amp; Sampling Theory</b>			
<p><b>Markov Chain:</b> Introduction to Stochastic process, Probability vectors, Stochastic matrices, Regular stochastic matrices, Markov Chains, Higher transition probabilities, Stationary distribution of Regular Markov chains and absorbing states, Markovian processes.  <b>Sampling Theory:</b> Introduction to sampling theory, Testing of hypothesis, level of significance, confidence limits, test of significance of mean and difference of means for large samples-z-test, test of significance of small samples-Student's t- distribution, Goodness of fit-Chi-square test.  <b>Selfstudy:</b> Applications of Markov Chain in Engineering.</p>		<p><b>L: 04</b> <b>T: 04</b></p>	<p><b>Apply</b></p>
<b>Module-4: Queuing theory</b>			
<p>Introduction, Symbolic representation of a queuing model, single server, Poiss                      on queuing</p>			

<p>model with infinite capacity (M/M/1: /FCFS), when <math>\lambda_n = \lambda</math> and <math>\mu_n = \mu(\lambda &lt; \mu)</math>, Performance measures of the model, Single server Poisson queuing model with finite capacity(M/M/S:N/FCFS), Performance measures of the model, derivation of <math>L_s</math>, <math>L_q</math>, <math>w_s</math>, <math>w_q</math> of M/M/1 queuing model with finite and infinite capacity, Multiple server Poisson queuing model with infinite capacity(M/M/S: <math>\infty</math>/ FCFS), when <math>\lambda_n = \lambda</math> for all <math>n</math>, (<math>\lambda &gt; S\mu</math>), Multiple server Poisson queuing model with finite capacity ( M/M/S:N/FCFS), Introduction to M/G/1 queuing model –problems.  <b>Self-study:</b> Applications of Queuing theory in Engineering.</p>	<p><b>L: 04</b> <b>T: 04</b></p>	<p><b>Apply</b></p>
<b>Module-5: Graph Theory</b>		
<p>Basic concepts, types of graphs, graphs and graph, order and size of a graph, in-degree and out-degree, bipartite-graphs, connected and disconnected graphs, Eulerian graph, Hamiltonian graphs, sub-graphs, isomorphic graphs. Matrix representation of graphs, adjacency matrix, incidence matrix. Planar graphs: definition, characterization of planar graphs, Kuratowski's theorem, Euler's formula and consequences.  <b>Self study:</b> Applications of graph theory in network system</p>	<p><b>L: 04</b> <b>T: 04</b></p>	<p><b>Apply</b></p>

**Course Outcomes:** After completing the course, the students will be able to

- CO 1: Make use of correlation and regression analysis to fit a suitable mathematical model for the statistical data.
- CO 2: Apply discrete and continuous probability and joint probability distributions in analyzing the probability models arising in engineering field.
- CO 3: Use Markov chain in prediction of future events and demonstrate the validity of testing the hypothesis.
- CO 4: Acquire skills in analyzing queuing models.
- CO 5: Apply the knowledge of Graph Theory in Network modeling, electrical network and computational algorithms

**Reference Books:**

1. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10<sup>th</sup> Ed.(Reprint), 2016.
2. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 44<sup>th</sup> Ed., 2017.
3. S. D. Sharma : -Operations Research", KedarNath Ram Nath & Co. Meerut, 2014.
4. C. Ray Wylie, Louis C. Barrett : —Advanced Engineering Mathematics", 6<sup>th</sup> Edition, 2. McGraw-Hill Book Co., New York, 1995.
5. James Stewart : Calculus —Early Transcendental, Cengage Learning India Private Ltd., 2017.
6. T Veerarajan : Probability, Statistics and Random processes, McGraw Hill Education(India)Private Limited, Third edition, Nineteenth reprint 2017.
7. B. V. Ramana: "Higher Engineering Mathematics" 11<sup>th</sup> Edition, Tata McGraw-Hill, 2010.
8. Srimanta Pal & Subobh C. Bhunia: -Engineering MathematicsII, Oxford University Press, 3<sup>rd</sup> Reprint, 2016.
9. Narsingh Deo, -Graph Theory with Applications to Engineering and Computer ScienceII, Prentice Hall of India, 2000.

**Web links and Video Lectures:**

1. <https://nptel.ac.in/courses/111104098>
2. <https://www.youtube.com/watch?v=1YkfeR05YXY>
3. <https://archive.nptel.ac.in/courses/111/104/111104079/>
4. <https://www.youtube.com/watch?v=xGkpXk-AnWU>
5. <https://archive.nptel.ac.in/courses/106/104/106104170/>

<b>SEMESTER-IV</b>			
<b>Course: MICROCONTROLLER AND EMBEDDED SYSTEM</b>			
<b>CourseCode:2IISE142</b>			
<b>L:T:P:J</b>	<b>3:0:2:0</b>	<b>CIA:</b>	<b>50</b>
<b>Credits:</b>	<b>04</b>	<b>SEA:</b>	<b>50</b>
<b>Hours:</b>	<b>48</b>	<b>SEA Duration:</b>	<b>03 Hours</b>
<b>Course Learning Objectives: The students will be able to</b>			
<ol style="list-style-type: none"> <li>1. Understand the fundamentals of ARM based systems, basic hardware components, selection methods and attributes of an embedded system.</li> <li>2. Program ARM controller using the various instructions</li> <li>3. Identify the applicability of the embedded system</li> <li>4. Comprehend the real time operating system used for the embedded system Develop and test Program using ARM7TDMI/LPC2148</li> <li>5. Conduct the experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' &amp;Keil Uvision-4 tool/compiler</li> </ol>			
<b>Module-1</b>		<b>No. of Hours</b>	<b>Blooms cognitive Levels=</b>
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 List of programs(not limited to): 1to10		<b>L:5</b> <b>P:5</b>	<b>Apply</b>
<b>Module-2</b>			
Introduction to the ARM Instruction Set: Data Processing Instructions, ProgrammeInstructions,SoftwareInterruptInstructions,ProgramStatusRegisterInst ructions, Coprocessor Instructions, Loading Constants ARM programming using Assembly language: Writing Assembly code, Profiling and cycle counting, instruction scheduling, Register Allocation, Conditional Execution, Looping Constructs List of programs(not limited to): 1to10		<b>L:5</b> <b>P:5</b>	<b>Apply</b>
<b>Module-3</b>			
Embedded System Components: Embedded Vs General computing system, History of embedded systems, Classification of Embedded systems, Major applications areas of embedded systems, Core of an Embedded System including all types of processor/controller, Memory, Sensors, Actuators, LED, 7segment LED display, stepper motor, Keyboard, Push button switch, Communication Interface (on board and external types), Embedded firmware, Other system components. List of programs(not limited to): 11to20		<b>L:5</b> <b>P:4</b>	<b>Apply</b>
<b>Module-4</b>			
Embedded System Design Concepts: Characteristics and Quality Attributes of Embedded Systems, Operational quality attributes, non-operational quality attributes, Embedded Systems-Application and Domain specific, Hardware Software Co-Design and Program Modelling, embedded firmware design and		<b>L:5</b> <b>P:4</b>	<b>Apply</b>

development List of programs(not limited to): 1 to 10		
<b>Module-5</b>		
RTOS and IDE for Embedded System Design: Operating System basics, Types of operating systems, Task, process and threads (Only POSIX Threads with an example program), Thread preemption, Multiprocessing and Multitasking, Task Communication (without any program), Concept of Binary and counting semaphores (Mutex example without any program), How to choose an RTOS, Integration and testing of Embedded hardware and firmware, Embedded system Development Environment – Block diagram (excluding Keil), Disassembler/decompiler, simulator, emulator and debugging techniques, target hardware debugging, boundaries can. List of programs(not limited to): 11 to 20	<b>L:5</b> <b>P:5</b>	<b>Apply</b>

<b>Course Outcomes: After completing the course, the students will be able to</b>	
<b>CO 1</b>	Describe the architectural features and instructions of ARM microcontroller
<b>CO 2</b>	Apply the knowledge gained for Programming ARM for different applications and Interface external devices and I/O with ARM microcontroller.
<b>CO 3</b>	Interpret the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
<b>CO 4</b>	Develop the hardware/software co-design and firm ware design approaches.
<b>CO 5</b>	Demonstrate the need of realtime operating system for embedded system applications
<b>CO 6</b>	Develop and test program using ARM7TDMI/LPC2148

<b>Conduct the following experiments by writing program using ARM7TDMI/LPC2148 using an evaluation board/simulator and the required software tool.</b>
<ol style="list-style-type: none"> <li>1. Write a program to multiply two 16-bit binary numbers.</li> <li>2. Write a program to find the sum of first 10 integer numbers.</li> <li>3. Write a program to find factorial of a number.</li> <li>4. Write a program to add an array of 16-bit numbers &amp; store the 32-bit result in internal RAM</li> <li>5. Write a program to find the square of a number (1 to 10) using look-up table.</li> <li>6. Write a program to find the largest number in an array of 32 numbers.</li> <li>7. Write a program to find the smallest number in an array of 32 numbers.</li> <li>8. Write a program to arrange a series of 32-bit numbers in ascending order.</li> <li>9. Write a program to arrange a series of 32-bit numbers in descending order.</li> <li>10. Write a program to count the number of ones and zeros in two consecutive memory locations.</li> </ol>
<b>Conduct the following experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' &amp; Keil Uvision-4 tool/compiler.</b>

11. Display “HelloWorld” message using Internal UART.
12. Display “Welcome” message using Internal UART.
13. Interface and Control a DCMotor.
14. Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.
15. Determine Digital output for a given Analog input using Internal ADC of ARM controller.
16. Interface a DAC and generate Triangular waveforms.
17. Interface a DAC and generate Square waveforms.
18. Interface a 4x4 keyboard and display the key code on an LCD.
19. Demonstrate the use of an external interrupt to toggle an LED On/Off.
20. Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between.

**Reference Books:**

1. Andrew N Sloss, Dominic Symes and Chris Wright, ARM system developers guide, Elsevier, Morgan Kaufman publishers, 2008 1st Edition.
2. Shibu K V, “Introduction to Embedded Systems”, Tata McGraw Hill Education, Private Limited, 2nd Edition.
3. Raghunandan..G.H, Microcontroller (ARM) and Embedded System, Cengage learning Publication, 2019 1st edition.
4. The Insider’s Guide to the ARM7 Based Microcontrollers, Hitex Ltd., 1st edition, 2005.
5. Steve Furber, ARM System-on-Chip Architecture, Second Edition, Pearson, 2015 1st edition.
6. Raj Kamal, Embedded System, Tata McGraw-Hill Publishers, 2nd Edition, 2008

**Web links and Video Lectures:**

1. <https://academicearth.org/>
2. [https://onlinecourses.nptel.ac.in/noc20\\_ee98/preview](https://onlinecourses.nptel.ac.in/noc20_ee98/preview)

<b>SEMESTER – IV</b>			
<b>Course: Design and Analysis of Algorithms</b>			
<b>Course Code: 21ISE143</b>			
<b>L:T:P:J</b>	<b>3:2:0:0</b>	<b>CIA Marks</b>	<b>50</b>
<b>Credits</b>	<b>4</b>	<b>SEA Marks</b>	<b>50</b>
<b>Hours</b>	<b>48</b>	<b>Exam Hours</b>	<b>03</b>
<b>Course Learning Objectives:</b> This course will enable students to: <ul style="list-style-type: none"> <li>• Explain various computational problem-solving techniques.</li> <li>• Apply appropriate method to solve a given problem.</li> <li>• Describe various methods of algorithm analysis</li> </ul>			
<b>Module-1</b>		<b>No. of Hours</b>	<b>Blooms Cognitive Levels</b>
<b>Introduction: Basics of Algorithms:</b> What is an Algorithm? Properties of an Algorithm, Fundamentals of Algorithmic Problem Solving, Asymptotic Notations, Standard Notations and Common Functions, Comparing functions, Mathematical Analysis of Non-recursive and Recursive Algorithms, Problems on Asymptotic Notation, Masters Theorem, Algorithm as a Technology. <b>Recursion:</b> Stack Overflow, Fibonacci, Factorial <b>Lab Program:</b> 1 - 4 (Not Limited to this) <b>Blooms Taxonomy:</b> Apply		<b>L: 5 T: 5</b>	Understand
<b>Module-2</b>			
<b>Brute Force:</b> Selection Sort and Bubble Sort, Sequential Search and Brute-Force String Matching. <b>Divide and Conquer:</b> Recurrence equation for divide and conquer, Binary Search, Mergesort, Quicksort, Analysis of Quicksort, The master method for solving recurrences problems. <b>Lab Program:</b> 5 - 7 (Not Limited to this) <b>Blooms Taxonomy:</b> Analyze		<b>L: 5 T: 4</b>	Analyze
<b>Module-3</b>			
<b>Greedy Technique:</b> Fractional Knapsack Problem, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman codes. <b>Decrease and Conquer:</b> Insertion Sort, Depth First Search, Breadth First Search, Topological Sorting. <b>Lab Program:</b> 8 - 10 (Not Limited to this) <b>Blooms Taxonomy:</b> Apply		<b>L: 5 T: 4</b>	Apply
<b>Module - 4</b>			
<b>Dynamic Programming:</b> Computing a Binomial Coefficient, Warshall's and Floyd's Algorithms, 0/1 Knapsack Problem, Travelling Salesman Problem, Multistage Graphs, Reliability design. <b>Lab Program:</b> 11 - 17 (Not Limited to this) <b>Blooms Taxonomy:</b> Apply		<b>L: 5 T: 5</b>	Apply
<b>Module - 5</b>			
<b>Backtracking:</b> General method, N-Queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles. <b>Branch-and-Bound:</b> Travelling Salesman Problem, NP-Completeness and reducibility, NP-complete Problems, Approximation Algorithms for NP Hard		<b>L: 5 T: 5</b>	Apply



Problems.		
<b>Lab Program:</b> 18 - 25 (Not Limited to this)		
<b>Blooms Taxonomy:</b> Apply		

<b>Course outcomes:</b> The students should be able to:	
<b>CO1</b>	Understand and explore the asymptotic runtime complexity of algorithms by using mathematical relations that helps to identify them in specific instances.
<b>CO2</b>	Analyze and solve problems using brute force, divide and conquer techniques.
<b>CO3</b>	Apply various problem solving methodologies such as greedy, decrease and conquer to solve a given problem.
<b>CO4</b>	Apply the dynamic programming to estimate the computational complexity of different algorithms.
<b>CO5</b>	Apply the efficient algorithm design approaches in a problem specific manner in terms of space and time complexity

<b>Reference Books:</b>
<ol style="list-style-type: none"> <li>1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3<sup>rd</sup> Edition, PHI.</li> <li>2. Introduction to the design and analysis of algorithms, by Anany Levitin, 3rd Edition, Pearson Education, 2011.</li> <li>3. Data Structures &amp; Algorithms using C, R.S. Salaria, 5th Edition, Khanna Publishing.</li> <li>4. Computer Algorithms, by Horowitz E., Sahani S., Rajasekharan S., 2nd Edition, UniversitiesPress, 2008</li> </ol>
<b>Web Links:</b>
<ol style="list-style-type: none"> <li>5. <a href="https://www.cs.duke.edu/courses/fall08/cps230/Book.pdf">https://www.cs.duke.edu/courses/fall08/cps230/Book.pdf</a>.</li> <li>6. <a href="https://www.tutorialspoint.com/design_and_analysis_of_algorithms/design_and_analysis_of_algorithms_tutorial.pdf">https://www.tutorialspoint.com/design_and_analysis_of_algorithms/design_and_analysis_of_algorithms_tutorial.pdf</a>.</li> </ol>

<b>Possible list of practical programs:</b>
<ol style="list-style-type: none"> <li>1. Apply brute force/divide and conquer technique to recursively implement the following concepts: <ol style="list-style-type: none"> <li>a. <b>Linear Search</b> or <b>Binary Search</b>.</li> <li>b. To find the maximum and minimum from a given list of n elements using Brute Force Method.</li> </ol> </li> <li>2. There are 5 books in the shelf, find the number of ways to select 3 books from 5 books on the shelf using the <math>{}^N C_R</math> with recursion.</li> <li>3. Find the next three terms of the sequence 15, 23, 38, 61, ... Fibonacci series of the given number using recursion.</li> <li>4. Demonstrate through a program how a sequence of characters is taken and checked for the possibility of the presence of the required string. If the possibility is found then, character matching is performed else no using Rabin Karp method.</li> <li>5. Suppose we need to search a string in a given string, choose the searching algorithm which is more efficient in addressing the search operation like Horspool algorithm for String Matching. Give the trace of this algorithm.</li> <li>6. Sort a given set of elements using <b>Quick Sort</b> method and determine the time required sort the</li> </ol>

- elements. Plot a graph of number of elements versus time taken. Specify the time efficiency class of this algorithm.
7. Sort a given set of elements using **Merge Sort** method and determine the time required sort the elements. Plot a graph of number of elements versus time taken. Specify the time efficiency class of this algorithm.
  8. We want to build a new plant in the following network, nodes are places and links represent costs to send energy from one place to another based on Dijkstra's algorithm, proposes a method to find the best place to build the plant, and then solve the problem with your method.
  9. The bank wishes to minimize the cost of building its network (which must allow for connection, possibly routed through other nodes, from each node to each other node), however due to the need for high-speed communication, they *must* pay to build the connection from one to another as well as the connection from one to next. Give a list of the connections the bank should establish in order to minimize their total cost, subject to this constraint. Find the minimum Cost Spanning Tree of a given connected undirected graph using **Kruskal's or Prim's algorithm**.
  10. Print all the nodes reachable from a given starting node in a digraph using **BFS**. Give the trace of this algorithm where one can move from node  $u$  to node  $v$  only if there's an edge from  $u$  to  $v$  and find the BFS traversal of the graph starting from the 0th vertex, from left to right according to the graph. Also, you should only take nodes directly or indirectly connected from Node 0 in consideration
  11. Implement 0/1 Knapsack problem using dynamic programming. Give the trace of this algorithm.
  12. Design and implement the presence of Hamiltonian Cycle in an undirected Graph  $G$  of  $n$  vertices.
  13. Apply decrease and conquer technique to implement
    - a. Topological ordering of vertices in each digraph.
    - b. Insertion sort algorithm to sort a given set of elements
  14. Apply transform and conquer technique to implement a program to Sort a given set of elements using the Heap sort and determine the time required to sort the elements.
  15. Suppose in a network of cities, you are interested in finding shortest paths between all cities. Design a 'C' program to implement this using Floyd's algorithm. Find its time and space complexity.
  16. Implement Dynamic Programming algorithm for the Optimal Binary Search Tree Problem.
  17. Suppose a salesperson want to visit  $n$  cities to promote the sales of a product. Find an optimal route / way to visit all the cities and reach back the same city using dynamic programming.
  18. Apply Space and Time trade off technique to implement a program to
    - a. Perform string matching using Horspool algorithm.
    - b. Comparison counting sorting algorithm
  19. Apply transform and conquer technique to implement a program to construct an AVL Tree for a given set of elements and display balance factor for each node.
  20. Apply Back Tracking technique to implement a program to find a subset of a given set  $S = \{s_1, s_2, \dots, s_n\}$  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.
  21. Let there be  $N$  workers and  $N$  jobs. Any worker can be assigned to perform any job, incurring some cost that may vary depending on the work-job assignment. It is required to perform all jobs by assigning exactly one worker to each job and exactly one job to each agent in such a way that the total cost of the assignment is minimized.

22. Suppose you are given a list of students who are assigned IDs. Write a C program to sort these students based on their id's using heapsort. Find its time and space complexity.
23. Suppose a travel agent is interested in finding shortest path from a single city to all the other cities in a network of 'n' cities. Write a C program to implement this using an algorithm. Find its time and space complexity.
24. A Government wants to construct a road network connecting 'n' towns. Suppose each road must connect '2' towns and be straight. Write a program using any algorithm to output the least expensive tree of roads. Find its time and space complexity.
25. Consider 'n' patients and 'nxn' small rooms. Design a C program to allot the patients to these rooms using nqueen's method such that no two patients are allotted rooms in same row, column, or diagonal. Find its time and space complexity.

<b>SEMESTER – IV</b>			
<b>DATABASE MANAGEMENT SYSTEM</b>			
<b>21ISE144</b>			
Teaching Hours/Week (L: T: P: J)	3:0:1:1	CIA Marks	50
Credits	4	SEA Marks	50
Total Number of Lecture Hours	48	Exam Hours	3
<b>Course Learning Objectives:</b>			
This course will enable students to			
<ul style="list-style-type: none"> <li>• Provide a strong foundation in database concepts, technology, and practice.</li> <li>• Practice SQL and NOSQL programming through a variety of database problems.</li> <li>• Demonstrate the use of concurrency and transactions in database.</li> <li>• Design and build database applications for real world problems.</li> </ul>			
		<b>Number of Hours</b>	<b>Bloom's Level</b>
<b>Module-1</b>			
<b>Databases and Databases Users:</b> Characteristics of database Approach, Advantages of using the DBMS Approach		<b>6</b>	<b>Understand</b>
<b>Database System Concepts and Architecture:</b> Data Models-Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment			
<b>Data Modeling Using the Entity-Relationship (ER) Model:</b> Entity types-Entity sets- Attributes and Keys, Relationship types – Relationship Sets – Roles and structural Constraints, Weak Entity Types, ER design for COMPANY Database, Relational database design using ER to Relational Mapping			
Draw ER Diagram for the following Databases using GitMind software. COMPANY Database UNIVERSITY Database AIRLINE Database BANK Database LIBRARY Database MOVIE Database ORDER Database COLLEGE Database		<b>4</b>	<b>Understand</b>
<b>Module-2</b>			
<b>Basic SQL:</b> SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT – DELETE and UPDATE Statements in SQL, Additional features in SQL		<b>6</b>	<b>Apply</b>
<b>More SQL: Complex Queries, Triggers, Views and Schema Modification:</b> More Complex SQL Retrieval Queries, Specifying Constraints as Assertions and actions as Triggers, Views (Virtual Tables) in SQL, Schema Change Statements in SQL			
Create Schema, insert at least 5 records in each table and add appropriate constraints for the following Library Database using ORACLE or MySQL DBMS under LINUX/Windows environment.		<b>4</b>	<b>Apply</b>

<p>BOOK(Book_id, Title, Publisher_Name, Pub_Year)  BOOK_AUTHORS(Book_id, Author_Name)  PUBLISHER(Name, Address, Phone)  BOOK_COPIES(Book_id, Branch_id, No-of_Copies)  BOOK_LENDING(Book_id, Branch_id, Card_No, Date_Out, Due_Date)  LIBRARY_BRANCH(Branch_id, Branch_Name, Address)</p> <p>Write SQL queries to</p> <ol style="list-style-type: none"> <li>1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch, etc.</li> <li>2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017.</li> <li>3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.</li> <li>4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.</li> <li>5. Create a view of all books and its number of copies that are currently available in the Library.</li> </ol>		
<b>Module-3</b>		
<p><b>Basics of Functional Dependencies and Normalization for Relational Database:</b> Functional Dependencies, Normal forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Forms, Multi-valued Dependency and Fourth Normal Form, Join Dependencies and fifth Normal Form</p>	<b>6</b>	<b>Apply</b>
<p>Create Schema, insert at least 5 records for each table and add appropriate constraints for the following Order Database using ORACLE or MySQL DBMS under LINUX/Windows environment.</p> <p>SALESMAN(Salesman_id, Name, City, Commission)  CUSTOMER(Customer_id, Cust_Name, City, Grade, Salesman_id)  ORDERS(Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)</p> <p>Write SQL queries to</p> <ol style="list-style-type: none"> <li>1. Count the customers with grades above Bangalore’s average.</li> <li>2. Find the name and numbers of all salesman who had more than one customer.</li> <li>3. List all the salesman and indicate those who have and don’t have customers in their cities (Use UNION operation.)</li> <li>4. Create a view that finds the salesman who has the customer with the highest order of a day.</li> <li>5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.</li> </ol>	<b>4</b>	<b>Apply</b>
<b>Module-4</b>		
<p><b>Introduction to Transaction Processing – Concepts and Theory:</b> Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties on Transactions  <b>Concurrency Control Techniques:</b> Two-Phase Locking Techniques for Concurrency Control, Multi-version Concurrency Control Techniques,</p>	<b>6</b>	<b>Understand</b>

Other Concurrency Control Issues <b>Database Recovery Techniques:</b> Recovery Concepts, Shadow Paging, Recovery in Multi- database Systems		
Create Schema, insert at least 5 records for each table and add appropriate constraints for the following Company Database using ORACLE or MySQL DBMS under LINUX/Windows environment.  EMPLOYEE(SSN, Name, Address, Sex, Salary, SuperSSN, DNo) DEPARTMENT(DNo, DName, MgrSSN, MgrStartDate) DLOCATION(DNo,DLoc) PROJECT(PNo, PName, PLocation, DNo) WORKS_ON(SSN, PNo, Hours)  Write SQL queries to 1. Make a list of all project numbers for projects that involve an employee whose last name is 'Scott', either as a worker or as a manager of the department that controls the project. 2. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise. 3. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department 4. Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator). 5. For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs. 6,00,000.	4	Apply
<b>Module-5</b>		
Why NoSQL? : The Emergence of NoSQL Data Models : Relationships, Graph Database, Schemaless Database, Materialized View, Modelling for Data Access. Types of Databases : What Is a Key-Value Store, What Is a Document Database?, What Is a Column-Family Data Store?, What Is a Graph Database?	6	Apply
<b>Course outcomes:</b> The students will able to: <ul style="list-style-type: none"> <li>• Understand the concept of structured and un-structured database, functional dependencies and transaction processing. (Understand)</li> <li>• Apply Structured Query Language (SQL) for database manipulation. (Apply)</li> <li>• Apply Functional Dependency to normalize relation. (Apply)</li> <li>• Solve the real time problem by using NOSQL Model. (Evaluate)</li> <li>• Develop application to interact with databases. (Create – For Mini Project)</li> </ul>		
<b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. Ramez Elmasari, Shamkant B Navathe, "Fundamentals of Database Systems", Pearson, Seventh Edition 2017.</li> <li>2. Pramod J Sadalage, Martin Fowler, "NOSQL Distilled", Pearson, 2013.</li> </ol>		

# PYTHON PROGRAMMING AND ITS APPLICATION

**Course Code: 21ISE145**

<b>L:T:P:J</b>	0:0:2:2	<b>CIA Marks</b>	50
<b>Credits</b>	2	<b>SEA Marks</b>	50
<b>Hours</b>	24 Hours	<b>SEA Duration</b>	03

**Course Learning Objectives:** This course() will enable studentsto:

- 1 To write, test, and debug simple Python programs.
- 2 To implement Python programs with conditionals and loops.
- 3 Use functions for structuring Python programs.
- 4 Represent compound data using Python lists, tuples, and dictionaries.
- 5 Read and write data from/to files in Python.

**Descriptions(if any):**

**Prerequisites:**

- 1 Processors: Intel Atom® processor or Intel® Core™ i3/i5 processor.
- 2 Operating systems: Windows\* 7 or later, macOS, and Linux.
- 3 **Python\*** versions: 2.7.X, 3.6.X.,3.8.X

**Programs List:**

## PART -A

1.	1.	Create a list and perform the following methods 1) insert() 2) remove() 3) append() 4) len() 5) pop() 6) clear()
	2.	Create a dictionary and apply the following methods 1) Print the dictionary items 2) access items 3) use get() 4)change values 5) use len()
	3.	Create a tuple and perform the following methods 1) Add items 2) len() 3) check for item in tuple 4)Access items
2.	1.	Write a python program to add two numbers.
	2.	Write a python program to print a number is positive/negative using if-else.
	3.	Write a python program to find largest number among three numbers.
	4.	Write a python Program to read a number and display corresponding day using if_elif_else?
3.	1.	Write a program to create a menu with the following options 1. TO PERFORM ADDITION 2. TO PERFORM SUBTRACTION 3. TO PERFORM MULTIPLICATION 4. TO PERFORM DIVISION Accepts, users input and perform the operation accordingly. Use functions with arguments.
	2.	Write a python program to check whether the given string is palindrome or not.
	3.	Write a python program to find factorial of a given number using functions
	4.	Write a Python function that takes two lists and returns True if they are equal otherwise false.
4.	1	Write a program to double a given number and add two numbers using lambda ()?
	2	Write a program for filter () to filter only even numbers from a given list.
	3	Write a program for map () function to double all the items in the list?
	4	Write a program to find sum of the numbers for the elements of the list by using reduce ()?
5.	1.	Demonstrate a python code to implement abnormal termination?
	2.	Demonstrate a python code to print try, except and finally block statements
	3.	Write a python program to open and write “hello world” into a file.
	4.	Write a python program to write the content “hi python programming” for the existing file.
6.	1.	Write a python program to get python version.

	2.	Write a python program to open a file and check what are the access permissions acquired by that file using os module?
	3.	Write a python program to display a particular month of a year using calendar module.
	4.	Write a python program to print all the months of given year.
7.	1.	Write a python program to print date, time for today and now.
	2.	Write a python program to add some days to your present date and print the date added.
	3.	Write a python program to print date, time using date and time functions
	4.	Write a python program, which accepts the radius of a circle from user and computes the area (use math module).
8.	1.	Write a python program to create a package (college), sub-package (allddept), modules (it,cse) and create admin and cabin function to module?
	2.	Write a python program to create a package (Engg), sub-package (years), modules (sem) and create staff and student function to module?
9.	1.	Write a python Program to display welcome to MRCET by using classes and objects.
	2.	Write a python Program to call data member and function using classes and objects
	3.	Write a program to find sum of two numbers using class and methods
	4.	Write a program to read 3 subject marks and display pass or failed using class and object.
10.	1.	Using a numpy module create an array and check the following: 1. Type of array 2. Axes of array 3. Shape of array 4. Type of elements in array
	2.	Using a numpy module create array and check the following: 1. List with type float 2. 3*4 array with all zeros 3. From tuple 4. Random values
	3.	Using a numpy module create array and check the following: 1. Reshape 3X4 array to 2X2X3 array 2. Sequence of integers from 0 to 30 with steps of 5 3. Flatten array 4. Constant value array of complex type
11.	1.	Write a python program to concatenate the dataframes with two different objects
	2.	Write a python code to read a csv file using pandas module and print the first and last five lines of a file.
12.	1.	Write a python code to set background color and pic and draw a circle using turtle module
	2.	Write a python code to set background color and pic and draw a square and fill the color using turtle module
	3.	Write a python code to perform addition-using functions with pdb module.
13.		Write a GUI for an Expression Calculator using tk.
14.		Write a program to implement the following figures using turtle.

### **PART – B (Mini projects)**

#### **Project 1: Dice Rolling Simulator**

**Goal:** This project involves writing a program that simulates rolling dice. When the program runs, it will randomly choose a number between 1 and 6. The program will print what that number is. It should then ask you if you'd like to roll again. For this project, you'll need to set the min and max number that your dice can produce. For the average die, that means a minimum of 1 and a maximum of 6. You'll also want a function that randomly grabs a number within that range and prints it.

**Concepts to keep in mind:**

- Random
- Integer
- Print
- While Loops



### **Project 2: Guess the Number**

**Goal:** This project uses the random module in Python. The program will first randomly generate a number unknown to the user. The user needs to guess what that number is. If the user's guess is wrong, the program should return some sort of indication as to how wrong (e.g. The number is too high or too low). If the user guesses correctly, a positive indication should appear. You'll need functions to check if the user input is an actual number, to see the difference between the inputted number and the randomly generated numbers, and to then compare the numbers.

#### ***Concepts to keep in mind:***

- Random function
- Variables
- Integers
- Input/Output
- Print
- While loops
- If/Else statements

### **Project 3: Mad Libs Generator**

**Goal:** The program will first prompt the user for a series of inputs a la Mad Libs. For example, a singular noun, an adjective, etc. Then, once all the information has been inputted, the program will take that data and place them into a premade story template. You'll need prompts for user input, and to then print out the full story at the end with the input included.

#### ***Concepts to keep in mind:***

- Strings
- Variables
- Concatenation
- Print

### **Project 4: TextBased Adventure Game**

**Goal:** A complete text game, the program will let users move through rooms based on user input and get descriptions of each room. To create this, you'll need to establish the directions in which the user can move, a way to track how far the user has moved (and therefore which room he/she is in), and to print out a description. You'll also need to set limits for how far the user can move. In other words, create "walls" around the rooms that tell the user, "You can't move further in this direction."

#### ***Concepts to keep in mind:***

- Strings
- Variables
- Input/Output
- If/Else Statements
- Print
- List
- Integers

### **Project 5: Hangman**

**Goal:** The main goal here is to create a sort of "guess the word" game. The user needs to be able to input letter guesses. A limit should also be set on how many guesses they can use. This means you'll need a way to grab a word to use for guessing. (This can be grabbed from a pre-made list. No need to get too fancy.) You will also need functions to check if the user has actually inputted a single letter, to check if the inputted letter is in the hidden word (and if it is, how many times it appears), to print letters, and a counter variable to limit guesses.

#### ***Concepts to keep in mind:***

- Random

- Variables
- Boolean
- Input and Output
- Integer
- Char
- String
- Length
- Print

**\*\*Projects are not limited.**

**Laboratory Outcomes:** After studying these laboratory programs, students will be able to

- 1 Write, test, and debug simple Python programs.
- 2 Implement Python programs with conditionals and loops.
- 3 Develop Python programs step-wise by defining functions and calling them.
- 4 Use Python lists, tuples, dictionaries for representing compound data.
- 5 Read and write data from/to files in Python.

**Procedure to Conduct of Practical Examination:**

- 1 Experiment distribution
- 2 For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.
- 3 For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.
- 4 Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
- 5 Marks Distribution (Courseed to change in accordance with university regulations)
- 6 For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+70+15= 100 Marks
- 7 For laboratories having PART A and PART B
  - i. Part A – Procedure + Execution + Viva = 5+15 + 5 = 25 Marks
  - ii. Part B – Procedure + Execution + Viva = 5+15 + 5 = 25 Marks

**Reference Books :**

1. Al Sweigart, “Automate the Boring Stuff with Python”, 1st Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at <https://automatetheboringstuff.com/>) (Chapters 1 to 18)
2. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd Edition, Green Tea Press, 2015. (Available under CC-BY-NC license <http://greenteapress.com/thinkpython2/thinkpython2.pdf>) (Chapters 13, 15, 16, 17, 18) (Download pdf/html files from the above links)
3. **Programming Python**, Mark Lutz, O'Reilly Media, Edition 2010.
4. Gowrishankar S, Veena A, “Introduction to Python Programming”, 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372.
5. Jake VanderPlas, “Python Data Science Handbook: Essential Tools for Working with Data”, 1st Edition, O'Reilly Media, 2016. ISBN-13: 978-1491912058.
6. Charles Dierbach, “Introduction to Computer Science Using Python”, 1st Edition, Wiley India Pvt Ltd, 2015. ISBN-13: 978-8126556014.

**Web Links and Video Lectures:**

1. <http://www.onlineprogrammingbooks.com/learning-program-using-python/>
2. <https://www.pdfdrive.com/python-for-data-analysis-data-wrangling-with-pandas-numpy-and-python-e158189564.html>.

<b>Semester:IV</b>		
<b>COURSE:CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS</b>		
<b>Course Code: 22SFH117/127</b>	<b>L:T:P:J: 0:2:0:0</b>	<b>CIE Marks:50</b>
<b>Credits:</b>	<b>1</b>	<b>SEE Marks:5 0</b>
<b>Hours:</b>	<b>15 hrs</b>	<b>SEE Duration:</b>
<b>Course Learning Objectives: The students will be able to</b>		
1	know the fundamental political codes, structure, procedures, powers, and duties of Indian government institutions, fundamental rights, directive principles, and the duties of citizens	
2	know the Indian top civil service positions and the exams conducted by UPSC and SPSC for the same	
3	Understand engineering ethics and their responsibilities; identify their individual roles and ethical responsibilities towards society.	
<b>MODULE 1: Introduction to Indian Constitution</b>		<b>RBT</b>
The Necessity of the Constitution, Introduction to Indian Constitution, The Making of the Constitution, Role of Constituent Assembly, Preamble and Salient features of the Constitution of India, Fundamental Rights and its Restriction and limitations in different complex situations, Directive Principles of State Policy, Fundamental Duties.		<b>Hrs</b>
		<b>1,2,3</b>
		<b>3</b>
<b>MODULE 2: System of Government, Central Government, State Government</b>		<b>RBT</b>
System of Government-Parliamentary System, Federal System.  Central Government-Basic details, Powers and Functions of Union Executive. Parliament- LS and RS (Composition, Duration, Membership and Presiding officers of Parliament and their functions). Leaders in Parliament (Leader of the House and Leader of the Opposition). Sessions of Parliament (Summoning, Adjournment, Adjournment Sine Die, Prorogation, Dissolution). Quorum of House, Language in Parliament, Joint sitting of two Houses. State Government-Basic details, Powers and Functions of State Executive. State Legislature(Composition, Duration, Membership and Presiding officers of Parliament and their functions).		<b>Hrs</b>
		<b>1,2,3</b>
		<b>3</b>
<b>MODULE 3: Judiciary, Amendments and Emergency Provisions</b>		<b>RBT</b>
Supreme Court, High Court, Judicial Review, Judicial Activism. Methods in Constitutional Amendments (How and Why). Types of Emergencies and its Consequences, Recent Amendments to the Constitution.		<b>Hrs</b>
		<b>1,2,3</b>
		<b>3</b>
<b>MODULE 4: Elections, Constitutional and Non Constitutional Bodies</b>		<b>RBT</b>
Elections- Election Commission of India, Electoral Process.  Constitutional Bodies- Election Commission, Union Public Service Commission,		<b>Hrs</b>
		<b>1,2,3</b>
		<b>3</b>

State Public Service Commission, Goods and Service Tax Council.		
Non Constitutional Bodies- Central Information Commission, State Information Commission.		
<b>MODULE 5: Professional Ethics</b>	<b>RBT</b>	<b>Hrs</b>
Scope & Aims of Engineering & Professional Ethics, Positive and Negative Faces of Engineering Ethics, Responsibilities in Engineering, the impediments to Responsibility. Trust and Reliability in Engineering, Risks, Safety and liability in Engineering, Clash of Ethics, IPRs (Intellectual Property Rights)	<b>1,2,3</b>	<b>3</b>

**Course outcome:** On completion of this course, students will be able to,

CO1: Have constitutional knowledge and legal literacy.

CO2: Have knowledge on All India Services and State Civil Services.

CO3: Understand Engineering and Professional Ethics and responsibilities of Engineers.

### Reference Books

#### Suggested Learning Resources:

**1. Title of the Book - Indian Polity**

Name of the Author - M Lakshmikanth

Name of the Publisher-Mc Graw Hill Education

Edition and Year- 2019

**2. Title of the Book - Engineering Ethics**

Name of the Authors - M. Govindarajan, S.Natarajan, V.S. Senthilkumar

Name of the Publisher- Prentice-Hall

Edition and Year-2004

**3. DurgaDasBasu (DDBasu):** "Introduction to the Constitution of India", (Students Edition.) Prentice-Hall, 19th/20th Edn., (Latest Edition) or 2008.

**4. ShubhamSingles, Charles E. Haries, and Etal:** "Constitution of India and Professional Ethics" by Cengage Learning India Private Limited, Latest Edition - 2018.

**5. M. Govindarajan, S. Natarajan, V.S. Senthilkumar,** "Engineering Ethics", Prentice-Hall of India Pvt. Ltd. New Delhi, 2004

**6. M.V. Pylee,** "An Introduction to Constitution of India", Vikas Publishing, 2002.

**7. Latest Publications of NHRC- Indian Institute of Human Rights,** New Delhi.

## **WebLinks and Video**

**Lectures**[www.unacademy.com/lesson/future-perfect-tense/YQ9NSNQZ](http://www.unacademy.com/lesson/future-perfect-tense/YQ9NSNQZ)<https://successesacademy>

### **Question paper pattern for SEE and CIE.**

- The SEE question paper will be set for 50 marks and the pattern of the question paper will be objective type (MCQ).
- The CIE question paper will be set for 50 marks and the pattern of the question paper will be objective type (MCQ).

## ADVANCED LEADERSHIP SKILLS

<b>Course Code:</b>	<b>Credit: 1</b>
<b>L:T:P:J: 0:0:2:0</b>	<b>CIA Marks: 100</b>

### Course Objectives

1. To prepare students to exercise different types of communication by engaging them across various real life and hypothetical scenarios.
2. To make students practically understand the essential aspects of communication that will aid them in becoming a leader.

Module No.	Contents of the Module	Session	COs
<b>1</b>	<b>Module-1 Understanding and Managing Self</b> Self-Awareness, Self-Management, Anger Management, Time management, Change management. Vision and goal setting - Diff between vision and goal, smart, stretched goal concept, case studies. Personality analysis using Big 5 personality test. Critical Thinking, Problem solving, Creativity and innovation Integrity, ethics, values.	<b>7</b>	<b>CO1</b>
<b>2</b>	<b>Module -2 Corporate etiquettes</b> Resume Writing, Basic etiquettes, Grooming etiquettes, Effective meeting skills Group discussion and Personal interview.	<b>8</b>	<b>CO2</b>

### Course Outcomes: At the end of the course the student will be able to:

<b>CO1</b>	Understand their strengths and weakness
<b>CO2</b>	Develop analytical and creative ability to solve problems
<b>CO3</b>	Become industry ready through practice of corporate etiquettes

### Mapping of Course Outcomes with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1		2			2			1	2
CO2					2				2
CO3		2			2				2

### MOOC Course:

#### Leading Diverse Teams

<https://www.coursera.org/learn/leading-diverse-teams>

### Practical component:

1. Mock GD and interview may be conducted at the end of the course to check their confidence. Students can prepare their SWOT analysis and present the same.

<b>Semester: IV</b>		
<b>COURSE: Environmental Science</b>		
<b>Course Code: 2IISE148</b>	<b>L:T:P:J: 2:0:0:0</b>	<b>CIE Marks:50</b>
<b>Credits:</b>	<b>2</b>	<b>SEE Marks:5 0</b>
<b>Hours:</b>	<b>30hrs</b>	<b>SEE Duration:</b>
<b>Course Learning Objectives: The students will be able to</b>		
1	To identify the major challenges in environmental issues and evaluate possible solutions.	
2	Develop analytical skills, critical thinking and demonstrate socio-economic skills for sustainable development.	
3	To analyse an overall impact of specific issues and develop environmental management plan.	
<b>Module 1 – Environment</b>		<b>RBT</b>
<b>a) Environment:</b> Definition, <b>b) Ecology and Ecosystems:</b> (i)Biomes (ii) Ecosystems& Sustainable Ecosystem (iv) Human Activities & Environment. <b>c) Human activities and their Impact on Environment :</b> (i) Agriculture (ii) Industry (iii) Transport (iv) mining. (i) Environmental Impact Assessment (EIA) (ii) Sustainable Development		1,2,3
<b>Module 2 –Natural Resources</b>		<b>RBT</b>
<b>Natural Resources</b>		
<b>a) Forest Resources:</b> (i) Forest wealth and its conservation (ii)Wood–Major renewable resources (iii) Biodiversity <b>b) Water resources and its uses:</b> (i) Quality (ii) Impurities – Fluoride etc <b>c) Water borne diseases</b> <b>d) Energy:</b> (i) Conventional (ii) Non-conventional (iii) Wind, Solar, Tidal, Hydro Electric, Biomass & Biogas (iv) Alternate source – Hydrogen, Bio fuel, Hybrid & semi hybrid vehicles, etc <b>e) Life on Earth:</b> (i)Wild life management, Nature, Genetically Modified (GM Crops), Balance of Nature – Nature pyramid, Floods and droughts		1,2,3
		<b>Hrs</b>
		<b>6</b>
		<b>6</b>

<b>Module 3 –Pollution and Current Global issues</b>	<b>RBT</b>	<b>Hrs</b>
<p><b>a) Pollution</b></p> <p>(i)Types of pollutions, Environmental, Air, Water, Noise, land , Effluents Public Health</p> <p>(ii) Carbon foot print, Climate change, Ozone depletion (ChloroFloro carbon)</p> <p>Global warming, Greenhouse effect, Acid Rain.</p> <p>(iii) Ground water pollution, (Earth summits for balancing effect on environment).</p> <p><b>b) Current Global Environmental issues:</b></p> <p>(i) Population</p> <p>(ii) Local urbanization - concrete jungles.</p> <p>(iii) waste water management.</p> <p>(iv) Effect on natural drainage in cities, encroachment on lakes, etc.</p>	<b>1,2,3</b>	<b>6</b>
<b>Module 4 –Sustainable development</b>	<b>RBT</b>	<b>Hrs</b>
<p><b>Sustainable development :</b></p> <p>(i)Solid waste, E-waste and Bio Medical waste management.</p> <p>(ii) Waste Water treatment, Encouraging Green buildings.</p> <p>(iii) Vermi compost, organic farming, adopting SubhashPalekar farming methods.</p>	<b>1,2,3</b>	<b>6</b>
<b>Module 5 –Environmental policies, Protection &amp; Laws</b>	<b>RBT</b>	<b>Hrs</b>
<p><b>Environmental policies, Protection &amp; Laws</b></p> <p><b>Regulations &amp; Laws</b></p> <p>(i) Forest, Wildlife, Water and Air.</p> <p>(ii) Environmental movements, NGO’s – Chipko, Silent valley, Narmada</p> <p>(iii) Environmental Ethics.</p> <p>(iv) Resource needs for future generations – for mankind other life forms on this planet.</p> <p>(v) Role of individual in sustainable development.</p>	<b>1,2,3</b>	<b>6</b>

<b>Course Outcomes: After completing the course, the students shall</b>	
22EVS116/126.1	CO1:Understandthe concepts ofecology, environment and biodiversity and the consequences of their destruction.
22EVS116/126.2	CO2: Gain awareness about the advances in energy systems as well ways to manage natural resources.



22EVS116/126.3	CO3: Understand the different kinds of pollution, their impact and manage waste through recycling.
22EVS116/126.4	CO4: Gain awareness about the current environmental issues and their global impact on various aspects.
22EVS116/126.5	CO5: Develop critical thinking and apply them to analyse a problem or question related to the environment.

**Question paper pattern:**

- ▮ The Question paper will have 100 objective questions.
- ▮ Each question will be for 1 mark
- ▮ Student will have to answer all the questions in an OMR Sheet.
- ▮ The Duration of Examination will be 3 hours.

<b>Textbook/s</b>				
<b>Sl. No.</b>	<b>Title of the Book</b>	<b>Name of the Author/s</b>	<b>Name of the Publisher</b>	<b>Edition and Year</b>
1	Environmental Studies	Anil Kumar De, Arnab Kumar De	New Age International (P) Limited, Publishers	2018
2.	Environmental Studies	Benny Joseph	Tata Mc Graw – Hill.	2 <sup>nd</sup> Edition, 2012
3.	Environmental Science working with the Earth	G. Tyler Miller Jr.	Thomson Brooks / Cole,	11 <sup>th</sup> Edition, 2006

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

SEMESTER – V

## Software Project Management and Finance

Course Code: 2IISE151

<b>L:T:P:J</b>	<b>2:2:0:0</b>	CIA Marks	<b>50</b>
<b>Credits:</b>	<b>3</b>	SEA Marks	<b>50</b>
<b>Hours:</b>	<b>40</b>	Exam Hours	<b>03</b>

### Course Learning Objectives:

This course will enable students to

- Identify ethical and professional issues and explain why they are of concern to software engineers.
- Recognize the importance of software maintenance and describe the intricacies involved in software evolution.
- Apply estimation techniques, schedule project activities and compute pricing.
- Identify software quality parameters and quantify software using measurements and metrics.
- Recognize the need for agile software development, describe agile methods, apply agile practices and plan for agility.

	<b>Number of Hours</b>	<b>Bloom's Level</b>
<b>Module-1</b>		
<b>Introduction:</b> Software Crisis, Need for Software Engineering. Professional Software Development, Software Engineering Ethics. Case Studies. <b>Software Processes:</b> Models: Waterfall Model, Incremental Model and Spiral Model, Process activities. <b>Requirements Engineering:</b> Requirements Engineering Processes, Functional and non-functional requirements. The software Requirements Document, Requirements Specification, Requirements validation, Requirements Management	<b>8</b>	<b>Apply</b>
<b>Module-2</b>		
<b>System Models:</b> Structural models, Behavioral models, UML modeling using StarUml tool. <b>Design and Implementation:</b> Introduction to RUP, Design Principles <b>Software Testing:</b> Development testing, Test-driven development, Release testing, User testing.	<b>8</b>	<b>Apply</b>
<b>Module-3</b>		
<b>Project management:</b> Risk management, Managing People, Teamwork. <b>Project Planning:</b> Software pricing, Plan-driven development, Project scheduling: Estimation techniques, <b>Quality management:</b> Software quality, Reviews and inspections, Software measurement and metrics, Software standards	<b>8</b>	<b>Apply</b>
<b>Module-4</b>		
<b>Agile Software Development:</b> Coping with Change, The Agile Manifesto: Values and Principles. Agile methods: SCRUM (Ref —The	<b>8</b>	<b>Apply</b>

SCRUM Primer, Ver 20.) and Extreme Programming. Plan-driven and agile development. Agile project management, Scaling agile methods.		
<b>Module-5</b>		
<p><b>How to Manage Project Finances</b>-Cost estimating: Work Breakdown Structure, Cost budgeting: Cost Aggregation, Reserve Analysis, Parametric estimating, Infrastructure and overheads, Cost control: Change Control, Resource Management</p> <p><b>Performance Measurement and Analysis</b>- Cost Variance, Earned Value, Schedule Variance, Cost Performance Index, Schedule Performance Index.</p> <p>Forecasting, Introduction of Tools to manage project Finances-TouchBase Project Financials</p>	<b>8</b>	<b>Apply</b>
<p><b>Course outcomes:</b></p> <ol style="list-style-type: none"> <li>1. Understand the activities involved in software engineering and identify the role of various process models.</li> <li>2. Design a software system, component, or process to meet desired needs within realistic constraints and describe various software testing methods</li> <li>3. Illustrate the role of project planning and quality management in software development.</li> <li>4. Describe agile project management and benefits of using agile approaches.</li> </ol> <ol style="list-style-type: none"> <li>1. Understanding financial concepts and apply it to control Project Costs.</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Software Engineering Ian Sommerville Pearson Education 9th Edition, 2012</li> <li>2. Software Engineering-A Practitioner approach Roger S. Pressman Tata McGraw Hil 7th Edition</li> <li>3. An Integrated Approach to Software Engineering Pankaj Jalote Wiley India</li> <li>4. A guide to the project Management body of knowledge- PMBOK guide , 7<sup>th</sup> edition</li> </ol>		

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: V

Course: Automata Theory and Computability

Course Code: 21ISE152

<b>L:T:P:J</b>	<b>2:2:0:0</b>	<b>CIA</b>	<b>:</b>	<b>50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>:</b>	<b>50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration</b>	<b>:</b>	<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

1	Introduce core concepts in Automata and Theory of Computation
2	Identify different Formal Language Classes and their Relationships
3	Design Grammars and Recognizers for different formal languages
4	Prove or disprove theorems in automata theory using their properties
5	Determine the decidability and intractability of Computational problems

<b>Module-1: Introduction to the Theory of Computation:</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
Three Basic Concepts: Languages, Grammars and Automata, Some Applications. <b>Finite Automata:</b> Deterministic Finite Accepters, Deterministic Accepters and Transition Graphs, Languages and DFA's Regular Languages, Nondeterministic Finite Accepters: Definition of a Nondeterministic Acceptor, Why Nondeterminism? Equivalence of Deterministic and Nondeterministic Finite Accepters	<b>8</b>	<b>Apply</b>
<b>Module-2: Regular Languages and Regular Grammars</b>		
<b>Regular Expressions:</b> Formal Definition of a Regular Expression, Languages Associated with Regular Expressions, Connection Between Regular Expressions and Regular Languages, Regular Expressions Denote Regular Languages, Regular Expressions for Regular Languages, Regular Expressions for Describing Simple Patterns. <b>Properties of Regular Languages:</b> Closure Properties of Regular Languages Closure under Simple Set Operations, Closure under Other Operations, Identifying Non-Regular Languages, Using the Pigeonhole Principle A Pumping Lemma.	<b>8</b>	<b>Apply</b>
<b>Module-3: Context-Free Languages:</b>		
Context-Free Grammars, Examples of Context-Free Languages Leftmost and Rightmost Derivations, Derivation Trees, Relation Between Sentential Forms and Derivation Trees, Parsing and Ambiguity, Parsing and Membership, Ambiguity in Grammars and Languages, <b>Simplification of Context-Free Grammars and Normal Forms:</b> Methods for Transforming Grammars, A Useful Substitution Rule, Removing Useless Productions, Removing $\lambda$ -Productions, Removing Unit-Productions, Two Important Normal Forms, Chomsky Normal Form, Definition of Greibach Normal Form.	<b>8</b>	<b>Apply</b>
<b>Module-4: Pushdown Automata</b>		
Nondeterministic Pushdown Automata: Definition of a Pushdown Automaton, The Language Accepted by a Pushdown Automaton, Pushdown Automata and Context-Free Languages: Pushdown Automata for Context-Free Languages, Context-Free Grammars for Pushdown Automata, A Pumping Lemma For Context-Free Language	<b>8</b>	<b>Apply</b>

<b>Module-5: Turing Machines and Undecidability</b>		
<b>Turing Machines: The Standard Turing Machine, Turing Machines as Language Accepters, Turing Machine with more complex storage: Multitape Turing Machine, Multidimensional Turing Machine, Nondeterministic Turing Machine, Universal Turing Machine, Turing Thesis, Linear Bounded Automata.</b> <b>Hierarchy of Formal Languages and Automata: Recursive and Recursively Enumerable Languages, the Chomsky Hierarchy.</b> <b>Limits of Algorithmic Computation: Some Problems that cannot be solved by Turing, Undecidable Problem for Recursively Enumerable Languages.</b>	<b>8</b>	<b>Apply</b>

<b>Course Outcomes:</b> After completing the course, the students will be able to
CO 1: Understand the basic properties of formal languages and grammars.
CO 2: Differentiate regular, context-free and recursively enumerable languages.
CO 3: Differentiate regular, context-free and recursively enumerable languages.
CO 4: Acquire concepts relating to the theory of computation and computational models like decidability
CO 5: Acquire concepts relating to church's hypothesis and the problem of undecidability.

<b>Reference Books:</b>
<ol style="list-style-type: none"> <li>1. Peter Linz, "An Introduction to Formal Languages and Automata", 3rd Edition, Narosa Publishers, 1998</li> <li>2. John E Hopcroft, Rajeev Motwani, Jeffery D Ullman, Introduction to Automata Theory, Languages, and Computation, 3rd Edition, Pearson Education, 2013.</li> <li>3. An introduction to formal languages and automata / Peter Linz.—5th ed.</li> <li>4. Michael Sipser : Introduction to the Theory of Computation, 3rd edition, Cengage learning,2013</li> <li>5. John C Martin, Introduction to Languages and The Theory of Computation, 3rd Edition, Tata McGraw –Hill Publishing Company Limited, 2013</li> <li>6. Basavaraj S. Anami, Karibasappa K G, Formal Languages and Automata theory, Wiley India, 2012</li> <li>7. C K Nagpal, Formal Languages and Automata Theory, Oxford University press, 2012.</li> </ol>
<b>Web links and Video Lectures:</b>
<ol style="list-style-type: none"> <li>1. <a href="https://archive.nptel.ac.in/courses/106/106/106106049/">https://archive.nptel.ac.in/courses/106/106/106106049/</a></li> <li>2. <a href="https://archive.nptel.ac.in/courses/111/103/111103016/">https://archive.nptel.ac.in/courses/111/103/111103016/</a></li> <li>3. <a href="https://www.csa.iisc.ac.in/~deepakd/atc-2021/">https://www.csa.iisc.ac.in/~deepakd/atc-2021/</a></li> </ol>

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: V

Course: Introduction to Data Science using Python

Course Code: 2IISE153

<b>L:T:P:J</b>	<b>2:0:2:0</b>	<b>CIA</b>	<b>:</b>	<b>50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>:</b>	<b>50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration:</b>		<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

1	To introduce data collection and pre-processing techniques for data science
2	Explore analytical methods for solving real life problems through data exploration techniques
3	Illustrate different types of data and its visualization
4	Find different data visualization techniques and tools
5	Design and map element of visualization well to perceive information

<b>Module-1:</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
Introduction to Data Science Introduction: What is Data Science? Big Data and Data Science hype – and getting past the hype, Why now? – Datafication, Current landscape of perspectives, Skill sets. Needed Statistical Inference: Populations and samples, Statistical modelling, probability distributions, fitting a model. Program: 1,2,3	<b>8</b>	<b>Understand</b>
<b>Module-2:</b>		
Exploratory Data Analysis and the Data Science Process Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process, Case Study: Real Direct (online realstate firm). Three Basic Machine Learning Algorithms: Linear Regression, k-Nearest Neighbours (k- NN), k-means. Programs: 4,5,6,7	<b>8</b>	<b>Apply</b>
<b>Module-3:</b>		
Feature Generation and Feature Selection Extracting Meaning from Data: Motivating application: user (customer) retention. Feature Generation (brainstorming, role of domain expertise, and place for imagination), Feature Selection algorithms. Filters; Wrappers; Decision Trees; Random Forests. Recommendation Systems: Building a User-Facing Data Product, Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal Component Analysis, Programs: 8,9,10	<b>8</b>	<b>Apply</b>
<b>Module-4:</b>		
Regression analysis, Regression: linear regression simple linear regression, multiple & Polynomial regression, Sparse model. Unsupervised learning, clustering, similarity and distances, quality measures of clustering, case study. Programs: 8,9,10	<b>8</b>	<b>Apply</b>

<b>Module-5:</b>		
Recommender Systems: Introduction, How do recommender system works?, Modelling user preferences, Evaluating recommenders, Practical case. Programs: 11	<b>8</b>	<b>Apply</b>

**Course Outcomes:** After completing the course, the students will be able to  
CO1: To introduce data collection and pre-processing techniques for data science  
CO2: Apply descriptive and statistical inference  
CO3: Identify different approaches in supervise learning  
CO4: Apply Regression Analysis and clustering approaches  
CO5: Develop Recommendation system

**Reference Books:**

1. Introduction to Data Science a Python approach to concepts, Techniques and Applications, Iqbal, L;Seghi', S. Springer, ISBN:978-3-319-50016-4
2. Doing Data Science, Cathy O'Neil and Rachel Schutt, O'Reilly Media, Inc O'Reilly Media, Inc, 2013.
3. Data Visualization workshop, Tim Grobmann and Mario Dobler, Packt Publishing, ISBN 9781800568112
4. Mining of Massive Datasets, Anand Rajaraman and Jeffrey D. Ullman, Cambridge University Press, 2010
5. Data Science from Scratch, Joel Grus, Shroff Publisher /O'Reilly Publisher Media 3. A handbookfor data driven design by Andy krik
6. Doing Data Science, Straight Talk from the Frontline, Cathy O'Neil, Rachel Schutt, O'Reilly, 1<sup>st</sup> edition, 2013
7. Mining of Massive Datasets, Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Cambridge University Press, 2nd edition, 2014

**Web links and Video Lectures:**

1. <https://www.knowledgehut.com/blog/data-science/eda-data-science>
2. <https://towardsdatascience.com/data-exploration-understanding-and-visualization-72657f5eac41>
3. <https://matplotlib.org/>

### List of Exercises

1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages. Write a python program to read CSV file.
2. Demonstrate Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data
3. Using the following data, build a model/function that can tell us the prices of the homes with 3300 sq.ft. and 5000 sq.ft using linear regression, and also plot the above data as a scatter plot.

Area	Price
2600	550000
3000	565000
3200	610000
3600	680000
4000	725000

4. Plot Mean and Standard Deviation in Pandas.
5. Suppose there are 100 students in the class and in one of the mathematics tests the average marks scored by the students in the subject is 78 and the standard deviation is 25. The marks of the student follow Normal probability distribution. Write a code to find
  - a. Percentage of Students who got less than 60 marks
  - b. Percentage of Students who have scored More than 70
  - c. Percentage of Students who have scored More than 75 and less than 85.
6. Predict if cancer is Benign or malignant. Using historical data about patients diagnosed with cancer enables doctors to differentiate malignant cases and benign ones are given independent attributes using SVM.
7. Implement random forest classifier on iris data set to classify the type of flower.
8. A linear regression line has an equation of the form  $Y = a + bX$ , where  $X$  is the explanatory variable and  $Y$  is the dependent variable. The slope of the line is  $b$ , and  $a$  is the intercept (the value of  $y$  when  $x = 0$ ). Write a Python program to describe linear regression.
9. Implement k-means algorithm.
10. Demonstrate how polynomial regression can be implemented.
11. Build a simple recommendation system.



# B.N.M. Institute of Technology

An Autonomous Institution under VTU  
Department of Information Science and Engineering  
Semester: V

**Course: COMPUTER NETWORK**

**Course Code: 2IISE154**

<b>L:T:P:J</b>	<b>2:2:2:0</b>	<b>CIA</b> : <b>50</b>
<b>Credits:</b>	<b>04</b>	<b>SEA</b> : <b>50</b>
<b>Hours:</b>	<b>50</b>	<b>SEA Duration</b> : <b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

- 1 Explain with the basics of data communication and various types of computer networks.
- 2 Demonstrate Medium Access Control protocols for reliable and noisy channels.
- 3 Expose wireless and wired LANs, Logical addressing.
- 4 Discuss transport layer services and understand UDP and TCP protocols.
- 5 Demonstration of application layer protocols

<b>Module-1:</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
<b>Introduction:</b> Data Communications, Networks, Network Types, Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model. <b>Introduction to Physical Layer:</b> Data Rate Limits, Performance Digital to Digital Conversion- Line coding: polar, unipolar, Block coding: 4B/5B, Multiplexing – FDM, TDM, Switching – Circuit switching, packet switching. Lab Program: 1,14(Not limited to this)	<b>10</b>	<b>Understand</b>
<b>Module-2:</b>		
<b>Error Detection and Correction:</b> Introduction, Block coding, Cyclic codes, <b>Data Link Layer:</b> Data Link Control –DLC services: Framing, Flow and Error Control, Data link layer protocols: HDLC, Point to Point Protocol. Media Access Control – Random Access: CSMA/CD, CSMA/CA, Controlled Access, Channelization. Lab Program: 2,3 (Not limited to this)	<b>10</b>	<b>Understand</b>
<b>Module-3:</b>		
<b>Network Layer:</b> IPV4Addresses: Address space, Classful Addressing, Classless Addressing, Dynamic Host Configuration Protocol (DHCP), Network Address Translation (NAT). IPv6 Addresses, Routing Algorithms: Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm. Routing in the Internet, OSPF, Inter/AS Routing: BGP, Broadcast Routing Algorithms and Multicast. Lab program: 4,5,6,16-18(Not limited to this)	<b>10</b>	<b>Analyze</b>
<b>Module-4:</b>		
<b>Transport layer:</b> Multiplexing and Demultiplexing, Connectionless Transport UDP: UDP Segment Structure, UDP Checksum, Connection-Oriented Transport-TCP: The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, TCP congestion control. Lab program: 7-10,15(Not limited to this)	<b>10</b>	<b>Analyze</b>
<b>Module-5:</b>		

<p><b>Application Layer:</b> The Web and HTTP: Overview of HTTP, Non-Persistent and Persistent Connections, HTTP Message Format, User-Server Interaction Cookies, Web Caching, The Conditional GET. File Transfer- FTP: FTP Commands and Replies, Electronic Mail in the Internet: SMTP, Comparison with HTTP, Mail Access Protocols. DNS—The Internet’s Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages, Lab program: 11-13(Not limited to this)</p>	<p><b>10</b></p>	<p><b>Apply</b></p>
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<p><b>Course Outcomes:</b> After completing the course, the students will be able to</p>
<p>CO 1: Understand the fundamentals of digital communication and switching.  CO 2: Infer error detection and correction mechanisms and Compare and contrast data link layer protocols.  CO 3: Classify wired and wireless network, IP and Routing Algorithms in network layer.  CO 4: Recognize transport layer services and infer UDP and TCP protocols.  CO 5: Identify principles and services of application layer protocols.</p>

<p><b>Reference Books:</b></p>
<ol style="list-style-type: none"> <li>1. Data Communication and Networking, Behrouz A. Forouzan, McGraw Hill, 5th Edition, 2013.</li> <li>2. James F. Kurose and Keith W. Ross: Computer Networking: A TopDown Approach, 8th edition, Addison-Wesley, 2021.</li> <li>3. Data and Computer Communication, William Stallings, 10th Edition, Pearson Education, 2013.</li> <li>4. Introduction to Data Communications and Networking – Wayne Tomasi, Pearson Education, 5<sup>th</sup>Edition, 2011.</li> <li>5. Larry L. Peterson and Bruce S Davie: Computer Networks: A Systems Approach, Fifth Edition, Elsevier, 2011.</li> <li>6. Tanenbaum: Computer Networks, 5<sup>th</sup>Edition, Pearson Education/PHI, 2010.</li> </ol>

<p><b>Web links and Video Lectures:</b></p>
<ol style="list-style-type: none"> <li>1. <a href="https://archive.nptel.ac.in/courses/106/105/106105183/">https://archive.nptel.ac.in/courses/106/105/106105183/</a></li> <li>2. <a href="https://www.wireshark.org/docs/wsug_html_chunked/">https://www.wireshark.org/docs/wsug_html_chunked/</a></li> <li>3. <a href="https://www.softwaretestinghelp.com/computer-networking-basics/">https://www.softwaretestinghelp.com/computer-networking-basics/</a></li> <li>4. <a href="https://ns3tutorial.com/ns2-ns3/">https://ns3tutorial.com/ns2-ns3/</a></li> </ol>

<p><b>List of Exercises</b></p> <p>Possible list of practical programs:  Implement the following in C/C++/Java or Wireshark as suitable.</p> <ol style="list-style-type: none"> <li>1. Building and testing a small network using CISCO packet tracer.</li> <li>2. Write a program for error detecting code using CRC-CCITT (16- bits).</li> <li>3. Trace Dynamic Host Configuration Protocol.</li> <li>4. Analyzing and troubleshooting the network layer protocols DHCP and IPv4 using Wireshark.</li> <li>5. Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present.</li> <li>6. Write a program on datagram socket for client/server to display the messages on client side, typed at the server side.</li> <li>7. Write a program for congestion control using leaky bucket algorithm.</li> <li>8. Analyzing and troubleshooting the transport layer protocols TCP, UDP using Wireshark.</li> <li>9. Trace Hypertext Transfer Protocol.</li> <li>10. Trace File Transfer protocol, Trace Transmission control protocol.</li> </ol>
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11. Setting up a DNS server to understand the functionality and its operations.

Implement the following in NS3 or any other suitable simulator.

1. Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped.
2. Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
3. Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.
4. Implement simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets.
5. Implement and study the performance of GSM on NS3 (Using MAC layer) or equivalent environment.

# B.N.M. Institute of Technology

An Autonomous Institution under VTU  
Department of Information Science and Engineering  
Semester: V

**Course: Robotic Process Automation**

**Course Code: 21ISE155**

<b>L:T:P:J</b>	<b>0:0:2:2</b>	<b>CIA</b>	<b>:</b>	<b>50</b>
<b>Credits:</b>	<b>02</b>	<b>SEA</b>	<b>:</b>	<b>50</b>
<b>Hours:</b>	<b>24</b>	<b>SEA Duration</b>	<b>:</b>	<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

1	To Understand the basic concepts and platforms of RPA.
2	To Describe the different types of variables and its Datatypes.
3	To Describe the various types of Sequence and Control flow.
4	To Apply various control techniques.
5	To Apply Screen Scraping and OCR in RPA along with Error Handling.

**Descriptions (if any):**

**Prerequisite**

- CPU with 1.4GHz 32-bit is minimum requirement and recommended is Dual Core 1.8GHz 64-bit.
- 4GB is the minimum requirement and 8GB is the recommended RAM.
- Windows 7 or above is required OS, though recommended is Windows 10.
- .NET framework 4.6.1 is minimum requirement.

## Part A

<b>Module-1:</b>	<b>No. of hours</b>	<b>Blooms Cognitive Levels</b>
<b>RPA Foundations and Platforms:</b> What is RPA, Components of RPA, RPA Platforms- About UiPath - The future of automation, Record and Play, Downloading and installing UiPath Studio, Learning UiPath Studio, Task recorder <b>DOWNLOADING AND INSTALLING UIPATH STUDIO.</b> On UiPath Installation, download the Community Cloud version. <b>REVERSING A STRING</b> <b>A Quick Guide To The Top RPA Tool:</b> Using Project Templates and UiPath Studio Components <b>“WELCOMING TO THE SESSION “</b> <b>Introduction to UiPath and its Components:</b> Using Types of Projects and Templates in UiPath and UiPath Components	<b>L: 04</b>	<b>Apply</b>
<b>Module-2:</b>		
<b>Variables and Data Types-</b> Variables and Scope, Collections, Data Types, Arguments, Purpose and use, File operation with step-by-step example- CSV/Excel  <b>A) Display a Message in Message Box directly</b> <b>B) Display Message in a Message Box using Variables</b>	<b>L: 05</b>	<b>Apply</b>

<p>C) <b>Assign Activity:</b> To assign a value to a variable. Example-Count Number of Files</p> <p>D) <b>Write CSV Activity:</b> To save the specified Data Table to a .csv file.</p>		
<b>Module-3:</b>		
<p><b>Sequence and Control Flow-</b>Sequencing the workflow, Activities-Control flow, various types of loops and decision making-Step-by Step example using Sequence.</p> <p><b>ACTIVITIES IN UIPATH</b></p> <p><b>If Activity:</b> Find whether a number is even/odd</p> <p><b>For Each Activity:</b> Print Fibonacci Series</p> <p><b>While Activity:</b> Print Numbers 1-10</p> <p><b>Do While Activity:</b> Print Numbers 1-10</p> <p><b>Switch Activity:</b> Sum of two numbers is even/odd</p>	<b>L: 05</b>	<b>Apply</b>
<b>Module-4:</b>		
<p><b>Taking Control of the Controls :</b> Finding and attaching windows , Act on controls - mouse and keyboard activities</p> <p><b>ACTIONS</b></p> <p><b>A) WINDOWS ACTIONS</b> To automate the action of getting the title of an active window.</p> <p><b>B) MOUSE CLICKS</b> To automate the action of closing a notepad window.</p> <p><b>C) KEYSTROKES</b> To automate the task of writing text into a notepad file.</p>	<b>L: 05</b>	<b>Apply</b>
<b>Module-5:</b>		
<p><b>Screen Scraping and OCR-</b> Screen Scraping, When to use OCR, Types of OCR available, How to use OCR,</p> <p><b>WEB EXTRACTION-WEB SCRAPING OF GOOGLE CONTACTS-</b></p> <p>Extract data from Google Contacts and store it in a file.</p> <p><b>READ PDF WITH OCR ACTIVITY</b></p> <p>Show the uses of optical character recognition to scan the images inside the PDF document and output all the text as a Variable</p>	<b>L: 05</b>	<b>Apply</b>
<b><u>PART – B (Mini projects)</u></b>		
<p><b><u>The List of Possible Projects</u></b></p> <p><b>1.MOVING FILES FROM SOURCE FOLDER TO DESTINATION FOLDER</b> <b>Task:</b> The aim is to automate the process of moving files from the source folder to the destination folder.</p> <p><b>2. WEB AUTOMATION</b> <b>Task:</b> The aim is to scrape data from a website and store it in a .csv File.</p> <p><b>3. EMAIL AUTOMATION</b> <b>Task:</b> The aim is to save the attachments of the top 30 emails which have a keyword in the subject line. The attachments will be stored in a particular folder.</p> <p><b>4. EXCEL AUTOMATION</b> <b>Task:</b> The aim is to fill a google form from the data stored in a .csv file automatically.</p>		

## 5. PDF AUTOMATION

**Task:** The aim is to extract text and images from a PDF File and store the output in a Message Box/TextFile.

## 6. IMAGE & TEXT AUTOMATION

**Task:** Consider an application is running in a virtual environment. Now, once we enter the account number, amount, choose transaction type, a transaction ID is automatically generated. Our task is to, display the Transaction ID in a message box once the transaction is successfully completed

## 7. AUTOMATED CUSTOMER SUPPORT EMAILS (WITH INSTRUCTIONS)

**Task:** The aim is to send automated replies to emails that have particular text in their subject line. For example, If a subject line has the word 'refund,' your solution would send an automated reply to it accordingly.

## 8. TO FIND OUT WHETHER A NUMBER IS EVEN OR ODD.

**Task:** The aim is to find out whether a number is even or odd using the different components of UiPath Studio and Dashboard Of UiPath

## 9. EXTRACTING DATA FROM AN E-COMMERCE WEBSITE

**Task:** Is to design automation which reads the subject line of an email and performs a custom search. So, For example, if my subject line says LG TV then, the designed automation must search for LG TVs' in Flipkart and extract the name, URL, and the price.

## 10. HOW TO AUTOMATE TASKS IN A VIRTUAL ENVIRONMENT?

**Task:** Automating Task on a Desktop Application:

Consider a scenario where you want to open a Notepad in the virtual environment and want to type something in it. How will you automate this task?

**\*\*Projects are not limited**

## Course Outcomes:

**After studying these laboratory programs using UiPath, students will be able to**

1. To Understand the basic concepts and platforms of RPA.
2. To Describe the different types of variables and its Datatypes.
3. To Describe the various types of Sequence and Control flow.
4. To Apply various control techniques.
5. To Apply Screen Scraping and OCR in RPA along with Error Handling.

## Reference Books:

1. Tom Taulli, The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems, 2020, ISBN-13 (electronic): 978-1-4842-5729-6, Publisher: A press
2. Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: Packt Publishing Release Date: March 2018 ISBN: 9781788470940
3. Frank Casale, Rebecca Dilla, Heidi Jaynes, Lauren Livingston, "Introduction to Robotic Process Automation: a Primer", Institute of Robotic Process Automation.
4. Richard Murdoch, Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become an RPA Consultant
5. Srikanth Merianda, Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation

## Web links

- <https://www.uipath.com/rpa/robotic-process-automation>
- <https://www.uipath.com>
- <https://academy.uipath.in>
- <https://www.edureka.co/blog>

# B.N.M. Institute of Technology

An Autonomous Institution under VTU  
Department of Information Science and Engineering  
Semester: V

**Course: Introduction to Web Technologies**

**Course Code: 21ISE1561**

<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA : 50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA : 50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration : 03 Hours</b>

**Course Learning Objectives:** The students will be able to

- 1 Understand the fundamentals of internet and web Technology.
- 2 Identify the Semantic Structure of HTML and CSS.
- 3 Develop forms, tables using HTML, CSS and JavaScript
- 4 Apply Java script functions and arrays to develop an application.
- 5 Apply event handling and validation using javascript

<b>Module-1</b>	<b>No. of hours</b>	<b>Blooms Cognitive Levels</b>
Fundamentals: A brief introduction to Internet, Origins, What the Internet Is, Internet Protocol Addresses, Domain Names, The World Wide Web, Origins, Web or Internet, Web browsers, Web servers, Web Server Operations, General Server Characteristics, Apache, IIS, Uniform Resource Locators, URL Formats, URL Paths, Multipurpose Internet Mail Extensions, Type Specification, Experimental Documental Types, Hypertext Transfer Protocol, The Request Phase, The Response Phase.	<b>08</b>	<b>Understand</b>
<b>Module-2</b>		
Introduction to HTML, what is HTML and Where did it come from? HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements, Introduction to CSS, what is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling. Programs: 1,2	<b>08</b>	<b>Apply</b>
<b>Module-3</b>		
HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility. Programs: 3,4	<b>08</b>	<b>Apply</b>
<b>Module-4</b>		
JavaScript: What is JavaScript and What can it do? JavaScript Design Principles, where does JavaScript Go? Syntax, JavaScript Objects, The Document Object Model (DOM), Javascript Data types and variables, Operators, screen output and keyboard input. Programs: 5,6,7	<b>08</b>	<b>Apply</b>
<b>Module-5</b>		
Control statements Javascript Functions, Arrays, Array Methods, Strings, String Methods, Regular expressions, JavaScript Events, Validating form Input. Programs: 8,9,10	<b>08</b>	<b>Apply</b>

**Course Outcomes:** After completing the course, the students will be able to

CO 1: Understand the fundamentals of internet and web Technology

CO 2: Identify the Semantic Structure of HTML and CSS

CO 3: Develop forms, tables using HTML, CSS and JavaScript

CO 4: Apply Java script functions and arrays to develop an application.

CO 5: Apply event handling and validation using javascript

**Reference Books:**

1. Programming the World Wide Web, 7<sup>th</sup> edition, Robert W. Sebesta , Pearson Education, ISBN- 9789332518827.
2. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 1<sup>st</sup> Edition, Pearson Education India. (ISBN:978-9332575271).
3. Web Technologies, Uttam K Roy, Oxford University Press, ISBN-13 : 978-0198066224.
4. Web Programming, building internet applications, Chris Bates 2nd edition, Wiley Dremtech.
5. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill.

**Web links and Video Lectures:**

1. <https://www.w3schools.com/>
2. [https://www.tutorialspoint.com/web\\_developers\\_guide/](https://www.tutorialspoint.com/web_developers_guide/)
3. <https://archive.nptel.ac.in/courses/106/105/106105084/>
4. [https://onlinecourses.swayam2.ac.in/aic20\\_sp32/](https://onlinecourses.swayam2.ac.in/aic20_sp32/)
5. [https://www.nptelvideos.com/php/php\\_video\\_tutorials.php](https://www.nptelvideos.com/php/php_video_tutorials.php)

**List of Programs (Not Restricted)**

1. Design a web page for restaurant application with an attractive background color, text color, an image, font. (Make use of External, Internal and Inline CSS and all selectors).
2. Design a calendar of December 2022 using HTML and CSS.
3. Design a web page that shows your class timetable using HTML table tag.
4. Design a form which should accept the student data such as, USN, Name of the Student, Date of birth, Branch, Semester. After submitting the form, It should display confirmation message.
5. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.
6. Create a variable called z, assign  $x + y$  to it, and display the result in an alert box.
7. Write a javascript to demonstrate all operators in javascript.
8. Write a function that takes one argument and returns the factorial of that number.
9. Write a javascript to demonstrate all string methods.
10. Write a javascript to validate the form created in program 4 and display proper error messages.



# B.N.M. Institute of Technology

An Autonomous Institution under VTU  
Department of Information Science and Engineering  
Semester: V

**Course: Software Engineering**

**Course Code: 21ISE1562**

<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA:50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA:50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration: 03 Hours</b>

**Course Learning Objectives:** The students will be able to

1	Outline software engineering principles and activities involved in building large software programs.
2	Describe the process of requirements gathering, requirements classification, requirements specification and requirements validation.
3	Apply estimation techniques, schedule project activities and compute pricing by identifying software quality parameters and quantify software using measurements and metrics.

<b>Module-1:</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
<b>Introduction:</b> FAQs about software engineering, Professional and ethical responsibility, Software Processes: Software Process models, Process Iteration, Process Activities, Software requirements: Functional and Non-functional requirements, User requirements, System requirements, Interface specification, The software requirements document.	<b>08</b>	<b>Understand</b>
<b>Module-2:</b>		
<b>Requirements engineering process:</b> Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management. <b>System models:</b> Context models, Behavioural models, Data models, Object models, Structured methods.	<b>08</b>	<b>Apply</b>
<b>Module-3:</b>		
<b>Architectural Design:</b> Architectural Design Decisions, System organization, Modular Decomposition styles, Control styles, Object oriented design: Objects and Object Classes, An object oriented design process, Design evolution.	<b>08</b>	<b>Analyze</b>
<b>Module-4:</b>		
<b>Project Management Concepts:</b> The Management Spectrum, People, Product, Process and Project, The W5HH principle, Critical practices, Estimation for Software Projects: Software Project estimation, Decomposition Techniques, Empirical Estimation models.	<b>08</b>	<b>Apply</b>
<b>Module-5:</b>		
<b>DevOps practices:</b> Introduction to DevOps, Collaboration and Communication, Continuous Integration (CI), Continuous Delivery (CD).	<b>08</b>	<b>Analyze</b>

**Course Outcomes:** After completing the course, the students will be able to

**CO1:** Apply Software Engineering Design Techniques and practices for developing Software.

**CO2:** Analyze the various requirements, design and Testing Techniques to select the appropriate techniques for the software system.

**CO3:** Design Models for different phases of software development to solve real world problems.

**CO4:** Manage Projects by Estimating cost and time required for developing the Software Product.

**Reference Books:**

1. "Software Engineering" Ian Somerville 8th Edition Pearson Education 2007.
2. "Software Engineering: A Practitioners Approach" Rogers S Pressman 7th edition MCGrawHill 2007.
3. "Software Engineering theory and Practice" Shari Lawrence Pfleeger, Joanne m Atlec 3rd edition Pearson Education 2006.
4. "Software Engineering Principles and Practice" Waman S Jawadekar Tata McGraw Hill 2004.

**Web links and Video Lectures:**

1. "Fundamentals of Software Engineering" Rajib Mall 3rd edition  
<https://www.docdroid.net/gzKpqAI/softwareengineering-rajibmall.pdf>
2. "An Integrated approach to Software Engineering" Pankaj Jalote. 3rd edition springer  
[https://www.academia.edu/4660479/an\\_integral\\_approach\\_to\\_software\\_engineering](https://www.academia.edu/4660479/an_integral_approach_to_software_engineering)

# B.N.M. Institute of Technology

An Autonomous Institution under VTU  
Department of Information Science and Engineering  
Semester: V

Course: Design and Analysis of Algorithms  
Course Code: 21ISE1563

<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA</b>	<b>: 50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>: 50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration</b>	<b>: 03 Hours</b>

**Course Learning Objectives:** The students will be able to

- 1 Explain various computational problem-solving techniques.
- 2 Apply appropriate method to solve a given problem.
- 3 Describe various methods of algorithm analysis.

<b>Module-1:</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
<p><b>Introduction:</b> Basics of Algorithms: What is an Algorithm? Properties of an Algorithm, Fundamentals of Algorithmic Problem Solving, Asymptotic Notations, Standard Notations and Common Functions, Comparing functions, Mathematical Analysis of Non-recursive and Recursive Algorithms, Problems on Asymptotic Notation.</p> <p><b>Lab Programs</b></p> <ol style="list-style-type: none"><li>1. Search a key element in a given set of elements using Linear Search method and determine the time required to search the element.</li><li>2. There are 5 books in the shelf, find the number of ways to select 3 books from 5 books on the shelf using the <math>{}^N C_R</math> with recursion.</li><li>3. Find the next three terms of the sequence 15, 23, 38, 61, ... Fibonacci series of the given number using recursion.</li></ol>	<b>08</b>	<b>Understand</b>
<p><b>Module-2:</b></p> <p><b>Brute Force:</b> Selection Sort and Bubble Sort, Sequential Search and Brute Force String Matching.</p> <p><b>Divide and Conquer:</b> Recurrence equation for divide and conquer, Binary Search, Merge sort, Quick sort, Analysis of Quicksort.</p> <p><b>Lab Programs</b></p> <ol style="list-style-type: none"><li>1. Demonstrate through a program how a sequence of characters is taken and checked for the possibility of the presence of the required string. If the possibility is found then, character matching is performed else no using Rabin Karp method.</li><li>2. Sort a given set of elements using Quick Sort method and determine the time required sort the elements. Plot a graph of number of elements versus time taken. Specify the time efficiency class of this algorithm.</li><li>3. Sort a given set of elements using Merge Sort method and determine the time required sort the elements. Plot a graph of number of elements versus time taken. Specify the time efficiency class of this algorithm.</li></ol>	<b>08</b>	<b>Apply</b>
<p><b>Module-3:</b></p> <p><b>Greedy Technique:</b> Fractional Knapsack Problem, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman codes.</p> <p><b>Lab Programs</b></p> <ol style="list-style-type: none"><li>1. We want to build a new plant in the following network, nodes are places and links represent costs to send energy from one place to another based on Dijkstra's algorithm, proposes a method to find the</li></ol>	<b>08</b>	<b>Apply</b>

<p>best place to build the plant, and then solve the problem with your method.</p> <ol style="list-style-type: none"> <li>2. Give a list of the connections the bank should establish in order to minimize their total cost, subject to this constraint. Find the minimum cost spanning tree of a given connected undirected graph using Prim's or Kruskal's algorithm.</li> <li>3. Construct a Huffman tree for the given code using data structures like priority queues, stacks, and trees to design a compression and decompression logic.</li> </ol>		
<b>Module-4:</b>		
<p><b>Decrease and Conquer:</b> Insertion Sort, Depth First Search, Breadth First Search, Topological Sorting</p> <p><b>Lab Programs</b></p> <ol style="list-style-type: none"> <li>1. Sort a given set of elements using Insertion Sort method and determine the time required sort the elements.</li> <li>2. Print all the nodes reachable from a given starting node in a digraph using BFS. Give the trace of this algorithm where one can move from node u to node v only if there's an edge from u to v and find the BFS / DFS traversal of the graph starting from the 0<sup>th</sup> vertex, from left to right according to the graph. Also, you should only take nodes directly or indirectly connected from Node 0 in consideration.</li> <li>3. Design a program to print topological sorting of a Directed Acyclic Graph(DAG)</li> </ol>	<b>08</b>	<b>Apply</b>
<b>Module-5:</b>		
<p><b>Dynamic Programming:</b> Computing a Binomial Coefficient, Warshall's and Floyd's Algorithms, 0/1 Knapsack Problem, Travelling Salesman Problem, Multistage Graphs, Reliability design.</p> <p><b>Lab Programs</b></p> <ol style="list-style-type: none"> <li>1. Implement 0/1 Knapsack problem using dynamic programming. Give the trace of this algorithm.</li> <li>2. Suppose in a network of cities, you are interested in finding shortest paths between all cities. Design a 'C' program to implement this using floyd's algorithm. Find its time and space complexity.</li> <li>3. Suppose a salesperson want to visit n cities to promote the sales of a product. Find an optimal route / way to visit all the cities and reach back the same city using dynamic programming.</li> </ol>	<b>08</b>	<b>Apply</b>

<b>Course Outcomes:</b> After completing the course, the students will be able to	
CO 1:	Understand and explore the asymptotic runtime complexity of algorithms by using mathematical relations that helps to identify them in specific instances.
CO 2:	Apply and solve problems using brute force, divide and conquer techniques
CO 3:	Apply problem solving methodologies such as greedy to solve a given problem
CO 4:	Apply problem solving methodologies such as decrease and conquer to solve a given problem
CO 5:	Apply the dynamic programming to estimate the computational complexity of different algorithms.

<b>Reference Books:</b>	
1.	Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3 <sup>rd</sup> Edition, PHI.
2.	Introduction to the design and analysis of algorithms, by Anany Levitin, 3rd Edition, Pearson Education, 2011.
3.	Data Structures & Algorithms using C, R.S. Salaria, 5th Edition, Khanna Publishing.
4.	Computer Algorithms, by Horowitz E., Sahani S., Rajasekharan S., 2nd Edition, Universities Press, 2008

**Web links and Video Lectures:**

1. [https://onlinecourses.nptel.ac.in/noc19\\_cs47/preview](https://onlinecourses.nptel.ac.in/noc19_cs47/preview)
2. [https://www.tutorialspoint.com/design\\_and\\_analysis\\_of\\_algorithms/design\\_and\\_analysis\\_of\\_algorithms\\_tutorial.pdf](https://www.tutorialspoint.com/design_and_analysis_of_algorithms/design_and_analysis_of_algorithms_tutorial.pdf)
3. [https://mrcet.com/downloads/digital\\_notes/IT/Design%20and%20Analysis%20Algorithms.pdf](https://mrcet.com/downloads/digital_notes/IT/Design%20and%20Analysis%20Algorithms.pdf)

# B.N.M. Institute of Technology

An Autonomous Institution under VTU  
Department of Information Science and Engineering  
Semester: V

**Course: Cloud Computing**

**Course Code: 21ISE1564**

<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA</b>	<b>: 50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>: 50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration:</b>	<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

- 1 Insight into the basics of cloud computing along with Infrastructure.
- 2 To familiarize cloud computing and its Virtualization.
- 3 Categorizing cloud platforms used for Application Development.

<b>Module-1:</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
<b>Overview of cloud computing:</b> Network-Centric Computing and Network-Centric Content, Peer-to-Peer Systems, Cloud Computing: An Old Idea Whose Time has Come, Cloud Computing Delivery Models and Services, Ethical Issues in Cloud Computing, Cloud Vulnerabilities, Major Challenges Faced by Cloud Computing,	<b>08</b>	<b>Understand</b>
<b>Module-2:</b>		
<b>Cloud Infrastructure:</b> Cloud Computing at Amazon, Cloud Computing: The Google Perspective, Microsoft Windows Azure and Online Services, Open-Source Software Platforms for Private Clouds, Cloud Storage Diversity and Vendor Lock-in, Cloud Computing Interoperability: The Intercloud, Energy Use and Ecological Impact of Large-Scale Data Centers, Energy Use and Ecological Impact of Large-Scale Data Centers, Service- and Compliance-Level Agreements, Responsibility Sharing Between User and Cloud Service Provider.	<b>08</b>	<b>Understand</b>
<b>Module-3:</b>		
<b>Cloud Computing Applications and Paradigms:</b> Challenges for Cloud Computing, Existing Cloud Applications and New Application Opportunities, Architectural Styles for Cloud Applications, Workflows: Coordination of Multiple Activities, Coordination Based on a State Machine Model: The ZooKeeper, The MapReduce Programming Model. A Case Study: The GrepTheWeb Application.	<b>08</b>	<b>Apply</b>
<b>Module-4:</b>		
<b>Cloud Resource Virtualization:</b> Virtualization, Layering and Virtualization, Virtual Machine Monitors, Virtual Machines, Performance and Security Isolation, Full Virtualization and Paravirtualization, Hardware Support for Virtualization. Case Study: Xen, a VMM Based on Paravirtualization.	<b>08</b>	<b>Apply</b>
<b>Module-5:</b>		
<b>Cloud Application Development:</b> Amazon Web Services: EC2 Instances, Connecting Clients to Cloud Instances Through Firewalls, Security Rules for Application and Transport Layer Protocols in EC2, How to Launch an EC2 Linux Instance and Connect to it, How to Use S3 in Java, How to Manage SQS Services in C#, How to Install the Simple Notification Service on Ubuntu 10.04, How to Create an EC2 Placement Group and Use MPI, How to Install Hadoop on Eclipse on a Windows System.	<b>08</b>	<b>Analyze</b>

<b>Course Outcomes:</b> After completing the course, the students will be able to	
CO 1:	Ability to apply knowledge of fundamentals of Cloud Computing.
CO 2:	Outline the Infrastructure of cloud.
CO 3:	Analyse the cloud Application and Paradigms.
CO 4:	Ability to analyze Cloud Resource Virtualization.
CO 5:	Analyze the platforms for development of cloud applications.

**Reference Books:**

1. Dan C. Marinescu-Cloud Computing Theory and Practice, MK Publication.
2. Cloud Computing –Shailendra Singh Oxford University Press
3. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud. Computing McGraw Hill Education

**Web links and Video Lectures:**

1. <http://nptel.ac.in/courses/106106129/21>
2. <https://freevideolectures.com/course/3649/cloud-computing>
3. [https://www.youtube.com/watch?v=Eg4AAGCE7X4&list=PL2UlrhJ\\_JwyA5IIOCdEW1NArFke4jgtlg](https://www.youtube.com/watch?v=Eg4AAGCE7X4&list=PL2UlrhJ_JwyA5IIOCdEW1NArFke4jgtlg)

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: VI

Course: Cryptography and Information Security

Course Code: 2IISE161

<b>L:T:P:J</b>	<b>2:2:0:0</b>	<b>CIA</b>	<b>:</b>	<b>50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>:</b>	<b>50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration</b>	<b>:</b>	<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

- 1 To understand Cryptography Theories, Algorithms and Systems.
- 2 To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.
- 3 To study Information Security Models, threats, and attacks.
- 4 To know the legal, ethical and professional issues in Information Security
- 5 To know the technological aspects of Information Security

<b>Module-1:</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
<b>Introduction:</b> Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security. <b>Classical Encryption Techniques:</b> Symmetric Cipher Model, Substitution Techniques – Caesar Cipher, Monoalphabetic Ciphers, Playfair Cipher, Hill Cipher, Polyalphabetic Ciphers, One-Time Pad, Transposition Techniques. Steganography- Foundations of modern cryptography: Perfect security – Information theory – Product cryptosystem – Cryptanalysis.	<b>8</b>	<b>Understand</b>
<b>Module-2:</b>		
<b>Mathematics of Symmetric Key Cryptography:</b> Algebraic structures - Modular arithmetic- Euclid's algorithm- Congruence and matrices - Groups, Rings, Fields- Finite fields- Traditional Block Cipher Structure – Stream Ciphers and Block Ciphers, Motivation for the Feistel Cipher Structure, The Feistel Cipher, Block Cipher Design Principles Symmetric key Cipher: introduction to DES, Advanced Encryption Standard - Stream Ciphers, RC4.	<b>8</b>	<b>Understand</b>



<b>Module-3:</b>		
<b>Mathematics of Asymmetric Key Cryptography:</b> Primes – Primality Testing – Factorization – Euler’s totient function, Fermat’s and Euler’s Theorem - Chinese Remainder Theorem – Exponentiation and logarithm – Asymmetric Key Ciphers: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange, Introduction to ElGamal cryptosystem and Elliptic curve cryptography. Cryptographic Hash Functions: Secure Hash Algorithm (SHA) – SHA-512 Logic, SHA-512 Round Function. Digital Signature Standard (DSS).	<b>8</b>	<b>Understand</b>
<b>Module-4:</b>		
<b>Introduction to Information Security:</b> Introduction, The history of Information Security, what is security? Critical characteristics of Information, CNSS security model, Components of an Information System - The security systems development life cycle. The need for security: Threats and Attacks, Professional, Legal, Ethical Issues in information Security.	<b>8</b>	<b>Understand</b>
<b>Module-5:</b>		
<b>Security Analysis: Risk Management:</b> Identifying and Assessing Risk, Assessing and Controlling Risk. <b>Security Technologies:</b> Introduction, Access Control, Firewalls, Protecting Remote Connections, Intrusion Detection and Prevention Systems – Honeypots, Honeynets and Padded Cell Systems – Scanning and Analysis Tools – Bio metric Access Controls.	<b>8</b>	<b>Understand</b>

**Course Outcomes:** After completing the course, the students will be able to

CO 1: Understand the basic concepts of classical encryption techniques, block ciphers, stream ciphers, cryptographic functions, key management, and IP security.

CO 2: Explain the structure of various block ciphers and stream ciphers.

CO 3: Apply public key cryptosystems, hash functions and key distribution techniques in real time applications.

CO 4: Understanding the critical characteristics, approaches and need for Information Security.

CO 5: Infer the aspects of risk management and security technologies.

**Reference Books:**

1. Cryptography and Network Security – Principles and Practice by William Stallings, Person, 7th Edition, 2017.
2. Principles of Information Security, 6th edition, Michael E Whittman, Herbert J Mattord, CENGAGE Learning, 2018
3. Network Security Essentials Applications and Standards, William Stallings, Pearson, 4 th Edition, 2012.
4. Network Security Private Communication in a Public world, Charlie Kaufman, Radia Perlman and Mike Speciner, 2nd Edition, PHI, 2013.
5. Network Security and Management, Brijendra Singh, 3rd Edition, PHI, 2013.

**Web links and Video Lectures:**

1. <https://dl.hiva-network.com/Library/security/Cryptography-and-network-securityprinciples-and-practice.pdf>.
2. <https://imcs.dvfu.ru/lib.int/docs/Networks/Security/Network%20Security%20Foundati>

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: VI

Course: CLOUD COMPUTING AND ITS APPLICATIONS

Course Code: 2IISE162

<b>L:T:P:J</b>	<b>2:0:1:0</b>	<b>CIA</b>	<b>:</b>	<b>50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>:</b>	<b>100</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration</b>	<b>:</b>	<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

- 1 Understand the concepts of cloud computing, virtualization and classify services of cloud computing
- 2 Illustrate architecture and programming in cloud.
- 3 Define the platforms for development of cloud applications and List the application of cloud.

<b>Module-1: INTRODUCTION</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing –Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.	<b>8</b>	<b>Apply</b>
<b>Module-2: CLOUD-ENABLING TECHNOLOGIES</b>		
Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish? Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU –Memory – I/O Devices – Virtualization Support and Disaster Recovery. <b>List of programs:</b> <ul style="list-style-type: none"><li>• Install Virtual box/VMware Workstation with different flavors of Linux or Windows OS on top of windows7 or 8.</li><li>• Install a C compiler in the virtual machine created using a virtual box and execute Simple Programs.</li></ul>	<b>8</b>	<b>Apply</b>
<b>Module-3: CLOUD ARCHITECTURE, SERVICES AND STORAGE</b>		
Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3. <b>List of programs:</b> <ul style="list-style-type: none"><li>• Install Google App Engine. Create hello world app and other simple web applications using python/java.</li><li>• Use GAE launcher to launch the web applications.</li></ul>	<b>8</b>	<b>Apply</b>
<b>Module-4: RESOURCE MANAGEMENT AND SECURITY IN CLOUD</b>		
Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security	<b>8</b>	<b>Apply</b>

<p>Overview – Cloud Security Challenges –Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM –Security Standards.</p> <p><b>List of programs:</b></p> <ul style="list-style-type: none"> <li>• Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.</li> <li>• Find a procedure to transfer the files from one virtual machine to another virtual machine.</li> </ul>		
<b>Module-5: CLOUD TECHNOLOGIES AND ADVANCEMENTS</b>		
<p>Cloud Security, Cloud Application Development: Cloud security risks, Amazon web services: EC2 instances, Connecting clients to cloud instances through firewalls, Security rules for application and transport layer protocols in EC2, How to launch an EC2 Linux instance and connect to it, How to use S3 in java, Cloud-based simulation of a distributed trust algorithm, A trust management service, A cloud service for adaptive data streaming, Cloud based optimal FPGA synthesis.</p> <p><b>Lab Component:</b></p> <p>7. Working and installation of Microsoft Azure</p> <p>8. Working with Mangra soft Aneka Software</p>	<b>8</b>	<b>Apply</b>

<b>Course Outcomes:</b> After completing the course, the students will be able to	
CO 1:	Understand the concepts of cloud computing, virtualization
CO 2:	Understand different cloud delivery models and services.
CO 3:	Illustrate architecture and programming in cloud.
CO 4:	Illustrate the security in cloud and virtual machine.
CO 5:	Analyze the advantages in cloud technology.

<b>Reference Books:</b>
<ol style="list-style-type: none"> <li>1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.</li> <li>2. Rittinghouse, John W., and James F. Ransome, Cloud Computing: Implementation, Management and Security, CRC Press, 2017.</li> <li>3. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing, Tata Mcgraw Hill, 2013.</li> <li>4. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.</li> <li>5. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), OReilly, 2009.</li> </ol>
<b>Web links and Video Lectures:</b>
<ol style="list-style-type: none"> <li>1. <a href="https://archive.nptel.ac.in/courses/106/105/106105167/">https://archive.nptel.ac.in/courses/106/105/106105167/</a></li> <li>2. <a href="https://www.youtube.com/watch?v=EN4fEbcFZ_E">https://www.youtube.com/watch?v=EN4fEbcFZ_E</a></li> <li>3. <a href="https://www.guru99.com/cloud-computing-for-beginners.html">https://www.guru99.com/cloud-computing-for-beginners.html</a></li> <li>4. <a href="https://www.simplilearn.com/tutorials/cloud-computing-tutorial">https://www.simplilearn.com/tutorials/cloud-computing-tutorial</a></li> <li>5. <a href="https://www.mygreatlearning.com/cloud-computing/tutorials">https://www.mygreatlearning.com/cloud-computing/tutorials</a></li> </ol>

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: VI

Course: Big Data Analytics

Course Code: 2IISE163

<b>L:T:P:J</b>	<b>2:2:2:0</b>	<b>CIA</b>	<b>: 50</b>
<b>Credits:</b>	<b>04</b>	<b>SEA</b>	<b>: 50</b>
<b>Hours:</b>	<b>50</b>	<b>SEA Duration:</b>	<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

- 1 Understand the Big Data Platform and its Use cases
- 2 Provide an overview of Apache Hadoop, HDFS Concepts and Interfacing with HDFS
- 3 Apply analytics on Structured, Unstructured Data
- 4 Exposure to Data Analytics Apache Cassandra

<b>Module-1:</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
<b>Introduction to Big Data and Hadoop</b> Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy.	<b>10</b>	<b>Understand</b>
<b>Module-2:</b>		
<b>HDFS(Hadoop Distributed File System)</b> The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures. Lab Programs: Prog 1	<b>10</b>	<b>Apply</b>
<b>Module-3:</b>		
<b>Map Reduce</b> Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features. Lab Programs: Prog 2 to 8	<b>10</b>	<b>Apply</b>
<b>Module-4:</b>		
<b>Hadoop Eco System</b> <b>Pig:</b> Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. <b>Hive:</b> Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Lab Programs:	<b>10</b>	<b>Apply</b>

Prog 9 and 10		
<b>Module-5:</b>		
<b>Hbase: HBasics, Concepts, Clients, Example, Hbase Versus RDBMS.</b> <b>Introduction to Apache Cassandra:</b> Introduction and its history, Key features and advantages of Cassandra, Comparison with other database systems, Understanding data modeling concepts in a NoSQL context, Designing a Cassandra data model, Primary keys and clustering keys, Data types in Cassandra.	<b>10</b>	<b>Apply</b>

<b>Course Outcomes:</b> After completing the course, the students will be able to	
CO 1:	Identify Big Data and its Business Implications
CO 2:	List the components of Hadoop and Hadoop Eco-System
CO 3:	Access and Process Data on Distributed File System, Manage Job Execution in Hadoop Environment
CO 4:	Apply different data processing tools like Pig, Hive and Spark
CO 5:	Apply different data processing tools like HBase and Apache Cassandra

<b>Reference Books:</b>
<ol style="list-style-type: none"> <li>1. Tom White “Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012.</li> <li>2. Seema Acharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015.</li> <li>3. "Cassandra: The Definitive Guide" by Jeff Carpenter and Eben Hewitt (O'Reilly)</li> <li>4. Jay Liebowitz, “Big Data and Business Analytics” Auerbach Publications, CRC press (2013).</li> <li>5. Michael Berthold, David J. Hand, "Intelligent Data Analysis”, Springer, 2007.</li> <li>6. AnandRajaraman and Jeffrey David Ulman, “Mining of Massive Datasets”, Cambridge University Press, 2012.</li> </ol>

<b>Web links and Video Lectures:</b>
<ol style="list-style-type: none"> <li>1. <a href="https://onlinecourses.nptel.ac.in/noc20_cs92/preview">https://onlinecourses.nptel.ac.in/noc20_cs92/preview</a></li> <li>2. <a href="https://onlinecourses.nptel.ac.in/noc22_cs65/preview">https://onlinecourses.nptel.ac.in/noc22_cs65/preview</a></li> <li>3. <a href="https://www.coursera.org/specializations/business-analytics">https://www.coursera.org/specializations/business-analytics</a></li> <li>4. <a href="https://www.classcentral.com/course/bigdata-analytics-4216">https://www.classcentral.com/course/bigdata-analytics-4216</a></li> <li>5. <a href="https://www.mygreatlearning.com/academy/learn-for-free/courses/mastering-big-data-analytics">https://www.mygreatlearning.com/academy/learn-for-free/courses/mastering-big-data-analytics</a></li> </ol>

<b>Lab Programs</b>
<ol style="list-style-type: none"> <li>1. Installation of Apache Hadoop</li> <li>2. Develop a MapReduce program to calculate the frequency of a given word in a given file.</li> <li>3. Develop a MapReduce program to find the maximum temperature in each year.</li> <li>4. Develop a MapReduce program to find the grades of student’s.</li> <li>5. Develop a MapReduce program to implement Matrix Multiplication.</li> <li>6. Develop a MapReduce to find the maximum electrical consumption in each year given electrical consumption for each month in each year.</li> <li>7. Develop a MapReduce to analyze weather data set and print whether the day is shinny or cool day</li> </ol>

8. Develop a MapReduce program to find the tags associated with each movie by analyzing movie lens data
9. Write queries to sort and aggregate the data in a table using HiveQL
10. Develop a Java application to find the maximum temperature using Spark

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: VI

Course: Internet of Things

Course Code: 21ISE164

<b>L:T:P:J</b>	<b>0:0:2:2</b>	<b>CIA</b>	<b>: 50</b>
<b>Credits:</b>	<b>02</b>	<b>SEA</b>	<b>:50</b>
<b>Hours:</b>	<b>24</b>	<b>SEA Duration:</b>	<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

1	A thorough knowledge of IOT devices, their characteristics components and basic awareness of Arduino /Raspberry Pi.
2	Infer the role of Data Analytics and Security in IoT.
3	Identify sensor technologies for sensing realworld entities and understand the role of IoT in various domains of Industry.
4	Create cloud data visualization and data analysis

**Descriptions (if any):**

**Prerequisite**

- Basic programming and Hardware knowledge
- Basic knowledge of Python
- Basic knowledge of Microcontrollers
- Basic knowledge of Linux

## Part A

<b>Module-1:</b>	<b>No. of hours</b>	<b>Blooms Cognitive Levels</b>
What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack. <b>Lab Program:</b> <b>DOWNLOADING AND INSTALLING Raspberry Pi</b> <b>Raspberry Pi4 Board features, pinout, OS installation and configuration</b> <ul style="list-style-type: none"><li>• Raspberry Pi 4 Board architecture, technical specifications</li><li>• Installing RASPBERRY OS using installer software Pi Imager.</li><li>• Updating and upgrading RASPBERRY PI OS. Installing required packages.</li><li>• Enabling SSH for remote desktop access of Raspberry.</li></ul>	<b>04</b>	<b>Apply</b>
<b>Module-2:</b>		
Smart Objects: The “Things” in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects <b>Study of connectivity and configuration of Raspberry-Pi circuit with basic peripherals, LEDs. Understanding GPIO and its use in program.</b>	<b>05</b>	<b>Apply</b>



<p><b>Lab Program:</b>  <b>Raspberry Pi Interfacing Peripherals / sensors</b></p> <ul style="list-style-type: none"> <li>• Raspberry Pi4 GPIO programming, BCM Mode &amp; Board pin numbering</li> <li>• Interfacing LED and LDR, DHT11 sensors</li> <li>• Raspberry Pi Interfacing display Peripherals</li> <li>• Interfacing 16 X 2 LCD without using library and using library.</li> <li>• Interfacing 7-segment Display</li> </ul> <p><b>Raspberry Pi Interfacing sensors/peripherals</b></p> <ul style="list-style-type: none"> <li>• Interfacing sensors : IR sensor, Distance sensor,</li> <li>• Interfacing Motion Sensor, Buzzer</li> <li>• Raspberry Pi Interfacing sensors/peripherals</li> <li>• Interfacing RFID RC522</li> <li>• Pi Camera for capturing still pictures and video</li> </ul>		
<b>Module-3:</b>		
<p><b>Controlling Raspberry pi peripherals with Flask Programming</b>  Set up a web server and create a simple website using Flask, Python, and HTML/CSS.</p> <p><b>Lab Program:</b></p> <ul style="list-style-type: none"> <li>• Using Flask to Send Data to a Raspberry Pi</li> <li>• Controlling Raspberry pi peripherals with Flask Programming</li> </ul> <p><b>Cloud data visualization and analysis</b>  <b>Communication using HTTP</b></p> <ul style="list-style-type: none"> <li>• Connecting to Cloud: Creating an Thing speak cloud account, Creating a channel,</li> <li>• Writing data to cloud using channel API keys, REST API &amp; HTTP Analyze and Visualize data using Matlab Analysis &amp; Visualization app in in Thingspeak.</li> <li>• Controlling Raspberry pi peripherals with Flask Programming</li> </ul>	<b>05</b>	<b>Apply</b>
<b>Module-4:</b>		
<p>IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino UNO , Exploring the Arduino Ecosystem, Downloading and Installing the Arduino IDE, Fundamentals of Arduino Programming. Breaking Down Your First Program</p> <p><b>Lab Program:</b>  <b>Digital inputs, Outputs, and Pulse-Width Modulation</b></p> <ul style="list-style-type: none"> <li>• Turning on an LED</li> <li>• LED with Changing Blink Rate</li> <li>• Led fade</li> <li>• Simple LED Control with a Button</li> <li>• Debounced Button Toggling</li> <li>• Building a Controllable RGB LED Nightlight</li> </ul>	<b>05</b>	<b>Apply</b>

<b>Module-5:</b>		
<p><b>Reading Analog Sensors</b> Reading Analog Sensors with the Arduino: analog Read()  <ul style="list-style-type: none"> <li>• Reading a Potentiometer</li> </ul> <b>CONTROLLING YOUR ENVIRONMENT- Using Transistors and Driving Motors-</b> Driving DC Motors- Controlling Motor Speed with PWM- Driving Servo Motors- Understanding the Difference Between Continuous Rotation and Standard Servos, Understanding Servo Control  <b>Lab Program:</b> <ul style="list-style-type: none"> <li>• Servo Potentiometer Control Building a Sweeping Distance Sensor</li> </ul> </p>	<b>05</b>	<b>Apply</b>

### **PART – B (Mini projects)**

#### **The List of Possible Projects**

1. Develop a Real time application like a smart home with following requirements. If anyone comes at door the camera module automatically captures his image send it to the e-mail account of user or send notification to the user. Door will open after users approval.
2. Develop an application for time lapse images using your Raspberry Pi board, and create a time-lapse camera for capturing such images(ex: using the Blinkt add-on) and create a video. The students can use a Pi Camera for this project and combine it with your Pi board.
3. **AI Assistant** -You can create an AI assistant by using a Raspberry Pi as well.
4. **Smart Home-** Do Amazon Alexa and Google Home fascinate you? Then this project would be perfect for you. You can automate multiple home appliances by using Raspberry Pi.
5. Smart Parking system- to keep track of empty slots and show it at the entrance
6. Smart garbage bin: segregate and dump the waste in appropriate container using moisture sensor,
7. Smart Irrigation system: check for the soil moisture ph and other vital minerals and control the water and/or liquid fertilizers to plants.
8. Raspberry Pi Pico based Line Follower Robot
9. Tomato/other specific item Sorting Machine using Edge Impulse TinyML on Raspberry Pi
10. Automated Security System with Telegram Bot and Facial Recognition

**\*\*Projects are not limited**

**Course Outcomes:** After completing the course, the students will be able to

- CO 1: Understand and explore the interconnection and integration of the physical world and the cyber space.
- CO 2: Implement interfacing of various sensors with Raspberry Pi.
- CO 3: Using Raspberry PI for webserver communication and cloud data visualization
- CO 4: Understanding Arduino Uno Ecosystem
- CO 5: Able to control the peripheral components using Arduino.

**Reference Books:**

1. Jeremy Blum " **Exploring ARDUINO** Tools and Techniques for Engineering Wizardry" Wiley 2013
2. Derek Molloy "Exploring Raspberry PI Interfacing to the Real World with Embedded Linux",Wiley 2016
3. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, JeromeHenry,"**IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things**",1<sup>st</sup>Edition,PearsonEducation(CiscoPressIndianReprint).(ISBN:978-9386873743)
4. VijayMadisetiandArshdeepBahga,"**InternetofThings(AHands-on-Approach)**", 1<sup>st</sup>Edition,VPT,2014.(ISBN:978-8173719547).
5. <https://www.raspberrypi.org/learn/>
6. SrinivasaK G,"**Internet ofThings**",CENGAGELearningIndia,2017.
7. Donald j Norris"**Beginning artificial intelligence with the raspberry Pi**" 1st Edition, Apress,2017.(ISBN: 978-1484227428)

**Web links and Video Lectures:**

1. <https://www.raspberrypi.org/learn/>
2. <https://www.arduino.cc/en/Guide>
3. <https://pinout.xyz/pinout/blink#>

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: VI

Course: Data Mining

Course Code: 21ISE1651

<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA</b>	<b>: 50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>: 50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration:</b>	<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

- 1 Understand the principles of Data warehousing and Data Mining
- 2 Be familiar with the Data warehouse architecture and its Implementation
- 3 Classify and predict the given data for the application development

<b>Module-1:</b>		<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
<b>Data modelling:</b> Basic Concepts- A multitier Architecture, Data warehouse models: Enterprise warehouse- Data mart and virtual warehouse, Extraction, Transformation and loading- Data Cube: A multidimensional data model- Stars, Snowflakes and Fact constellations: Schemas for multi dimensional Data models- Dimensions: The role of concept Hierarchies- Measures: Their Categorization and computation, Typical OLAP Operations.		<b>8</b>	<b>Understand</b>
<b>Module-2:</b>			
<b>Data Mining:</b> - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture of A Typical Data Mining Systems- Classification of Data Mining Systems. Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining		<b>8</b>	<b>Understand</b>
<b>Module-3:</b>			
<b>Association Analysis:-</b> Association Analysis: Problem Definition- Frequent Item set Generation- Rule generation- Alternative Methods for Generating Frequent Item sets- FP-Growth Algorithm- Evaluation of Association Patterns		<b>8</b>	<b>Apply</b>
<b>Module-4:</b>			
<b>Cluster Analysis:</b> - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis		<b>8</b>	<b>Analyze</b>

<b>Case Study:</b> Customer Segmentation of E-Commerce data using Clustering Algorithms		
<b>Module-5:</b>		
<b>Mining Object, Spatial, Multimedia, Text and Web Data:</b> Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web <b>Case Study:</b> Interpreting Twitter Data from ongoing technical developments in country Tweets	<b>8</b>	<b>Analyze</b>

<b>Course Outcomes:</b> After completing the course, the students will be able to	
CO 1:	Understand the principles of Data Modeling
CO 2:	Understand the principles of Data Mining
CO 3:	Apply the concepts of association analysis
CO 4:	Analyze the concepts of various clusters
CO 5:	Analyze the concepts of spatial and multimedia mining

**Reference Books:**

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, “Introduction to Data Mining, Pearson, First impression, 2014
2. Jiawei Han, MichelineKamber and Jian Pei“Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2011.
3. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.
4. K.P. Soman, ShyamDiwakar and V. Ajay “Insight into Data Mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
5. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
6. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.

**Web links and Video Lectures:**

1. <https://www.udemy.com/topic/data-warehouse/>
2. <https://www.coursera.org/professional-certificates/microsoft-azure-dp-203-data-engineering>
3. <https://www.edx.org/learn/data-warehouse>
4. <https://alison.com/tag/data-mining>
5. <https://www.datacamp.com/courses/introduction-to-data-warehousing>

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: VI

Course: Block Chain Technologies: Platforms and Applications

Course Code: 21ISE1652

<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA</b>	<b>:</b>	<b>50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>:</b>	<b>50</b>
<b>Hours:</b>	<b>36</b>	<b>SEA Duration</b>	<b>:</b>	<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

1	Understand the basic concepts of blockchain technology.
2	Applications of Blockchain and its technologies for bitcoin and cryptocurrencies.
3	Demonstrate the functioning of smart contracts with the help of Ethereum 101.
4	Apply the concept of hyperledger for creation of distributed and personalized blockchains.
5	Build and Implement blockchain technology for real world applications.

<b>Module-1:</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
<b>Blockchain:</b> Distributed systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain. <b>Decentralization and Cryptography:</b> Decentralization using blockchain, Cryptography and Technical and Technical Foundations: Cryptographic primitives, Asymmetric cryptography, Public and private keys	<b>L :08</b>	<b>Understand</b>
<b>Module-2:</b>		
<b>Bitcoin and Alternative Coins A:</b> Bitcoin, Transactions, Blockchain, Bitcoin payment <b>B:</b> Alternative Coins, Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash.	<b>L : 07</b>	<b>Apply</b>
<b>Module-3:</b>		
<b>Smart Contracts and Ethereum 101:</b> Smart Contracts: Definition: Ricardi contracts. Ethereum 101: Introduction, Ethereum blockchain, Elements of the Ethereum of the Ethereum blockchain, Precompiled contracts.	<b>L : 07</b>	<b>Apply</b>
<b>Module-4:</b>		
<b>Introduction to Hyperledger:</b> What is Hyperledger? Distributed Ledger Technology & its Challenges, Hyperledger & Distributed Ledger Technology, Hyperledger Fabric, Hyperledger Composer.	<b>L : 07</b>	<b>Apply</b>
<b>Module-5:</b>		
<b>Applications of Blockchains:</b> Alternative block chain: Blockchain-Outside-of Currencies, Internet of Things, Government, Finance, Media,Medical Record Management System, Domain Name Service and Future of Blockchain.	<b>L : 07</b>	<b>Apply</b>

Course Outcomes: After completing the course, the students will be able to

CO1	Understand the fundamental concepts of block chain technology
CO2	Apply the concepts of blockchain for bitcoin and cryptocurrencies.
CO3	Apply the working of Smart Contracts through Ethereum 101
CO4	Apply the Concepts of Hyperledger for development of personalized and distributed blockchains
CO5	Create and Develop real world block chain based solutions using varieties of Block chain technology.

**Reference Books:**

1. Mastering Blockchain- Distributed ledgers, decentralization and smart contracts explained, Author Imran Bashir, Packet Publishing Ltd, 2nd edition, ISBN 978-1-7812-544-5, 2017
2. Bitcoin and Cryptocurrency Technologies, Author-Arvind Narayanan, Joseph Bonneau, Edward Felten, Andre Miller, Steven Goldfeder, Princeton University, 2016.
3. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Author-Daniel Drescher, Apress, 1st Edition, 2017
4. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Andreas M. Antonopoulos, O'Reilly Media, 1st Edition, 2014.
5. Blockchain with Hyperledger Fabric , Nitin Gaur, Anthony O'Dowd, Petr Novotny, Luc Desrosiers, Venkatraman Ramakrishna, Salman A. Baset, November 2020, Packt Publishing, Second Edition, ISBN: 9781839218750

**Web links and Video Lectures:**

1. NPTEL online course : <https://nptel.ac.in/courses/106/104/106104220/>
2. Udemy: <https://www.udemy.com/course/build-your-blockchain-az/>
3. <https://eduxlabs.com/courses/blockchain-technology-training/?tab=tab-curriculum>

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

SEMESTER – VI

Course: Cyber Security

Course Code: 2IISE1653

<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA</b>	<b>: 50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>: 50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration:</b>	<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

- 1 Explain the importance of cyber security
- 2 Explain the security issues in programming, web, OS and network.
- 3 This course is intended to study the basics of Blockchain technology.
- 4 Explore various aspects of Digital Forensics technology
- 5 By implementing, learners will have idea about computer crime.

<b>Module-1:</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
<b>Introduction:</b> What Is Computer Security? Threats, Harm, Vulnerabilities, Controls, Conclusion, What's Next? <b>Toolbox:</b> Authentication, Access Control, and Cryptography: Authentication, Access Control. <b>Programs and Programming:</b> Unintentional (Non-malicious) Programming Oversights, Malicious Code—Malware, Countermeasures.	<b>8</b>	<b>Understand</b>
<b>Module-2:</b>		
<b>The Web—User Side:</b> Browser Attacks, Web Attacks Targeting Users, Obtaining User or Website Data, Email Attacks. <b>Operating Systems:</b> Security in Operating Systems, Security in the Design of Operating Systems, Rootkit.	<b>8</b>	<b>Apply</b>
<b>Module-3:</b>		
<b>Networks:</b> Network concepts, War on Networks: Threats to Network Communications, Wireless Network Security, Denial of Service, Distributed Denial-of-Service.	<b>8</b>	<b>Apply</b>
<b>Module-4:</b>		
<b>Introduction to Digital Forensics,</b> Forensic Software and Hardware, Analysis and Advanced Tools, Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network Forensics.	<b>8</b>	<b>Understand</b>



<b>Module-5:</b>		
<b>Introduction to Cyber Crime Investigation,</b> Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies, Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.	<b>8</b>	<b>Apply</b>

<b>Course Outcomes:</b> After completing the course, the students will be able to	
CO 1:	Understand fundamental aspects of cyber security
CO 2:	Identify the security issues in web, network, Operating system
CO 3:	Understand and explore the working of Blockchain technology
CO 4:	Illustrate computer forensic techniques to identify the digital forensics associated with criminal activities.
CO 5:	Apply forensic analysis tools to recover important evidence for identifying computer crime.

**Reference Books:**

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, Security in Computing, 5th Ed, Pearson Education, 2015
2. Understanding Forensics in IT-NIIT, 2005
3. Nelson Phillips and Enfinger Stuart, Computer Forensics and Investigations, Cengage Learning Publisher, 2009
4. Sammons, John, and Michael Cross. The basics of cyber safety: computer and mobile device safety made easy. Elsevier, 2016.
5. Brooks, Charles J., Christopher Grow, Philip Craig, and Donald Short. Cybersecurity essentials. John Wiley & Sons, 2018
6. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained", Second Edition, Packt Publishing, 2018.
7. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction" Princeton University Press, 2016

**Web links and Video Lectures:**

1. [https://onlinecourses.nptel.ac.in/noc23\\_cs127/preview](https://onlinecourses.nptel.ac.in/noc23_cs127/preview)
2. <https://www.slideshare.net/Siblu28/cyber-security-36922359>
3. <https://www.geeksforgeeks.org/cyber-security-types-and-importance/>
4. NPTEL online course : <https://nptel.ac.in/courses/106/104/106104220/#>
5. Udemy: <https://www.udemy.com/course/build-your-blockchain-az/>

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: VI

Course: Data Visualization and Dashboards

Course Code: 21ISE1654

L:T:P:J

3:0:0:0

CIA

:

50

Credits:

03

SEA

:

50

Hours:

40

SEA Duration:

03 Hours

**Course Learning Objectives:** The students will be able to

- 1 Understand and describe the main concepts of data visualization, chart types and their recommended usage.
- 2 Create data visualizations and dashboards using Tableau Desktop
- 3 Identify the latest dashboard and reporting features of Microsoft Power BI
- 4 Make Use of data from multiple sources, create stunning visualizations
- 5 Identify the capabilities of Power BI mobile applications

**Descriptions (if any):**

**Prerequisite**

- Working knowledge of Programming Language.
- Windows or Apple O.S.
- CPUs must support SSE4.2 and POPCNT instruction sets
- Citrix environments, Microsoft Hyper-V, Parallels, and VMware.

<b>Module-1:</b>	<b>No. of hours</b>	<b>Blooms Cognitive Levels</b>
<b>Introduction:</b> Introduction to data visualization, Getting started with Tableau Desktop, Connecting to the tutorial dataset, Creating the charts. <b>Common charts:</b> Creating common visualizations (bar charts, line charts etc.), Filtering and sorting data, Adding Titles, Labels, and descriptions, Publish your work to Tableau Cloud.	<b>8</b>	<b>Understand</b>
<b>Module-2:</b>		
<b>Interactions:</b> Interactivity with text and visual tooltips, Interactivity with actions (filter, highlight, URL), Assembling dashboards from multiple charts. <b>Transform the data:</b> Creating simple calculations in Tableau, Using table calculations, Introduction to Tableau Preparation.	<b>8</b>	<b>Apply</b>
<b>Module-3:</b>		

<p><b>Preparing Data Sources:</b> Query folding, Query design per dataset mode, Import mode dataset queries, Direct Query dataset queries, Direct Query report execution, Composite datasets, and Table storage modes.</p> <p><b>Data Sources:</b> Authentication, Data Source settings, Privacy levels, Power BI as a data source, Power BI Desktop options, Global options, Current FILE options.</p>	<b>8</b>	<b>Apply</b>
<b>Module-4:</b>		
<p><b>SQL views:</b> SQL views versus M queries, SQL view examples, Date dimension view, Mark as date table, Product dimension view, Slowly changing dimensions.</p> <p><b>Designing Dashboards:</b> Dashboard design, Visual selection, Layout, Navigation pane, Full screen mode, supporting tiles</p>	<b>8</b>	<b>Apply</b>
<b>Module-5:</b>		
<p><b>Dashboard Architecture</b> Single dashboard Architecture, Multiple dashboard Architecture, Organizational Dashboard Architecture, Multiple datasets.</p> <p><b>Dashboard Tiles:</b> Tile details and custom links, Real time data tiles, Dashboard themes, Mobile optimized dashboards</p>	<b>8</b>	<b>Apply</b>

**Course Outcomes:** After completing the course, the students will be able to

CO1: Understand and describe the main concepts of data visualization, chart types and their recommended usage.

CO2: Create data visualizations and dashboards using Tableau Desktop

CO3: Identify the latest dashboard and reporting features of Microsoft Power BI

CO4: Make use of data from multiple sources, create stunning visualizations

CO5: Identify the capabilities of Power BI mobile applications

**Reference Books:**

1. Steve Wexler, Jeffrey Shaffer, Andy Cotgreave: The Big Book of Dashboards
2. Mastering Microsoft Power BI - Second Edition By Greg Deckler , Brett Powell
3. Ryan Sleeper: Practical Tableau
4. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.
5. A Julie Steele and Noah Iliinsky, Designing Data Visualizations: Representing Informational Relationships, O'Reilly

**Web links:**

- <https://powerbi.microsoft.com>
- <https://www.tableau.com>
- <https://www.udemy.com/course/data-visualization-dashboard-design>
- <https://www.insightplatforms.com/10-free-tools-dashboards-data-visualization-infographics>

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: VI

Course: UI Frameworks

Course Code: 21ISE1655

<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA</b>	<b>:</b>	<b>50</b>
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<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>:</b>	<b>50</b>
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<b>Hours:</b>	<b>40</b>	<b>SEA Duration:</b>	<b>03 Hours</b>
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**Course Learning Objectives:** The students will be able to

- |   |   |
|---|---|
| 1 | To understand the Front-end Web UI Framework.                             |
| 2 | To understand the essence of Bootstrap grid system and responsive design. |
| 3 | To understand the various Bootstrap CSS components                        |
| 4 | To understand the various Bootstrap Java script components                |
| 5 | To understand the concept of Bootstrap and JQuery Web Tools               |

<b>Module-1:</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
Front-end Web UI Frameworks Overview: Front-End Web UI Frameworks and Tools: Bootstrap 4, How to Use the Learning Resources, What is Full-Stack Web Development? Setting up Git, Basic Git Commands, Online Git Repositories, Front-end Web UI Frameworks.	<b>8</b>	<b>Understand</b>
<b>Module-2:</b>		
Introduction to Bootstrap: Getting Started with Bootstrap, Responsive Design, Bootstrap Grid System, Responsive Design and Bootstrap Grid System.	<b>8</b>	<b>Understand</b>
<b>Module-3:</b>		
Bootstrap CSS Components: Navigation and Navigation Bar, Navbar and Breadcrumbs, Icon Fonts, Icon Fonts, User Input, Buttons, Forms, Bootstrap Tables and Cards, Displaying Content: Tables and Cards, Images and Media, Alerting Users.	<b>8</b>	<b>Apply</b>
<b>Module-4:</b>		
Bootstrap Javascript Components: Bootstrap JavaScript Components, Tabs, Pills and Tabbed Navigation, Tabs, Collapse and Accordion, Accordion, Tooltips, Popovers and Modals, Tooltips and Modals, Carousel.	<b>8</b>	<b>Apply</b>

<b>Module-5:</b>		
Web Tools: Bootstrap and JQuery, More Bootstrap and JQuery, CSS Preprocessors: Less and Sass, Less, Scss, Building and Deployment, Task Runners, Grunt, Web UI Frameworks.	<b>8</b>	<b>Apply</b>

**Course Outcomes:** After completing the course, the students will be able to

- CO 1: Understand the Front-end Web UI Framework and basic Git commands
- CO 2: Understand the Bootstrap grid system and responsive design
- CO 3: Develop an application using bootstrap CSS components
- CO4: Develop an application using bootstrap Javascript Components
- CO5: Building and Deployment of applications

**Reference Books:**

1. Mastering Front-End Web Development (HTML, Bootstrap, CSS, SEO, Cordova, SVG, JavaScript, An Advanced Guide, Chong Lip Phang, November 2020
2. Mastering Bootstrap 4, Benjamin Jakobus , Jason Marah, September 2016
3. Learning Bootstrap 4, Matt Lambert, Second Edition
4. Step By Step Bootstrap 3: A Quick Guide to Responsive Web Development Using Bootstrap 3 – May 22, 2014
5. Bootstrap in 24 Hours, Sams Teach Yourself, Jennifer Kyrnin , 1st Edition

**Web links and Video Lectures:**

1. <https://coursesity.com/course-detail/front-end-web-ui-frameworks-and-tools-bootstrap-4>
2. <https://medium.com/swlh/front-end-web-ui-frameworks-and-tools-bootstrap-4-fb3906d885ff>
3. <https://getbootstrap.com/docs/5.3/getting-started/introduction/>
4. <https://www.youtube.com/watch?v=-qfEOE4vtxE>
5. <https://www.youtube.com/watch?v=eow125xV5-c>

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: VI

Course: Strategic Management

Course Code: 21ISE1656

<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA</b>	<b>:</b>	<b>50</b>
<b>Credits: 03</b>	<b>03</b>	<b>SEA</b>	<b>:</b>	<b>50</b>
<b>Hours: 36</b>	<b>40</b>	<b>SEA Duration</b>	<b>:</b>	<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

- |   |  |
|---|--|
| 1 | To provide a framework for students to understand strategic management concepts and conduct external analysis for competitive advantage. |
| 2 | To help students develop a thorough understanding of principles and models related to an organization's internal analysis.               |
| 3 | To help students understand the different strategy options available for organizations in a complex and dynamic environment.             |

### Module-1: Introduction to Strategic Management and External Analysis

**No. of hours**

**Blooms cognitive Levels**

Meaning and Characteristics of Strategic Management; The Strategic Management Process. **External Analysis**– PESTLE analysis, Environment Threat and Opportunity Profile (ETOP); Industry Analysis –Porter's Dominant Economic Features, Porter's Five Forces Model, Strategic Group Mapping; Industry Key Success Factors, Key Performance Indicators and Key Result Areas.

**8**

**Apply**

### Module-2: Internal Analysis

Strategic Vision, Mission, Goals, Long-Term and Short-Term Objectives and their Value to the Strategic Management Process; Organizational Capability Profile – Resource Based View of the firm (RBV) and VRIN; Business Portfolio Analysis – BCG / Growth Share Matrix, GE 9 Cell Model; Balanced Score Card, SWOC Analysis, Value Chain Analysis, Benchmarking.

**8**

**Apply**

### Module-3: Strategy Formulation

**Corporate Strategies:** Growth Strategies – Internal Growth, External Growth (Integration, Diversification, Mergers, Joint Ventures, Strategic Alliances), Product/Market Expansion grid / Ansoff's Matrix; Stability Strategies – NoChange, Profit and Proceed with Caution.

**8**

**Apply**

### Module-4: Strategy Implementation

**Facilitators for implementation of strategy:** Organisational Structures – matching structure to strategy, McKinsey's 7S, Changing structure and processes (Business Process Reengineering, Six Sigma); Strategic Leadership; Organisational Culture – Learning organisations, MBO, TQM.

**8**

**Apply**

<b>Module-5: Strategic Control</b>		
Focus of Strategic Control, Establishing Strategic Controls (Premise Control, Strategic Surveillance, Special Alert Control, Implementation Control), Exerting Strategic Control (through Competitive Benchmarking, Performance and Formal and Informal Organisations).	<b>8</b>	<b>Apply</b>

<b>Course Outcomes:</b> After completing the course, the students will be able to	
CO 1:	Understand strategic management concepts and how to conduct external analysis for competitive advantage.
CO 2:	Apply selected models of internal analysis to evaluate an organization.
CO 3:	Understand and analyse the different strategy options available for organizations in a complex and dynamic environment.
CO 4:	Appreciate the essential factors in strategy implementation.
CO 5:	Understand how to establish and exert strategic control.

**Reference Books:**

1. Strategy: Theory & Practice , Stewart Clegg Chris Carter Marting Kornberger Jochen Schweitze: Sage Publications 3 rd Ed, 2020
2. Strategy Management: Theory & Practice John Parnell Biztantra 2004
3. Crafting and Executing Strategy: The Quest for Competitive Advantage – Concepts and Cases ,Arthur A. Thompson Jr. Margaret A. Peteraf John E. Gamble A. J. Strickland III Arun K. Jain McGraw Hill Education 19th Ed, 2017

**Web links and Video Lectures:**

1. <https://www.edx.org/learn/strategic-management>
2. <https://www.youtube.com/watch?v=ZmRK9wc3hjI>
3. <https://ipbusinessacademy.org/wp-content/uploads/2021/02/Lecture-NotesPart1.pdf>



# B.N.M. Institute of Technology

An Autonomous Institution under VTU  
Department of Information Science and Engineering  
Semester: VI

Course: Natural Language Processing  
Course Code: 2IISE1661

<b>L:T:P:J</b>	<b>2:1:0:0</b>	<b>CIA</b>	<b>:</b>	<b>50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>:</b>	<b>50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration:</b>		<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

1	To learn the fundamentals of natural language processing
2	To understand the use of CFG and PCFG in NLP
3	To understand the role of semantics of sentences and pragmatics
4	To apply the NLP techniques to IR applications
5	Compare and contrast the use of different statistical approaches for different types of NLP applications

<b>Module-1: Introduction</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance	<b>8</b>	<b>Understand</b>
<b>Module-2: Word Level Analysis</b>		
Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.	<b>8</b>	<b>Apply</b>
<b>Module-3: Syntactic Analysis</b>		
Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.	<b>8</b>	<b>Apply</b>
<b>Module-4: Semantics and Pragmatics</b>		
Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.	<b>8</b>	<b>Apply</b>
<b>Module-5: Discourse Analysis and Lexical Resources</b>		
Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).	<b>8</b>	<b>Apply</b>

**Course Outcomes:** After completing the course, the students will be able to

CO 1:	To tag a given text with basic Language features
CO 2:	To design an innovative application using NLP components

CO 3:	To implement a rule based system to tackle morphology/syntax of a language
CO 4:	To design a tag set to be used for statistical processing for real-time applications
CO 5:	To compare and contrast the use of different statistical approaches for different types of NLP applications.

**Reference Books:**

1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, O\_Reilly Media, 2009..
3. Breck Baldwin, —Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
4. Richard M Reese, —Natural Language Processing with Javal, O\_Reilly Media, 2015.
5. Nitin Indurkha and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
6. Tanveer Siddiqui, U.S. Tiwary, —Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: VI

Course: NoSQL

Course Code: 21ISE1662

<b>L:T:P:J</b>	<b>2:1:0:0</b>	<b>CIA</b>	<b>:</b>	<b>50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>:</b>	<b>50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration:</b>		<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

1	Compare different types of NoSQL Databases
2	Compare and contrast RDBMS with different NoSQL databases.
3	Demonstrate the detailed architecture Document-oriented NoSQL databases.
4	Explain performance tune of Key-Value Pair NoSQL databases.
5	Apply Nosql development tools on different types of NoSQL Databases.

<b>Module-1: Why NoSQL</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points	<b>8</b>	<b>Understand</b>
<b>Module-2: Aggregate and Distributed Data model</b>		
Aggregate, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.	<b>8</b>	<b>Apply</b>
<b>Module-3: Document Databases</b>		
Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.	<b>8</b>	<b>Apply</b>
<b>Module-4: Column-Family Store and Key-Value Databases</b>		
Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage. Key-Value Database: Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases.	<b>8</b>	<b>Apply</b>
<b>Module-5: Graph Databases</b>		
Graph Databases, Graph Database. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages. NoSQL Key/Value databases using MongoDB.	<b>8</b>	<b>Apply</b>

**Course Outcomes:** After completing the course, the students will be able to

CO 1: Understand different types of NoSQL Databases.

CO 2: Compare Relational Database to NoSql stores and explain Sharding and Replication

CO 3: Illustrate the Document-oriented NoSQL databases

CO 4: Understand column oriented NoSql Database.

CO 5: Understand detailed architecture of Graph NoSQL databases and apply Nosql Development tools with suitable usecase.

**Text Books:**

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications, 1st Edition, 2019.

**Web Reference**

1. <https://www.ibm.com/cloud/learn/nosql-databases>
2. <https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp>
3. <https://www.geeksforgeeks.org/introduction-to-nosql/>
4. <https://www.javatpoint.com/nosql-database>

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

SEMESTER – VI

Course: Operation Research

Course Code: 2IISE1663

<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA</b>	<b>:</b>	<b>50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>:</b>	<b>50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration</b>	<b>:</b>	<b>03Hours</b>

**Course Learning Objectives:** The students will be able to

1	To understand the methodology of OR problem solving and formulate linear programming problem.
2	Describe numerous problem-solving approaches for optimization.
3	Solve linear programming problems using simplex method, Big M method 2- phase method.
4	Identify the problems of transportation and assignment problem, and then solve it.
5	Use game theory as a case study in a decision support system.

<b>Module-1:</b>		<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
<b>Introduction, Linear Programming:</b> Introduction: The origin, nature and impact of OR; Defining the problem and gathering data; Formulating a mathematical model; Deriving solutions from the model; Testing the model; Preparing to apply the model; Implementation. Introduction to Linear Programming Problem (LPP): Prototype Example Assumption of LPP, Formulation of LPP and Graphical Method Various Examples.		<b>8</b>	<b>Understand</b>
<b>Module-2:</b>			
<b>Simplex Method-1:</b> The essence of the simplex method; Setting up the simplex method; Types of variables, Algebra of the simplex method; the simplex method in tabular form; Tiebreaking in the simplex method, BigM method, Two phase method.		<b>8</b>	<b>Apply</b>
<b>Module-3:</b>			
<b>Simplex Method-2: Duality Theory-</b> The essence of duality theory, Primal dual relationship, conversion of primal to dual problem and viceversa. The dual simplex method.		<b>8</b>	<b>Apply</b>
<b>Module-4:</b>			
<b>Transportation and Assignment Problems:</b> The transportation problem, Initial Basic Feasible Solution (IBFS) by North West Corner Rule method, Matrix Minima Method, Vogel's Approximation Method. Optimal solution by Modified Distribution Method (MODI).The Assignment problem; A Hungarian algorithm for the assignment problem. Minimization and Maximization varieties in Transportation and assignment problems.		<b>8</b>	<b>Apply</b>

<b>Module-5:</b>		
<b>Game Theory:</b> Game Theory: The formulation of two persons, zero sum games; saddle point, maximin and minimax principle, Solving simple games- a prototype example; Games with mixed strategies; Graphical solution procedure.	<b>8</b>	<b>Apply</b>

<b>Course Outcomes:</b> After completing the course, the students will be able to	
CO 1:	Solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained.
CO 2:	Determine optimal strategy for products using various methods
CO 3:	Solve linear programming problems using duality theory and post optimality analysis
CO 4:	Understand the given problem as transportation and assignment problem and solve.
CO5:	Illustrate game theory for decision support system.

<b>Reference Books:</b>
<ol style="list-style-type: none"> <li>1. D.S. Hira and P.K. Gupta, Operations Research, (Revised Edition), Published by S. Chand &amp; Company Ltd, 2014</li> <li>2. S Kalavathy, Operation Research, Vikas Publishing House Pvt Limited, 01-Aug-2002</li> <li>3. S D Sharma, Operation Research, KedarNath Ram Nath Publishers.</li> <li>4. Kantiswaroop, P.K.Guptha and Man Mohan: Operation Research. Sultan Chand.</li> <li>5. Introduction to Operations Research - Hiller and Liberman, MGH, 7th Edition, 2002.</li> </ol>
<b>Web links and Video Lectures:</b>
<ol style="list-style-type: none"> <li>1. <a href="https://archive.nptel.ac.in/courses/112/106/112106134/#">https://archive.nptel.ac.in/courses/112/106/112106134/#</a></li> <li>2. <a href="http://www.universalteacherpublications.com/univ/ebooks/or/Ch1/techniq.htm">http://www.universalteacherpublications.com/univ/ebooks/or/Ch1/techniq.htm</a></li> <li>3. <a href="https://indiafreenotes.com/operations-research-techniques/">https://indiafreenotes.com/operations-research-techniques/</a></li> <li>4. <a href="https://nptel.ac.in/courses/110106062">https://nptel.ac.in/courses/110106062</a></li> <li>5. <a href="https://onlinecourses.nptel.ac.in/noc22_ma48/preview">https://onlinecourses.nptel.ac.in/noc22_ma48/preview</a></li> </ol>

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: VI

Course: Introduction to Augmented and Virtual Reality

Course Code: 21ISE1664

<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA</b>	<b>: 50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>:50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration:</b>	<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

- 1 Learn the fundamental of Augmented Reality and displays
- 2 Review the Computer Vision for Augmented Reality and AR Application Requirements
- 3 Learn the fundamental of Virtual Reality and geometry of virtual worlds
- 4 Gather the interface to virtual world input
- 5 Gather the interface to virtual world output

<b>Module-1:</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
<b>Introduction to Augmented Reality:</b> Definition and Scope, A Brief History of Augmented Reality, Examples, Related Fields. <b>Displays:</b> Multimodal Displays, Visual Perception, Requirements and Characteristics, Spatial Display Model, Visual Displays	<b>8</b>	<b>Understand</b>
<b>Module-2:</b>		
<b>Computer Vision for Augmented Reality:</b> Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Incremental Tracking, Simultaneous Localization, Outdoor Tracking <b>AR Application Requirements:</b> Software Engineering Requirements, Distributed Object Systems, Dataflow, Scene Graphs, Developer Support.	<b>8</b>	<b>Apply</b>
<b>Module-3:</b>		
<b>Introduction to Virtual Reality (VR):</b> Introduction, What Is Virtual Reality?, VR Experiences, Hardware, Software, Human Physiology and Perception. <b>The Geometry of Virtual Worlds:</b> Geometric Models, Changing Position and Orientation, Angle Representations of Rotation, Viewing Transformations, Chaining the Transformations.	<b>8</b>	<b>Understand</b>
<b>Module-4:</b>		
<b>Interface to the Virtual World-Input:</b> User Monitoring (User Input to the Virtual World), Body Tracking, Other Physical Input Devices, Platforms, Speech Recognition (Audio Input), World Monitoring (Input to the Virtual World).	<b>8</b>	<b>Understand</b>
<b>Module-5:</b>		

<b>Interface to the Virtual World Output:</b> Visual Displays, Properties of Visual Displays, Logistic Properties of Visual Displays, Monitor-based-or Fishtank—VR, Projection-based VR, Head-based VR, See-through Head-based Displays, Handheld VR, Aural Displays, Haptic Displays, Vestibular and Other Senses	<b>8</b>	<b>Understand</b>
<b>Course Outcomes:</b> After completing the course, the students will be able to		
CO 1:	Understand the Augmented Reality Scope, History and Examples	
CO 2:	Apply Computer Vision for Augmented Reality and AR Application Requirements	
CO 3:	Understand the fundamental of Virtual Reality and geometry of virtual worlds	
CO 4:	Understand interface to virtual world input	
CO 5:	Understand interface to virtual world output	

<b>Reference Books:</b>
<ol style="list-style-type: none"> <li>Schmalstieg, D., Höllerer, T., (2016), “Augmented Reality: Principles &amp; Practice,” Pearson, ISBN: 9789332578494</li> <li>Steven M La Valle, (2020), “ Virtual Reality”, Cambridge University Press.</li> <li>William R. Sherman, Alan B. Craig, “Understanding Virtual Reality Interface, Application, and Design”, Morgan Kaufmann Publishers.</li> <li>Craig, A. B., (2013), “Understanding Augmented Reality, Concepts and Applications,” Morgan Kaufmann, ISBN: 9780240824086.</li> <li>LaViola Jr., J. J., Kruijff, E., McMahan, R. P., Bowman, D. A., Poupyrev, I., (2017), “3D User Interfaces: Theory and Practice,” Pearson, ISBN: 9780134034324.</li> </ol>

<b>Web References:</b>
<ol style="list-style-type: none"> <li>Manivannan, M., (2018), “Virtual Reality Engineering,” IIT Madras, <a href="https://nptel.ac.in/courses/121106013">https://nptel.ac.in/courses/121106013</a></li> <li>Misra, S., (2019), “Industry 4.0: Augmented Reality and Virtual Reality,” IIT Kharagpur, <a href="https://www.youtube.com/watch?v=zLMgdYI82IE">https://www.youtube.com/watch?v=zLMgdYI82IE</a>.</li> <li>Dube, A., (2020), “Augmented Reality - Fundamentals and Development,” NPTEL Special Lecture Series, <a href="https://www.youtube.com/watch?v=MGuSTAqIz9Q">https://www.youtube.com/watch?v=MGuSTAqIz9Q</a>.</li> <li><a href="http://cambum.net/course-2.htm">http://cambum.net/course-2.htm</a>.</li> <li><a href="https://youtu.be/EwdOjbBG9wY">https://youtu.be/EwdOjbBG9wY</a></li> </ol>



# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

SEMESTER – VI

Course: Agile Software Development

Course Code: 21ISE1665

<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA</b>	<b>:</b>	<b>50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>:</b>	<b>50</b>
<b>Hours:</b>	<b>36</b>	<b>SEA Duration</b>	<b>:</b>	<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

1	To understand how an iterative, incremental development process leads to faster delivery of more useful software
2	To understand the essence of agile development methods
3	To understand the principles and practices of extreme programming
4	To understand the roles of prototyping in the software process
5	To understand the concept of Mastering Agility

<b>Module-1:</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
<b>Agile:</b> Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility, <b>How to Be Agile?:</b> Agile Methods, Don't Make Your Own Method, The Road to Mastery, Find a Mentor	<b>06</b>	<b>Understand</b>
<b>Module-2:</b>		
<b>Understanding XP:</b> The XP Lifecycle, The XP Team, XP Concepts, <b>Adopting XP:</b> Is XP Right for Us?, Go!, Assess Your Agility.	<b>06</b>	<b>Understand</b>
<b>Module-3:</b>		
<b>Practicing XP: Thinking:</b> Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, <b>Collaborating:</b> Trust, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand- Up Meetings, Coding Standards, Iteration Demo, Reporting, <b>Releasing:</b> “Done Done”, No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation, <b>Planning:</b> Vision, Release Planning, The Planning Game, Iteration Planning, Slack, Stories, Estimating, <b>Developing:</b> Incremental Requirements, Customer Tests, Test-Driven Development, Refactoring, Simple Design, Incremental Design and Architecture, Spike Solutions.	<b>08</b>	<b>Analyze</b>

<b>Module-4:</b>		
<b>Mastering Agility: Values and Principles:</b> Commonalities, About Values, Principles, and Practices, Further Reading, <b>Improve the Process:</b> Understand Your Project, Tune and Adapt, Break the Rules, <b>Rely on People:</b> Build Effective Relationships, Let the Right People Do the Right Things, Build the Process for the People, <b>Eliminate Waste:</b> Work in Small, Reversible Steps, Fail Fast, Maximize Work Not Done, Pursue Throughput.	<b>08</b>	<b>Analyze</b>
<b>Module-5:</b>		
<b>Deliver Value:</b> Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, <b>Seek Technical Excellence:</b> Software Doesn't Exist, Design Is for Understanding, Design Tradeoffs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery.	<b>08</b>	<b>Analyze</b>

<p><b>Course Outcomes:</b> After completing the course, the students will be able to</p> <p>CO 1: Understand the essence of agile development methods</p> <p>CO 2: Understand The XP Lifecycle, XP Concepts, Adopting XP</p> <p>CO 3: Analyze the Work on Pair Programming, Root-Cause Analysis, Retrospectives, Planning, Incremental Requirements, Customer Tests</p> <p>CO 4: Analyze the concept of Mastering Agility</p> <p>CO 5: Analyze the principles and practices of extreme programming</p>
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<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li><b>The Art of Agile Development</b> (Pragmatic guide to agile software development), James shore, Chromatic, O'Reilly Media, Shroff Publishers &amp; Distributors, 2007.</li> <li>Agile Software Development, Principles, Patterns, and Practices, Robert C. Martin, Prentice Hall; 1<sup>st</sup> edition, 2002</li> <li>“Agile and Iterative Development A Manger’s Guide”, Craig Larman Pearson Education, First Edition, India, 2004.</li> <li>Essential Scrum: A Practical Guide to the Most Popular Agile Process (Addison-Wesley Signature Series (Cohn)) 1st Edition by <a href="#">Kenneth Rubin</a></li> <li>Scrum: The Art of Doing Twice the Work in Half the Time Hardcover – September 30, 2014 by <a href="#">Jeff Sutherland</a> (Author), <a href="#">J.J. Sutherland</a></li> </ol>
<p><b>Web links and Video Lectures:</b></p> <ol style="list-style-type: none"> <li><a href="https://www.techtarget.com/searchsoftwarequality/definition/agile-software-development">https://www.techtarget.com/searchsoftwarequality/definition/agile-software-development</a></li> <li><a href="https://www.atlassian.com/agile/kanban">https://www.atlassian.com/agile/kanban</a></li> <li><a href="https://www.atlassian.com/agile/scrum">https://www.atlassian.com/agile/scrum</a></li> <li><a href="https://www.simplilearn.com/tutorials/agile-scrum-tutorial/what-is-agile">https://www.simplilearn.com/tutorials/agile-scrum-tutorial/what-is-agile</a></li> <li><a href="https://www.youtube.com/watch?v=WjwEh15M5Rw">https://www.youtube.com/watch?v=WjwEh15M5Rw</a></li> </ol>

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: VI

Course: KNOWLEDGE MANAGEMENT

Course Code: 2IISE1666

<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA : 50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA :50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration: 03 Hours</b>

**Course Learning Objectives:** The students will be able to

1 Understand the basics of knowledge creation and knowledge capture

2 Understand the mechanics of knowledge management

3 Understand the use of knowledge management strategy and application of KM tools

<b>Module-1: Introduction</b>	<b>No of hours</b>	<b>Blooms cognitive Levels</b>
Introduction: An Introduction to Knowledge Management - The foundations of knowledge management- including cultural issues- technology applications organizational concepts and processes- management aspects- and decision support systems. The Evolution of Knowledge management: From Information Management to Knowledge Management - Key Challenges Facing the Evolution of Knowledge Management - Ethics for Knowledge Management.	<b>8</b>	<b>Apply</b>
<b>Module-2: Creating The Culture Of Learning And Knowledge Sharing</b>		
Organization and Knowledge Management - Building the Learning Organization. Knowledge Markets: Cooperation among Distributed Technical Specialists – Tacit Knowledge and Quality Assurance.	<b>8</b>	<b>Apply</b>
<b>Module-3: Knowledge Management-The Tools</b>		
Telecommunications and Networks in Knowledge Management - Internet Search Engines and Knowledge Management - Information Technology in Support of Knowledge Management - Knowledge Management and Vocabulary Control - Information Mapping in Information Retrieval - Information Coding in the Internet Environment - Repackaging Information	<b>8</b>	<b>Apply</b>
<b>Module-4: Knowledge Management-Application</b>		
Components of a Knowledge Strategy - Case Studies (From Library to Knowledge Center, Knowledge Management in the Health Sciences, Knowledge Management in Developing Countries).	<b>8</b>	<b>Apply</b>

<b>Module-5: Future Trends and Case Studies</b>		
Advanced topics and case studies in knowledge management - Development of a knowledge management map/plan that is integrated with an organization's strategic and business plan - A case study on Corporate Memories for supporting various aspects in the process life -cycles of an organization.	<b>8</b>	<b>Apply</b>

<b>Course Outcomes:</b> After completing the course, the students will be able to	
CO 1:	Understand the basics of knowledge management
CO 2:	Understand and apply knowledge management models
CO 3:	Understand the mechanics of knowledge management
CO 4:	Understand and implement knowledge management strategy and knowledge management tools
CO 5:	Understand and apply ICT tools for effective knowledge management

<b>Reference Books:</b>
<ol style="list-style-type: none"> <li>1. Srikantaiah, T.K., Koenig, M., “Knowledge Management for the Information Professional” Information Today, Inc., 2000.</li> <li>2. Nonaka, I., Takeuchi, H., “The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation”, Oxford University Press, 1995.</li> <li>3. Frances Horibe, MANAGING KNOWLEDGE WORKERS, John Wiley &amp; Sons</li> <li>4. Fernandez &amp; Leidner, KNOWLEDGE MANAGEMENT, PHI Learning, New Delhi,2008</li> <li>5. Ganesh Natarajan and Sandhya Shekhar, KNOWLEDGE MANAGEMENT - ENABLING BUSINESS GROWTH, Tata McGrawHill, New Delhi</li> <li>6. Elias.M. Award &amp; Hassan M. Ghaziri,KNOWLEDGE MANAGEMENT, PearsonEducation</li> </ol>
<b>Web links and Video Lectures:</b>
<ol style="list-style-type: none"> <li>1.What is Knowledge Management? <a href="https://www.youtube.com/watch?v=3_eI5r55XhU">https://www.youtube.com/watch?v=3_eI5r55XhU</a></li> <li>2.Knowledge Management and Innovation <a href="https://www.youtube.com/watch?v=DNUwZctwwhw">https://www.youtube.com/watch?v=DNUwZctwwhw</a></li> </ol>

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: VI

Course: Introduction to Data Science

Course Code: 21ISE1671

<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA</b>	<b>: 50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>:50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration</b>	<b>: 03 Hours</b>

**Course Learning Objectives:** The students will be able to

- 1 Understand data collection and pre-processing techniques for data science
- 2 Identify fundamentals of R language and statistics
- 3 Utilize Iterative programming and functions in R for data handling.
- 4 Identify complex statistical operations using lists and data frames in R
- 3 Apply Data Reduction and Visualization Techniques

<b>Module-1</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
Introduction to Data Science Introduction: What is Data Science? Big Data and Data Science hype – and getting past the hype, Why now? – Datafication, Current landscape of perspectives, Statistical Inference: Populations and samples, Statistical modelling, probability distributions, fitting a model.	<b>8</b>	<b>Understand</b>
<b>Module-2</b>		
Basics of R: Introduction, R Environment Setup, Programming with R, Basic Data Types. Attributes and Measurement, What is an Attribute? The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes. Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode.	<b>8</b>	<b>Apply</b>
<b>Module-3</b>		
Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Interquartile Range, Graphic Displays of Basic Statistical Descriptions of Data. Conditionals and Control Flow: Relational Operators, Logical Operators. Iterative Programming in R: Introduction, While Loop, For Loop.	<b>8</b>	<b>Apply</b>

<b>Module-4</b>		
<p>Functions in R: Introduction, writing a Function in R, Nested Functions, Function Scoping, Loading an R Package, Mathematical Functions in R, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.</p> <p>Lists: Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements.</p>	<b>8</b>	<b>Apply</b>
<b>Module-5</b>		
Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.	<b>8</b>	<b>Apply</b>

<b>Course Outcomes:</b> After completing the course, the students will be able to
CO1: Understand data collection and pre-processing techniques for data science.
CO2: Identify fundamentals of R language and statistics.
CO3: Utilize Iterative programming and functions in R for data handling.
CO4: Identify complex statistical operations using lists and data frames in R.
CO5: Apply Data Visualization Techniques.

<b>Reference Books:</b>
<ol style="list-style-type: none"> <li>1. Doing Data Science, Straight Talk from The Frontline. Cathy O’Neil and Rachel Schutt, O’Reilly,2014.</li> <li>2. K G Srinivas, G M Siddesh, “Statistical programming in R”, Oxford Publications</li> <li>3. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.</li> <li>4. Mining of Massive Datasets, Anand Rajaraman and Jeffrey D. Ullman, Cambridge University Press, 2010.</li> <li>5. Data Science from Scratch, Joel Grus, Shroff Publisher /O’Reilly Publisher Media 3. A handbook for data driven design by Andy krik.</li> </ol>

**Web links and Video Lectures:**

1. <https://www.javatpoint.com/r-tutorial>
2. <https://nptel.ac.in/courses/106106179>
3. <https://nptel.ac.in/courses/111104147>
4. <https://nptel.ac.in/courses/111104146>
5. <https://nptel.ac.in/courses/128106002>

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: VI

Course: SOFTWARE TESTING

Course Code: 21ISE1672

L:T:P:J

3:0:0:0

CIA

: 50

Credits:

03

SEA

: 50

Hours:

40

SEA Duration:

03 Hours

**Course Learning Objectives:** The students will be able to

- 1 Understand the importance of software testing fundamentals, methodologies, and tools.
- 2 Apply the knowledge of software testing strategies and methodologies for various types of testing
- 3 Identify the various types and testing strategies to find bugs in the software.
- 4 Investigate test planning and its management.
- 5 Demonstrate the usage of modern testing tools to write automation script

## Module-1:

No. of  
hours

Blooms  
cognitive  
Levels

**Basics of Software Testing:** Basic definitions, Software Quality, Requirements, Behavior and Correctness, Correctness versus Reliability, Testing and Debugging, Test cases, identifying test cases, Test-generation Strategies, Test Metrics, Error and fault taxonomies, Levels of testing, Testing and Verification, Static Testing, the triangle problem, commission problem, the SATM (Simple Automatic Teller Machine) problem.

08

Understand

## Module-2:

**Functional Testing:** Boundary value analysis, Robustness testing, Worst-case testing, Robust Worst testing for triangle problem, Nextdate problem and commission problem, Equivalence classes, Equivalence test cases for the triangle problem, NextDate function, and the commission problem, Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem.

08

Apply

## Module-3:

**Types and levels of Testing: Unit Testing:** Driver, Stub **Integration Testing:** Top-Down integration, Bottom-up Integration, Bi-Directional Integration **Testing on Web application:** Performance Testing, Load testing, stress Testing, security Testing, Client-server Testing **Acceptance Testing:** Alpha Testing and Beta Testing, special Tests: Regression Testing, GUI Testing.

08

Apply



<b>Module-4:</b>		
<b>Test Management: Test Planning:</b> Preparing a test plan, Deciding Test approach, setting up criteria for testing, identifying responsibilities, Staffing, Resource Requirements, Test Deliverables, Testing Tasks. <b>Test Management:</b> Test infrastructure management, Test People Management <b>Test process:</b> Base Lining a test plan, Test case specification Test Reporting: Executing Test cases, Preparing Test summary Report.	<b>08</b>	<b>Apply</b>
<b>Module-5:</b>		
<b>Testing Tools and Measurements:</b> Manual Testing and need for automation testing tools, advantages, and disadvantages of using tools, selecting a testing tool, when to use automated testing tools, testing using automated tools. Metrics and Measurement: Types of metrics, product metrics and process metrics, object-oriented metrics in testing.	<b>08</b>	<b>Apply</b>

<b>Course Outcomes:</b> After completing the course, the students will be able to	
CO1	Understand the importance of software testing fundamentals, methodologies, and tools
CO2	Apply the knowledge of software testing strategies and methodologies for various types of testing.
CO3	Analyze various types of testing and identify bugs to create defect report of given application.
CO4	Explore test planning and its management.
CO5	Explore testing software for performance measures using automated testing tools.

**Reference Books:**

1. Software Testing: Principles and Practices, Srinivasn Desikan Gopaldaswamy Ramesh Pearson publisher: Pearson India 2005, ISBN: 9788177581218
2. Software Testing: Principles, Techniques and Tools, Limaye M.G, Tata McGraw Hill.
3. Software Testing, A Craftsman's Approach, Paul C. Jorgensen, 3rd Edition, Auerbach, Publications, 2008
4. Software Testing: Principles and Practices, Naresh Chauhan, Oxford University press.
5. Software Testing, Singh Yogesh, Cambridge university press, Bengaluru, ISBN 978-1-10765278-1

**Web links and Video Lectures:**

1. <http://www.selenium.com>
2. <https://nptel.ac.in/courses/106/105/106105150/>
3. <https://nptel.ac.in/courses/106/101/106101163/>
4. [www.toolsqa.com](http://www.toolsqa.com)
5. [http://en.wikipedia.org/wiki/Test\\_automation](http://en.wikipedia.org/wiki/Test_automation)
6. [http://en.wikipedia.org/wiki/Software\\_testing#Testing\\_tools](http://en.wikipedia.org/wiki/Software_testing#Testing_tools)

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: VI

Course: Introduction to Blockchain

Course Code: 21ISE1673

<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA</b>	<b>:</b>	<b>50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>:</b>	<b>50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration</b>	<b>:</b>	<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

- 1 Understand the emerging abstract models for Blockchain Technology
- 2 Familiarize with the functional/operational aspects of crypto currency eco-system
- 3 Understand the security issues in block chain

<b>Module-1: INTRODUCTION TO BLOCKCHAIN</b>		<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
Distributed DBMS – Limitations of Distributed DBMS, Introduction to Block chain – History, Definition, Distributed Ledger, Blockchain Categories – Public, Private, Consortium, Blockchain Network and Nodes, Peer-to-Peer Network, Mining Mechanism, Generic elements of Blockchain, Features of Blockchain, and Types of Blockchain.		<b>08</b>	<b>Understand</b>
<b>Module-2: BLOCKCHAIN ARCHITECTURE</b>			
Operation of Bitcoin Blockchain, Blockchain Architecture – Block, Hash, Distributer P2P, Structure of Blockchain- Consensus mechanism: Proof of Work (PoW), Proof of Stake (PoS), Byzantine Fault Tolerance (BFT), Proof of Authority (PoA) and Proof of Elapsed Time (PoET)		<b>08</b>	<b>Understand</b>
<b>Module-3: Ethereum basics: BLOCKCHAINS IN BUSINESS</b>			
Public versus private and permissioned versus permission less blockchains Privacy and anonymity in Ethereum- Why are privacy and anonymity important? - The Ethereum Enterprise Alliance- Blockchain- as-a-Service- Initial Coin Offering (ICO) Ethereum and Smart Contracts		<b>08</b>	<b>Understand</b>
<b>Module-4: PRIVACY, SECURITY ISSUES IN BLOCKCHAIN</b>			
Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchains: Sybil attacks, selfish mining, 51% attacks advent of algorand; Sharding based consensus algorithms to prevent these attacks		<b>08</b>	<b>Understand</b>
<b>Module-5: CASE STUDIES</b>			
Block chain in Financial Service, Supply Chain Management and Government Services		<b>08</b>	<b>Understand</b>

**Course Outcomes:** After completing the course, the students will be able to

- CO 1: Understand the basic concepts and technology used for blockchain.
- CO 2: Understand the blockchain architecture and the various mechanisms involved in it.
- CO 3: Understand Ethereum block chain contract.
- CO 4: Understand the various security features in blockchain technologies
- CO 5: Understand the use of smart contracts in real world applications

**Reference Books:**

1. Narayanan, Bonneau, Felten, Miller and Goldfeder, “Bitcoin and Cryptocurrency Technologies – A Comprehensive Introduction”, Princeton University Press.
2. Josh Thompson, ‘Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming’, Create Space Independent Publishing Platform, 2017.
3. Narayanan, Bonneau, Felten, Miller and Goldfeder, “Bitcoin and Cryptocurrency Technologies – A Comprehensive Introduction”, Princeton University Press.
4. Josh Thompson, ‘Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming’, Create Space Independent Publishing Platform, 2017.
5. Imran Bashir, “Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained”, Packt Publishing.
6. Merunas Grincalaitis, “Mastering Ethereum: Implement Advanced Blockchain Applications Using Ethereum-supported Tools, Services, and Protocols”, Packt Publishing.

**Web links and Video Lectures:**

1. <https://www.ibm.com/topics/blockchain>
2. <https://www.investopedia.com/terms/b/blockchain.asp>
3. <https://builtin.com/blockchain>
4. [https://youtu.be/SSo\\_EIwHSd4](https://youtu.be/SSo_EIwHSd4)
7. Prof. Sandip Chakraborty, Dr. Praveen Jayachandran, “Blockchain Architecture Design And Use Cases”[MOOC], NPTEL: <https://nptel.ac.in/courses/106/105/106105184>

# B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: VI

Course: INTRODUCTION TO BIG DATA

Course Code: 21ISE1674

<b>L:T:P:J</b>	<b>3:0:0:0</b>	<b>CIA</b>	<b>: 50</b>
<b>Credits:</b>	<b>03</b>	<b>SEA</b>	<b>:50</b>
<b>Hours:</b>	<b>40</b>	<b>SEA Duration:</b>	<b>03 Hours</b>

**Course Learning Objectives:** The students will be able to

- 1 | Data Analytics and Decision Making
- 2 | Identify an appropriate probability of the data
- 3 | Show analytical distribution of a system
- 4 | Able to make decisions under Uncertainty
- 5 | Perform testing on estimated data

<b>Module-1:</b>	<b>No. of hours</b>	<b>Blooms cognitive Levels</b>
<b>Introduction:</b> Introduction to Big Data Analytics: Big Data, Scalability and Parallel Processing, Designing Data Architecture, Data Sources, Quality, Pre-Processing and Storing, Data Storage and Analysis, Big Data Analytics Applications and Case Studies.	<b>08</b>	<b>Understand</b>
<b>Module-2:</b>		
<b>Introduction to Hadoop:</b> Introduction, Hadoop and its Ecosystem, Hadoop Distributed File System, MapReduce Framework and Programming Model, Hadoop Yarn, Hadoop Ecosystem Tools. <b>Hadoop Distributed File System Basics:</b> HDFS Design Features, Components, HDFS User Commands. <b>Essential Hadoop Tools:</b> Using Apache Pig, Hive, Sqoop, Flume, Oozie, HBase	<b>08</b>	<b>Understand</b>
<b>Module-3:</b>		
<b>NoSQL Big Data Management, MongoDB and Cassandra:</b> Introduction, NoSQL Data Store, NoSQL Data Architecture Patterns, NoSQL to Manage Big Data, Shared-Nothing Architecture for Big Data Tasks, MongoDB, Databases, Cassandra Databases.	<b>08</b>	<b>Apply</b>
<b>Module-4:</b>		
<b>MapReduce, Hive and Pig:</b> Introduction, MapReduce Map Tasks, Reduce Tasks and MapReduce Execution, Composing MapReduce for Calculations and Algorithms, Hive, HiveQL, Pig.	<b>08</b>	<b>Apply</b>

<b>Module-5:</b>		
<b>Text, Web Content, Link, and Social Network Analytics:</b> Introduction, Text mining, Web 10 Mining, Web Content and Web Usage Analytics, Page Rank, Structure of Web and analyzing a Web Graph, Social Network as Graphs and Social Network Analytics:	<b>08</b>	<b>Analyze</b>

<b>Course Outcomes:</b> After completing the course, the students will be able to	
CO 1:	Understand fundamentals of Big Data analytics
CO 2:	Understand Hadoop framework and Hadoop Distributed File system
CO 3:	Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.
CO 4:	Understand the MapReduce programming model to process the big data along with Hadoop tools.
CO 5:	Analyze web contents and Social Networks to provide analytics with relevant visualization tools.

<b>Reference Books:</b>
<ol style="list-style-type: none"> <li>1. Raj Kamal and Preeti Saxena, “Big Data Analytics Introduction to Hadoop, Spark, and Machine-Learning”, McGraw Hill Education, 2018 ISBN: 9789353164966, 9353164966</li> <li>2. Douglas Eadline, "Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem", 1 stEdition, Pearson Education, 2016. ISBN13: 978-9332570351</li> <li>3. Tom White, “Hadoop: The Definitive Guide”, 4 th Edition, O’Reilly Media, 2015.ISBN-13: 978-9352130672</li> <li>4. Boris Lublinsky, Kevin T Smith, Alexey Yakubovich, "Professional Hadoop Solutions", 1 stEdition, Wrox Press, 2014ISBN-13: 978-8126551071</li> <li>5. Eric Sammer, "Hadoop Operations: A Guide for Developers and Administrators",1 stEdition, O’Reilly Media, 2012.ISBN-13: 978-9350239261</li> <li>6. Arshdeep Bahga, Vijay Madiseti, "Big Data Analytics: A Hands-On Approach", 1st Edition, VPT Publications, 2018. ISBN-13: 978-0996025577</li> </ol>
<b>Web links and Video Lectures:</b>
<p><a href="https://onlinecourses.nptel.ac.in/noc20_cs92/preview">https://onlinecourses.nptel.ac.in/noc20_cs92/preview</a>  <a href="https://archive.nptel.ac.in/courses/106/104/106104189/">https://archive.nptel.ac.in/courses/106/104/106104189/</a>  <a href="https://www.digimat.in/nptel/courses/video/106104189/L01.html">https://www.digimat.in/nptel/courses/video/106104189/L01.html</a></p>