



Shri. Shamrao Patil (Yadravkar) Educational & Charitable Trust's

**Sharad Institute of Technology College of Engineering, Yadrav-Ichalkaranji**  
An Autonomous Institute

**Artificial Intelligence and Data Science** Accredited by  
NAAC 'A' Grade, ISO 9001:2015 Certified

## VISION AND MISSION OF THE ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

### ↓ Vision

To be a center of excellence in Artificial Intelligence and Data Science education to prepare professionally competent engineers with lifelong learning attitude for the accomplishment of ever-growing needs of society.

### ↓ Mission

1. To prepare technically and professionally competent engineers by imparting quality education through effective teaching learning methodologies and providing stimulating environment for research and innovation.
2. To develop professional skills and right attitude in students that will help them to succeed and progress in their personal and professional career.
3. To imbibe moral and ethical values in students with concern to society and environment.



  
Head of Department,  
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## PEO

### PEO 1:

Demonstrate capabilities to develop optimal solution with the help of Artificial Intelligence to the real world engineering problems by applying theory based practical approach of engineering and related engineering disciplines.

**PEO 2:** Exhibit professional skills, ethical attitude and sensitivity towards society and environment.

**PEO 3:** Engage in AI & Data Science is Lifelong learning for successful adaption to technological changes.



  
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Department of Artificial Intelligence and Data Science

Program Outcomes (PO's)

**Engineering graduates will be able to,**

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problem.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problem reaching sustained conclusions using first principle of mathematics, natural sciences, and engineering sciences.
3. **Design/ development of solutions:** Design solutions for complex engineering problem and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, societal and environmental considerations.
4. **Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
5. **Modern tool usage:** Create, select and apply appropriate the techniques, resources and modern engineering and IT tools including and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
9. **Individual and teamwork:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of engineering and management principles and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Lifelong learning:** Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

#### Program Specific Outcomes

**1 : To establish a unique learning environment and to enable the students to face the challenges in Artificial Intelligence and Data Science.**

**2 : To analysis the role of information and analytics skills and right attitude in students that will help them to succeed and progress in their professional career.**



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## Abbreviations

L: Lecture

T: Tutorial

P: Practical

MSE: Mid Semester Exam

ESE: End Semester Exam

TW: Term Work

OE: Oral Exam

POE: Practical and Oral Exam

HSMC: Humanities and Social Sciences including Management courses

BSC: Basic Science Courses

ESC: Engineering Science Courses

PCC: Professional Core Courses

PEC: Professional Elective Courses

OEC: Open Electives Courses

PROJ: Project work, seminar, and internship in industry or elsewhere

MC: Mandatory Courses



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## **Syllabus Structure of S.Y. (AI&DS)**

**Department of Artificial Intelligence and Data  
Science**

**Semester: III & IV**



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Department: Artificial Intelligence and Data Science

Rev: AI&DS Course Structure/2021-22

Class: S.Y.B-Tech

Semester: III

Sr No	Course Code	Type of Course	Course Title	Teaching Scheme				Evaluation Scheme					Credits
				L	T	P	Total Hrs	CA1	MSE	CA2	ESE	Total	
1	AD301	BSC	Linear Algebra and Fuzzy set theory	3	1	-	4	10	30	10	50	100	4
2	AD302	PCC	Discrete Mathematical Structures	3	1	-	4	10	30	10	50	100	4
3	AD303	PCC	Data Structure	3	-	-	3	10	30	10	50	100	3
4	AD304	PCC	Operating System	3	-	-	3	10	30	10	50	100	3
5	AD305	ESC	Digital Electronics and Microcontroller	3	-	-	3	10	30	10	50	100	3
6	AD306	PCC	Problem Solving using Python Programming	-	-	2	2	15	-	15	20	50	1
7	AD307	PCC	Data Structures Laboratory	-	-	2	2	15	-	15	20	50	1
8	AD308	PCC	Operating System Laboratory	-	-	2	2	15	-	15	20	50	1
9	AD309	ESC	Digital Electronics and Microcontroller Laboratory	-	-	2	2	15	-	15	20	50	1
10	MDC02	MC	Environmental Sciences	2	-	-	2	25	-	25	-	50	Audit
11	HMS01	HSMC	Aptitude Skills-I	1	-	-	1	25	-	25	-	50	1
12	HMS02	HSMC	Language Skills-I			2	2	25	-	25	-	50	Audit
13	PRJ02	PROJ	Mini Project II			2	2	25	-	25	-	50	Audit
<b>Total</b>				<b>18</b>	<b>2</b>	<b>12</b>	<b>32</b>	<b>210</b>	<b>150</b>	<b>210</b>	<b>330</b>	<b>900</b>	<b>22</b>

Type of Course	BSC	PCC	ESC	HSMC	MC	PEC	OEC	PROJ	Total
Credit	4	13	4	1	-	-	-	-	22
Cumulative	21	13	22	5	-	-	-	1	62



*(Signature)*

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S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester III

AD301	BSC	Linear Algebra and Fuzzy Set Theory	3-1-0	4 Credits
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<b>Teaching Scheme:</b> Lecture: 3hrs/week Tutorial: 1hr/week	<b>Examination Scheme:</b> Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks CA 1 & CA 2 : 20 Marks Term Work: -- Oral Exam: -- Practical and Oral Exam: --
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**Pre-Requisites:** Basic Logic, Set, Graph related concepts

**Course Outcomes:** At the end of the course, students will be able to:

CO1	Apply various interpolation methods and finite difference concepts and also Apply numerical integration techniques whenever and wherever routine methods are not applicable.
CO2	Solve the system of simultaneous linear equations by direct & iterative methods and also solve algebraic and transcendental equations by numerical techniques
CO3	Determine whether a given structure is vector space, subspace structure and will be able to determine basis and dimension of vector spaces
CO4	Find the orthogonalization in inner product spaces and find eigenvalues, eigenvectors and Diagonalization and apply Diagonalization to find powers of matrices, etc
CO5	Differentiate the ordinary sets and fuzzy set.
CO6	Apply the concepts of fuzzy theory in engineering

**Mapping of course outcomes with program outcomes**

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	2	2	-	-
CO6	2	2	-	-	-	-	-	-	-	-	-	1	2	-	-

**Course Contents:**

<b>Unit 1: Interpolation and Numerical Integration</b> Finite differences: Interpolation/extrapolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae (All formulae without proof). Numerical integration: Simpson's $(1/3)^{th}$ rule, Simpson's $(3/8)^{th}$ rule and Weddle's rule (without proof) Problems.	[6]
<b>Unit 2: Solution of Simultaneous linear, transcendental &amp; algebraic equations</b> Gauss elimination method, Gauss-Jordan method, Iterative method of solution- Jacobi iteration method, Gauss-Seidal iteration method. Solution of Algebraic and Transcendental Equation: Bisection method, Method of false position, Secant method and Newton-Raphson method.	[6]
<b>Unit 3: Vector Spaces</b>	[7]





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Introduction to Eigen values and Eigen vectors of a matrix- Eigenbases - Diagonalization- Inner product space Norm of a vector Normed vector space Orthogonal and orthonormal sets Gram Schmidt orthogonalization process.	
<b>Unit 5: Introduction to Fuzzy sets</b> Basic concepts of fuzzy sets; Crisp set and Fuzzy set; Membership functions; Basic operations on fuzzy sets; Properties of fuzzy sets.	[5]
<b>Unit 6: Fuzzy Arithmetic</b> Fuzzy numbers; Fuzzy cardinality; Operations on Fuzzy number; Fuzzy equations of type $A + X = B$ and $A.X = B$ .	[5]
<b>Text books:</b>  1. P. N. Wartikar & J. N. Wartikar, A Text Book of Applied Mathematics (Vol I & II), Pune Vidyarthi Griha Prakashan,Pune.  2. N. P. Bali, A Text Book of Engineering Mathematics, Laxmi Publications, NewDelhi.  3. Peter O' Neil, A Text Book of Engineering Mathematics, Thomson Asia Pvt. Ltd.,Singapore.  4. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East West press, Reprint2005.	
<b>Reference Books:</b>  1. B. S. Grewal, Higher Engineering Mathematics, KhannaPublishers.  2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.  3. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publications, NewDelhi.  4. C. R. Wylie & L. C. Barrett, Advanced Engineering Mathematics, McGraw Hill Publishing CompanyLtd.  5. Fuzzy sets and Fuzzy Logic by George J. Klir, BoYuan.  6. S. Kumaresan, Linear Algebra – A Geometric Approach, Prentice HallInd  7. Linear Algebra by Vivek Sahai and Vikas Bist, Pangbourne AlphaScience,2002	



  
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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester III**

AD302	PCC	Discrete Mathematics Structures	3-1-0	4 Credits
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<b>Teaching Scheme:</b> Lecture: 3hrs/week Tutorial: 1hr/week	<b>Examination Scheme:</b> Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks CA 1 & CA 2 : 20 Marks Term Work:-- Oral Exam:-- Practical and Oral Exam:--
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**Pre-Requisites:** Basic Logic, Set, Graph related concepts

**Course Outcomes:** At the end of the course, students will be able to:

CO1	Illustrate the logic and set concepts.
CO2	Make use of the algebraic structures and morphism
CO3	Categorize the various graphs, path and representation techniques
CO4	Analyze rooted trees, binary search tree and minimal spanning trees
CO5	Solve mathematical problems on combinatory
CO6	Illustrate fundamental structure of mathematical induction

**Mapping of course outcomes with program outcomes**

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	2	-	-	-	1	2	-	-
CO2	2	2	-	-	-	-	-	2	-	-	-	1	2	-	-
CO3	2	2	-	-	-	-	-	2	-	-	-	1	2	-	-
CO4	2	2	-	-	-	-	-	2	-	-	-	1	2	-	-
CO5	2	2	-	-	-	-	-	2	-	-	-	2	2	-	-
CO6	2	2	-	-	-	-	-	2	-	-	-	1	2	-	-

**Course Contents:**

<b>Unit 1:</b> <b>Mathematical Logic and Set Theory:</b> Propositional logic, Logical connectives, Truth tables, Equivalence of formulas and Tautological Implications, Normal forms, Validity, Predicate logic, Universal and existential quantification, Sets-Definition, types and operation, Venn diagram, Cartesian product, relation, properties of binary relations, partition and covering of set, equivalence relation, composition, POSET, Function	[8]
<b>Unit 2</b> <b>Algebraic systems:</b> Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean algebra and Boolean Ring, Representation of BooleanFunction	[8]
<b>Unit 3</b> <b>Graph Theory:</b> Basic terminology, Multi graphs and weighted graphs, Paths and circuits, Shortest path problems, Euler and Hamiltonian paths, Representation of graph, Isomorphic graphs, Connectivity, Matching Coloring, PERT techniques	[7]
<b>Unit 4</b> <b>Trees:</b> Rooted trees, Path length in rooted tree, Binary search trees, Spanning trees and cut set, Minimal spanning trees, Kruskal's and Prim's algorithms for minimal spanning tree	[4]
<b>Unit 5</b>	[5]



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**Case Study**

1. Social Media Network, Search Engine, Google Map, Cryptography, Computer Graphics, Image Processing

**Text Books:**

1. Discrete Mathematical Structures with Application to Computer Science - J. P. Tremblay & R. Manohar (MGH International)
2. C. L. Liu, *Elements of Discrete Mathematics*, McGraw-Hill Publication, 3rd Edition, 2008.
3. Kenneth H. Rosen, *Discrete Mathematics and its Applications*, McGraw-Hill Publication, 6<sup>th</sup> Edition, 2010.

**Reference Books:**

1. Lipschutz, *Discrete Mathematics*, McGraw-Hill Publication, 3rd Edition, 2009.
2. V. K. Balakrishnan, *Schaum's Outline of Graph Theory*, McGraw-Hill Publication, 1<sup>st</sup> Edition, 1997.
3. Eric Gossett, *Discrete Mathematics with Proof*, Wiley Publication, 2nd Edition, 2009.
4. Y. N. Singh, *Discrete Mathematical Structures*, Wiley Publication, 1st Edition, 2010.
5. Dr. Sukhendu Dey, *Graph Theory with Applications*, SPD Publication, 1st Edition, 2012.

**Case Study Reference Links:**

[Discrete Mathematics in the Real World \(mathily.org\)](http://mathily.org),  
[Discrete Mathematics - Lecture 9: Proof Technique \(Case Study\) \(nptel.ac.in\)](http://nptel.ac.in),  
[Discrete mathematics course assessment - a case study | Request PDF \(researchgate.net\)](#),  
[approach-to-sets.pdf \(openu.ac.il\)](http://openu.ac.il)



  
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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester III**

AD303	PCC	Data Structure	3-0-0	3 Credits
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<b>Teaching Scheme:</b> Lecture: 3hrs/week Tutorial: --	<b>Examination Scheme:</b> CA1: 10 Marks CA2 :10Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks
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**Pre-Requisites:** Basic Logic, Set, Graph related concepts

CO1	Outline the basics of data structure and its application.
CO2	Outline Concepts of searching and sorting
CO3	Apply Concepts of stack, queue and solve real-time problems.
CO4	Demonstrate the concepts of Linked List and apply various operations on them.
CO5	Demonstrate the concepts of Trees and apply various operations on them
CO6	Demonstrate Basic terminologies and representation of graph and Hashing.

**Mapping of course outcomes with program outcomes**

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	-	-	-	1	-	-	-	1	-	-	1
CO2	2	2	-	1	-	1	-	1	-	1	-	1	1	-	-
CO3	1	1	-	-	-	1	-	1	-	1	-	1	-	-	-
CO4	2	2	2	1	-	2	-	1	-	1	-	1	-	-	-
CO5	1	1	-	-	-	1	-	1	-	1	-	1	-	1	-
CO6	2	2	2	1	-	1	-	1	-	1	-	1	-	-	1

**Course Contents:**

<p><b>Unit 1: Introduction to Data Structure</b> Basic Terminology · Elementary data structure organization · Classification of data structure, Operations on data structures · Traversing, Inserting, deleting · Searching, sorting, merging Different Approaches to designing an algorithm · Top-Down approach · Bottom-up approach Complexity · Time complexity · Space complexity, Big 'O' Notation</p>	[6]
<p><b>Unit 2: Sorting and Searching Techniques</b> Introduction, Selection sort, Insertion sort, Bubble sort, Merge sort, Radix sort (Only algorithm), Shell sort (Only algorithm) Quick sort ( Only algorithm ) , Searching · Linear search, Binary search</p>	[6]
<p><b>Unit 3: Introduction to stack and Queue</b> Stack as an abstract data type · Representation of stack through arrays, Applications of Stack, Reversing a list, Polish notations, Conversion of infix to postfix expression, Evaluation of postfix expression, Converting an infix into prefix expression, Evaluation of prefix expression, Recursion, Introduction · Queues as an abstract data type · Representation of a Queue as an array, Types of Queue, · Circular Queue · Double Ended Queue · Priority Queue · De -queues, Applications of Queue</p>	[6]
<p><b>Unit 4: Linked List</b> Introduction Terminologies: node, Address, Pointer, Information, Next, Null Pointer, Empty list etc. Type of lists : Linear list · Circular list · Doubly list 5.3 Operations on a singly linked list (only</p>	[6]





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<b>Unit 5: Tree Introduction Terminologies</b>	[6]
Tree, degree of a node, degree of a tree, level of a node, leaf node, Depth / Height of a tree, In-degree & out- Degree, Directed edge, Path, Ancestor & descendant nodes. Type of Trees · General tree · Binary tree · Binary search tree (BST). Binary tree traversal (only algorithm) · In order traversal · Preorder traversal · Post order traversal, Expression tree	
<b>Unit 6: Graph and Hashing</b>	[6]
Introduction, · Terminologies: graph, node (Vertices), arcs (edge), directed graph, in-degree, out-degree, adjacent, successor, predecessor, relation, weight, path, length. Representations of a graph. Array Representation · Linked list Representation, Traversal of graphs · Depth-first search (DFS). · Breadth-first search (BFS). Applications of Graph Hashing, Hash function, Collision resolution techniques	
<b>Text Books:</b>	
<ol style="list-style-type: none"><li>1. Thomas Cormen, Introduction to Algorithms, PHI Publication, 2<sup>nd</sup> Edition, 2002.</li><li>2. E. Horowitz, S. Sahani, Fundamentals of Data Structures, Galgotia Publication, 1<sup>st</sup> Edition, 1983.</li><li>3. Kyle Loudon, Mastering Algorithms with C: Useful Techniques from Sorting to Encryption, O'Reilly Media, 1<sup>st</sup> Edition, 1999</li><li>4. Mark Allen Weiss, Data structures and algorithms analysis in C++, Pearson Education, 4<sup>th</sup> Edition, 2013.</li></ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"><li>1. S. Lipschutz, Data Structures, McGraw-Hill Publication, Revised 1<sup>st</sup> Edition, 2014.</li><li>2. Y. Langsam, M. Augenstein, A. Tanenbaum, Data Structure using C and C++, Prentice Hall India Learning Private Limited, 2<sup>nd</sup> Edition, 1998. Trembley and Sorenson, Introduction to Data Structures, PHI Publication, 2<sup>nd</sup> Revised Edition, 1983</li></ol>	



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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester III**

AD304	PCC	Operating System	3-0-0	1 Credits
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<b>Teaching Scheme:</b> Lecture: 3hrs/week Tutorial: –	<b>Examination Scheme:</b> CA1: 10 Marks CA2: 10Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks
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**Pre-Requisites:** Basic Logic, Set, Graph related concepts

CO1	Explain the basic concept of operating system & their types.
CO2	Illustrate the flow of process with its states and different process scheduling policies.
CO3	Explain concepts of Mutual exclusion and IPC
CO4	Make use the concept of deadlocks
CO5	Illustrate concept of memory management policies.
CO6	Illustrate the concepts of Unix and Linux OS.

**Mapping of course outcomes with program outcomes**

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	-	-	-	1	-	-	-	-	1	-	-
CO2	2	2	1	2	-	-	-	1	-	1	-	1	1	-	-
CO3	2	2	1	1	-	1	-	1	-	1	-	1	1	-	-
CO4	2	2	2	1	-	1	-	-	-	1	-	1	-	-	-
CO5	2	2	2	2	1	-	-	-	-	1	-	2	2	2	
CO6	2	2	2	2	1	-	-	-	-	1	-	2	2	2	

**Course Contents:**

<b>Unit 1 Introduction:</b> Basics of Operating Systems: Definition – Generations of Operating systems – Types of Operating Systems, OS Service, System Calls, OS structure: Layered, Monolithic, Microkernel Operating Systems – Concept of Virtual Machine	[04]
<b>Unit 2 Process Management</b> Processes: Definition , Process Relationship , Process states , Process State transitions , Process Control Block ,Context switching – Threads – Concept of multithreads , Benefits of threads – Types of threads Process Scheduling: Definition , Scheduling objectives ,Types of Schedulers ,Scheduling criteria : CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time (Definition only) Scheduling algorithms : Preemptive and Non , preemptive , FCFS – SJF– RR , Multiprocessor scheduling : Types , Performance evaluation of the scheduling.	[05]
<b>Unit 3 Inter-process Communication</b> Race Conditions, Critical Section, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem etc..	[04]
<b>Unit4 Deadlocks:</b>	[03]



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Protection and sharing – Disadvantages of paging.

**Virtual Memory:**

Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging ( Concepts only) – Page Replacement policies : Optimal (OPT) , First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU)

**Unit 6 Unix/Linux Operating System**

Development of Unix/Linux, Role & Function of Kernel, System Calls, Elementary Linux command & Shell Programming, Directory Structure, System Administration Case study: Linux, Windows Operating System

[03]

**Text Books**

1. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, ISBN-10: 0-13- 380591-3, ISBN-13: 978-0-13-380591-8, 8thEdition.
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, WILEY, ISBN 978-1-118-06333-0 , 9thEdition
3. Andrew S. Tanenbaum & Herbert Bos, Modern Operating System, Pearson, ISBN-13: 9780133592221, 4th Edition.

**Reference Books**

1. Tom Adelstein and Bill Lubanovic, Linux System Administration, O'Reilly Media, ISBN-10: 0596009526, ISBN-13:978-0596009526
2. Harvey M. Deitel, Operating Systems, Prentice Hall, ISBN-10: 0131828274, ISBN-13: 978-0131828278
3. Thomas W. Doeppner, Operating System in depth: Design and Programming, WILEY, ISBN: 978-0-471-68723-

**Useful Links**

1. [www.gnu.org/s/gdb/](http://www.gnu.org/s/gdb/)
2. <https://nptel.ac.in/courses/106/105/106105214/IITKharagpur>.
3. <https://nptel.ac.in/courses/106/106/106106144/IITMadras>.



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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester III**

AD305	ESC	Digital Electronics & Microcontroller	3-0-0	3 Credits
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<b>Teaching Scheme:</b> Lecture: 3hrs/week Tutorial: –	<b>Examination Scheme:</b> CA1: 10 Marks CA2: 10Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks
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**Pre-Requisites:** Basic Electronics.

**Course Outcomes:** At the end of the course, students will be able to:

CO1	Explain the different logic gates and different number system operations.
CO2	Explain different combinational logic circuits.
CO3	Make use of flip flops to build different converters and counters.
CO4	Develop assembly language program for arithmetic & logical operations using 8051.
CO5	Apply concepts of serial communication, timers & interrupts using I/O ports.
CO6	Make use of 8051 for interfacing External Peripherals.

**Mapping of course outcomes with program outcomes**

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	1	-	-	1	1	-	1	1	1	1
CO2	2	2	-	-	1	-	-	1	1	-	1	1	1	1
CO3	2	2	-	-	1	-	-	1	1	-	1	1	1	1
CO4	3	2	-	-	1	-	-	1	1	-	-	1	2	2
CO5	3	2	-	-	1	-	-	1	1	-	-	1	2	2
CO6	3	2	-	-	1	-	-	1	1	-	-	1	2	2

<b>Unit 1: Logic Gates and Number Systems)</b> Analog Signal, Analog Circuits, Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, examples of IC gates, Boolean algebra, Number Systems: binary, signed binary, octal hexadecimal number, Number System Conversion, binary arithmetic, one's and two's complements arithmetic.	[6]
<b>Unit 2: Combinational Digital Circuits:</b> Standard representation for logic functions, K-map representation and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder	[6]
<b>Unit 3: Sequential circuits and systems:</b> A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, D, J-K, and T types flip flops, Shift registers, serial to parallel converter, parallel to serial converter, ring counter, Ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, asynchronous sequential counters	[6]
<b>Unit 4: 8051 Microcontroller Architecture and Instruction Set</b>	[6]





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<b>Unit 5: On-Chip Peripherals and Programming</b> Embedded C Programming: Data Types, Operators, Embedded C Programming: Data Conversion, I/O Programming Timer/Counter: Operating Modes, Programming. UART: Operating Modes, Programming. Interrupt: 8051 Interrupt- External and Internal Interrupts.	[6]
<b>Unit 6: Off-Chip Peripheral Interfacing and Programming</b> Interfacing: LED, Switches and Matrix Keyboard, LCD, ADC 0808 with Analog Sensor, DAC.	[6]

**Term Work:**

- The term work shall consist of Continuous practical assessment, Attendance & Internaloral.

**Text Books:**

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education,2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India,2016.
3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India,2016.
4. RameshS. Gaonkar- I. Microprocessors Architecture, Programming and applications with8085A
5. The 8051 Microcontroller & Embedded Systems By Muhammad Ali Mazidi & JaniceGillispie Mazidi Pearson Edition L. P.E.

**Reference Books:**

1. The 8051 Microcontroller By Ayala- 3<sup>rd</sup> Edition



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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester III**

AD306	PCC	Problem Solving Using Python Programming	0-0-1	1 Credits
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<b>Teaching Scheme:</b> Lecture: -- Tutorial: -- Practical: 2hrs/week	<b>Examination Scheme:</b> PR- CA 1 & CA 2 : 30 Marks Practical and Oral Exam:--20 Marks
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**Pre-Requisites:** Basic Electronics.

**Course Outcomes:** At the end of the course, students will be able to:

CO1	Describe the numbers, math functions, strings, tuples and lists in Python
CO2	Express different decision-making statements and Functions.
CO3	Interpret object-oriented programming in Python.
CO4	Demonstrate and summarize different file handling operations.

**Mapping of course outcomes with program outcomes**

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	1	-	-	1	1	-	1	1	1	1	-
CO2	2	2	1	-	1	-	-	1	1	-	1	1	1	1	-
CO3	2	2	1	-	1	-	-	1	1	-	1	1	1	1	-
CO4	3	2	1	-	1	-	-	1	1	-	-	1	2	2	-

**Practical List:**

1.	Write a program to demonstrate basic data type in python.
2.	A program to compute distance between two point taking input from the user Write a program add.d.py that takes 2 numbers as command line arguments and prints its sum.
3.	Write a Program for checking whether the given number is an even number or not. Using a for loop.
4.	Write a Program to demonstrate list and tuple in python. Write a program using a for loop that loops over a sequence. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
5.	Find the sum of all the primes below two million. By considering the terms in the Fibonacci sequence whose values do not exceed four million, WAP to find the sum of the even-valued terms.
6.	Write a program to count the numbers of characters in the string and store them in a dictionary data structure Write a program to use split and join methods in the string and trace a birthday of a person with a dictionary data structure
7.	Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file? Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a textfile?
8.	Write a program to print each line of a file in reverse order. Write a program to compute the number of characters, words and lines in a file.



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**Text Books:**

1. Introduction to computing and Problem Solving Using Python, E Balagurusamy McGraw Hill Education Pvt. Ltd, ISBN-13:978-93-5260-258-2
2. Programming and Problem Solving with Python , Kamthane, McGraw Hill Education Pvt.Ltd, ISBN: 9789387067578
3. Python the complete reference, Brown, McGraw Hill Education Pvt. Ltd, ISBN:9789387572942.

**Reference Books:**

1. Python Programming: An introduction to Computer Science, John Zelle, Franklin, Beedle and Associates, Inc.
2. Learning Python, Mark Lutz, O'reilly, 5e
3. Programming in Python, Dr. Pooja Sharma, BPB Publications, ISBN:978-93-8655-127-6
4. Dr. C. Karthikeyan, A. Antonidoss, S. K. Muthusundar "Doorstep Python" National Press 2021



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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester III**

AD307	PCC	Data Structure Laboratory	0-0-1	1 Credits
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<b>Teaching Scheme:</b>	<b>Examination Scheme:</b>
Practical: 2hr/week	CA1: 15 Marks CA2: 15Marks Practical and Oral Exam:--20 Marks

**Practical List:**

S. No	List of Experiments
1	Write a program for traversing of array. a) To define an integer array of 10 elements and displayit. b) To define 2*2 array and display it in matrixform.
2	Write a program to perform operations on an array. a) Insertion of element inarray b) Deletion of element fromarray
3	Write a program to search a number in an array of 10 elements. a)LinearSearch b)BinarySearch
4	Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order: a) Bubblesort b) Selection sort c) Insertion sort
5	a) Write a program to implement stack operation usingarray. b) Write a program to implement Infix to Postfix usingStack.
6	a) Write a program to implement linear queue operation usingarray. b) Write a program to implement Circular queue operation usingarray.
7	a) Write a program to create singly linkedlist. b) Write a program to create doubly linkedlist.
8	Write a program to create binary tree and perform In order, Pre order and Post Order
9	Write a program to create a graph of n vertices using an adjacency list.
10	Write a program to search an element using hashing techniques.



  
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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester III**


AD308	PCC	Operating System Laboratory	0-0-1	1 Credits
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<b>Teaching Scheme:</b> Practical: 2hr/week	<b>Examination Scheme:</b> CA1: 15 Marks CA2: 15Marks Practical and Oral Exam:--20 Marks
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**Practical List:**

List of Practical:	
1.	Study of different Operating System.
2.	Hands on UNIX/LINUX commands.
3.	Shell programming for file handling.
4.	Shell script programming using the commands grep, awk and sed.
5.	Implementation of different scheduling algorithms.
6.	Write a program to implement Producer consumer problem
7.	Write a program to simulate Bankers Algorithm for the purpose of Deadlock avoidance.
8.	Implementation of various page replacement policies.
9.	Implementation of synchronization primitives-semaphores, locks and conditional variables.
10.	Implementation of various memory allocation algorithms.



  
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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester III**

AD309	PCC	Digital Electronics and Microcontroller Laboratory	0-0-1	1 Credits
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<b>Teaching Scheme:</b> Practical: 2hr/week	<b>Examination Scheme:</b> CA1: 15 Marks CA 2: 15Marks Practical and Oral Exam:--20 Marks
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<b>Practical List:</b>
1. Implementation of logic gates using universal gates.
2. Realization of half/full adder & half/full subtractors using logic gates.
3. Realization of parallel adder/subtractors using 7483 chip.
4. MUX/DEMUX – use of 74153, 74139 for arithmetic circuits
5. Truth table verification of flip-flops.
6. Arithmetic and Logical operations using 8051 Microcontroller.
7. LEDs Interfacing to 8051 Microcontroller with Timer Interrupt.
8. LCD Interfacing to 8051 Microcontroller.
9. Keyboard Interfacing to 8051 Microcontroller.
10. Stepper Motor Interfacing to 8051 Microcontroller.



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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester III**

MDC01	MC	Environmental Sciences	2-0-0	Audit
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Teaching Scheme:	Examination Scheme:
Lecture: 2 hrs/week	CA1:25 Marks CA2:25 Marks

Pre-Requisites: NA

**Course Outcomes:** At the end of the course, students will be able to:

CO1	Explain various natural resources and associated Problems
CO2	Summarize various ecosystems
CO3	Explain the importance of conservation of biodiversity and its importance in balancing the earth.
CO4	Recognize various causes of environmental pollution along with various protection acts in India to limit the pollution
CO5	Extract the information based of field study and prepare a report.

**Mapping of course outcomes with program outcomes**

Course Outcomes	Program Outcomes														
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	2	2	-	1	2		-1	-	-	-

**Course Contents:**

<b>Unit 1:NatureofEnvironmentalStudies:</b> Definition, scope and importance, Multidisciplinary nature of environmental studies.Need for public awareness.	(2)
<b>Unit 2: NaturalResourcesandAssociatedProblems:</b> Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests	(6)





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<b>Unit3:Biodiversity:</b> Introduction- Definition: genetic, species and ecosystem diversity, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Various approaches for the conservation of biodiversity. And at least one case study in line with this	(4)
<b>Unit 4: Environmental Pollution and Environmental Protection:</b> Definition: Causes, effects and control measures of various types of pollution, Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution, Concept of sustainable development : From Unsustainable to Sustainable development, Various environmental Protection Acts and their scope	(4)
<b>Unit5:FieldWork:</b> The student should Visit to a local area to document environmental assets- River/Forest/Grassland/Hill/Mountain, Visit to a local polluted site - Urban / Rural / Industrial/Agricultural, Study of common plants, insects, birds. or Study of simple ecosystems - ponds, river, hill slopes, etc, The student should expect to do this activity in a group size of 4-5 and prepare and submit a report on it.	(4)

**Text Books:**

1. Agarwal, K.C.2001, Environmental Biology, NidiPub.Ltd.,Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt.Ltd., Ahmedabad 380013, India,Email:mapin@icenet.net(R)
3. Brunner R.C.,1989, Hazardous Waste Incineration,McGrawHillInc.480p
4. Clank R.S. Marine Pollution, ClandersonPressOxford(TB)
5. Cunningham, W.P. Cooper, T.H.Gorhani, E. & Hepworth,M.T.2001, Environmental Encyclopedia, JaicoPub.Mumbai,1196p
6. De A.K., Environmental Chemistry, WileyWasternLtd.
7. Down to Earth , Centre for Science and Environment,NewDelhi.(R)
8. Gleick, H.,1993, Water in crisis, Pacific Institute for studies in Dev., Environment & Security. Stockholm Env. Institute. OxfordUniv.Press473p
9. Hawkins R.E., Encyclopedia of Indian Natural History, BombayNatural History Society,Bombay(R)
- 10.Heywood, V.H.& Watson, R.T.1995, Global BiodiversityAssessment, Cmbridge Univ. Press1140p.
- 11.Jadhav, H.and Bhosale, V.M.1995, Environmental Protectionand Laws, Himalaya Pub.House,Delhi



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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester III**

HMS01	HSMC	Aptitude Skills- I	1-0-0	1 credit
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Teaching Scheme:	Examination Scheme:
Lecture: 1 hrs/week Tutorial: NA Practical: NA	CA1: 25 marks CA2: 25 marks

re-Requisites: CommunicationSkills

**Group A  
Aptitude (12Hrs)**

**Course Objectives:**

1	To study multiplications, squares, square roots, cubes and cube roots to solve aptitude problems
2	To understand the concepts of Number system
3	To study the basics of aptitude skills like percentage, average, ratio and proportion,
4	To study the various speed, time and distance basic concepts
5	To understand the concepts of business aptitude
6	To understand the Concepts of Geometry and Venn diagram in Aptitude

**Course Outcomes:** At the end of the course, students will be able to:

1	Understand speed math techniques to solve aptitude problems
2	Summarize number systems in detail.
3	Explain basic aptitude techniques related to Percentage, Average, Ratio Proportion and Fraction
4	Understand speed, time and distance concepts
5	Summarize the concepts of Business aptitude using basic aptitude
6	Solve the aptitude problems on Geometry and Venn Diagram

**Mapping of course outcomes with program outcomes**

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2													2
CO2	2													2
CO3	1					1								2
CO4	2													2
CO5						1		1		2				2
CO6						1		1		2				2

Course Contents:



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<b>Unit3:BasicAptitude</b> Percentage, Average, Ratio and Proportion, Fraction, Partnership	(3)
<b>Unit 4: Speed-Time-Distance</b> Speed, Time, and Distance, Trains, Boats, Streams, Races	(2)
<b>Unit 5:BusinessAptitude</b> Profit & Loss, Simple Interest, Compound Interest	(2)
<b>Unit 6: Geometry andVenn Diagram</b> 2D and 3D Mensuration, Venn diagram	(2)

**Text Books:**

1. Arun Shrama - Quantitative aptitudeforCAT.
2. RS Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. ChandPublisher; 2016edition
3. RS Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Publisher; 2016edition

**Reference Books:**

1. Fast Track Objective Arithmetic Paperback, by Rajesh Verma–2018
2. Teach Yourself Quantitative Aptitude, ArunSharma
3. The Pearson Guide To Quantitative Aptitude For Competitive Examination byDineshKhattar



  
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S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester III

HMS02	HSMC	Language Skill- I	0-0-2	Audit
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Teaching Scheme:	Examination Scheme:
Lecture: NA Tutorial: NA Practical: 2 hrs/week	CA1=25 marks CA2=25 marks

**Pre-Requisites:** Communication Skills

**Languages (Any One)**

**C Programming (Technical Language)  
(24Hrs)**

**Course Objectives:**

This course provides an opportunity to enhance acquisition of the fundamental elements of the C programming language. Emphasis is on the progressive development of basic programming syntaxes and essentials used in C programming

**Course Outcomes: At the end of the course, students will be able to:**

1	Explain fundamentals & essentials of C programming.
2	Illustrate Types, Operators and Expressions.
3	Make use of Decision Making and Looping Statements
4	Make use of Arrays in C programming.

**Mapping of course outcomes with program outcomes**

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	0	0	0	0	0	1	1	1	0	1	1	1	1
CO2	1	1	0	0	0	0	0	1	1	1	0	1	1	1	1
CO3	1	2	2	1	0	0	0	1	1	1	0	1	1	2	0
CO4	1	2	2	1	0	0	0	1	1	1	0	1	1	2	0

<b>Unit 1: Basics of C</b> Editing, Compiling, Error Checking, executing, testing and debugging of Programs, Flowcharts, Algorithms, Structure of C Program.	(6)
<b>Unit 2: Types, Operators and Expressions</b>	(6)





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**Unit4:Arrays**

Initializing arrays, Initializing character arrays,two dimensional and multidimensional arrays.

(6)

**Text Books**

1. C Programming Absolute Beginner's Guide, Que Publishing; 3rd edition (22August2013)
2. C Programming Language 2nd Edition, PearsonPublication

**Reference Books**

1. C: The Complete Reference, McGraw Hill Education; 4th edition (1July2017)
2. C Programming in easy steps, 5th Edition, In EasyStepsLimited
3. The C Programming Language, Second Edition, By Pearson Education India (1January2015)

**Japanese Language Course I (24Hrs)**

**Course Objectives:**

This course is designed to introduce students to the everyday language of Japan. Lessons will be organized around natural conversational topics, leading students from fundamental aspects of grammar to readings in simple texts.

**Course Outcomes:** At the end of the course, students will be able to:

1	Explain the history and scripts used in Japanese
2	Translate simple English words into Japanese
3	Express themselves by using simple sentences and responses to questions.
4	Demonstrate Japanese scripts through oral and written communication.

**Mapping of course outcomes with program outcomes**

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	--	--	--	--	--	--	--	--	--	1	--	1	--	--	--
CO2	--	--	--	--	--	--	--	--	--	1	--	1	--	--	--
CO3	--	--	--	--	--	--	--	--	--	2	--	1	--	--	--
CO4	--	--	--	--	--	--	--	--	--	2	--	1	--	--	--

**Course Contents:**

**Unit1: Introduction**

(6)



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<b>Unit 3: Simple sentence forming</b> Introduction of Katakana, Formation of simple sentences involving asking and answering questions, Basic Conversational skills. Asking and answering questions based on the topics studied, Introduction of few simple Kanji, and their use in sentences based on the pattern "--ni---gaarimasu".	<b>[6]</b>
<b>Unit 4: Simple interactions</b> Translations from, and into Japanese, Reading an unseen paragraph, and answering questions based thereon, General revision	<b>[6]</b>
<b>Text Book:</b> <ol style="list-style-type: none"><li>1. Nihongo Shoho I (Japan Foundation Publ.)</li><li>2. GENKI I: An Integrated Course in Elementary Japanese (English and Japanese Edition)</li><li>3. Japanese for Busy People I: Kana Version (Japanese for Busy People Series) 3rd Edition</li></ol>	
<b>Reference Book:</b> <ol style="list-style-type: none"><li>1. Minna No Nihongo I (3A Corporation, Japan)</li><li>2. Japanese from Zero! 1: Proven Techniques to Learn Japanese for Students and Professionals 6<sup>th</sup> Edition by George Trombl</li></ol>	



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### Foreign Languages (Any One)

#### German Language Course I

(24Hrs)

#### Course Objectives:

This course provides an opportunity to enhance acquisition of the fundamental elements of the German language. Emphasis is on the progressive development of basic listening, speaking, reading, and writing skills through the use of supplementary learning media and materials.

**Course Outcomes:** At the end of the course, students will be able to:

1	Summarize the simple German words used for daily used words
2	Translate simple English words into German
3	Express themselves by using simple sentences and responses to questions.
4	Demonstrate German scripts through oral and written communication.

#### Mapping of course outcomes with program outcomes

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1										1		1		
CO2										1		1		
CO3										2		1		
CO4										2		1		

#### Course Contents:

<b>Unit1: Introduction</b> Introduction of the language, Greetings, introduce oneself, speaking about yourself and others, numbers, E-mail address, Alphabets, speaking about countries and languages, Speaking about Hobbies, to have an informal appointment, learning weekdays, months and seasons	[6]
<b>Unit 2: SimpleWordforming</b> Speaking about professions, work and wartimes, learning to fill up a profile in German, Learning to name the famous places, buildings in a city, learning definite/ indefinite and negative articles in German, to name the modes of transportation, To learn to describe the way, to understand the texts with internationalwords.	[6]
<b>Unit 3: Simplesentenceforming</b> To speak about food, to plan a shopping, conversation with the shopkeeper,	[6]





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**Unit4:Simple interactions**

[6]

Learning about punctuality in Germany and how to excuse for delay, telephonic conversation about the appointments, To plan something together, speaking about birthday, to understand invitation and to write an invitation, to order and to pay in restaurant, to speak about own experiences, To understand particular information from the texts, to understand about different events and events related information in Radio

**Text Books**

1. Netzwerk Arbetisbuch A1GoyalPublisher.
2. "The Everything Learning German Book: Speak, Write and Understand Basic German in No Time" by EdSwick
3. "German Made Simple: Learn to Speak and Understand German QuicklyandEasily"

**Reference Books**

1. by Eugene Jackson andAdolphGeiger
2. "Hammer's German Grammar and Usage" (Fifth Edition) by ProfessorMartinDurrell
3. "Learn German with Stories: Café in Berlin" by AndréKlein



  
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S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester III

PROJ02	PROJ	Mini Project II	0-0-2	Audit
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<b>Teaching Scheme:</b>	<b>Examination Scheme:</b>
Practical: 2hr/week	CA1:25Marks CA2:25Marks

**Pre-Requisites:** Basic knowledge of Communication skills (LSRW)

**Course Outcomes:** At the end of the course, students will be able to:


CO1	Acquire practical knowledge within the chosen area of technology for project development
CO2	Identify, analyze and handle programming projects with a comprehensive and systematic approach
CO3	Contribute as an individual or in a team in development of technical projects
CO4	Develop effective communication skills for presentation of project related activities
CO5	Formulate and propose a plan for creating a solution for the problem identified

**Course Contents:**

The mini- should be preferably by Students who will jointly work and implement the mini-project. The group will select a project with the approval of the guide. Students who will jointly work and implement the mini-project. The group will select a project with the approval of the guide.

A batch of practical / Tutorial will be divided into mini project groups. Mini project topics and the work for these groups in the batch will be guided by a teacher for the batch, preferably on one of the topics like Compiler Construction, Database Engineering, Operating System, Computer Graphics and Multimedia, Advanced Programming and latest developments and trends in Computer Science and Technology.



  
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The teacher will periodically assess the performance of individual student in the mini project, jointly with a teacher of another batch. Project group will submit hardcopy project report along with project demonstration software in CD and/or project hardware gadget at the term end.



  
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Department: Artificial Intelligence and Data Science

Rev: AI&DS Course Structure/2021-22

Class: S.Y.B-Tech

Semester: IV

Sr. No	Course Code	Course Type	Course Title	Teaching Scheme				Evaluation Scheme					Credit
				L	T	P	Total Hrs	CA1	MSE	CA2	ESE	Total	
1	AD401	BSC	Probability and Statistics	3	-	-	3	10	30	10	50	100	3
2	AD402	PCC	Database Technologies	3	-	-	3	10	30	10	50	100	3
3	AD403	PCC	Java Programming	3	-	-	3	10	30	10	50	100	3
4	AD404	PCC	Data Communication And Networking	3	-	-	3	10	30	10	50	100	3
5	AD405	PEC	Elective-I	3	-	-	3	10	30	10	50	100	3
6	AD406	PCC	Database Technologies Laboratory	-	-	2	2	15	-	15	20	50	1
7	AD407	PCC	Java Programming Laboratory	-	-	2	2	15	-	15	20	50	1
8	AD408	PCC	Data Communication And Networking Laboratory	-	-	2	2	15	-	15	20	50	1
9	AD409	PEC	Elective-I Laboratory	-	-	2	2	15	-	15	20	50	1
10	PRJ03	PROJ	Mini project III	-	-	2	2	25	-	25	-	50	1
11	MDC01	MC	Constitution of India	1	-	-	1	25	-	25	-	50	Audi
12	HMS03	HSMC	Aptitude Skills-II	1	-	-	1	25	-	25	-	50	Audi
13	HMS04	HSMC	Language Skills-II	-	-	2	2	25	-	25	-	50	1
14	IFT01	PROJ	Industrial Training/Field Training-I	-	-	-	-	-	-	-	50	50	Audi
<b>Total</b>				<b>17</b>	<b>0</b>	<b>12</b>	<b>29</b>	<b>210</b>	<b>150</b>	<b>210</b>	<b>380</b>	<b>950</b>	<b>21</b>

Elective I: AD405A: R Programming, AD405B: Information Security, AD405C: LISP

Type of Course	BSC	PCC	ESC	HSMC	MC	PEC	OEC	PROJ	Total
Credit	3	12	-	1	-	4	-	1	21
Cumulative	24	25	22	6	-	4	-	2	83



*[Signature]*  
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**S.Y. (ARTIFICIAL INTELLIGENCE & DATA SCIENCE) Semester IV**

AD401	BSC	Probability and Statistics	3-0-0	03 Credits
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<b>Teaching Scheme:</b> Lecture: 3 hrs/week	<b>Examination Scheme:</b> CA1: 10 Marks CA2: 10Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks
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**Pre-Requisites:** Basic Mathematics skills

**Course Outcomes:** At the end of the course, students will be able to

CO1	Apply the concepts of probability to solve engineering problems.
CO2	Illustrate and formulate fundamental probability distribution and density functions, as well as functions of random variable.
CO3	Apply different methods to find the correlation between the variable
CO4	Develop basic mathematical tools for regression analysis
CO5	Develop basic mathematical tools for fitting of curves like linear and non-linear curve.
CO6	Develop basic mathematical tools for Queening theory.

**Mapping of course outcomes with program outcomes**

Course Outcomes	Program Outcomes												PSO1	PSO2	PSO3	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12				
CO1	2	2			1			1				1				
CO2	2	2			1			1				1				
CO3	2	2			1			1				1				
CO4	2	2			1			1				1				
CO5	2	2			1			1				1				
CO6	2	2			1			1								

**Course Contents**

<b>Unit 1: Basic Probability</b> Definition and concept of probability: Addition theorem of probability Multiplication theorem of probability (Without proofs), Examples. Random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Join and marginal probability distributions, Properties of expectation and variance with proofs.	[7]
<b>Unit 2: Theoretical Probability Distributions</b>	[7]



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<b>Unit 4: Linear Regression Analysis</b> Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Coefficients of regression, Properties of regression coefficient.	[6]
<b>Unit 5: Applied Statistics</b> Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and Exponential curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.	[7]
<b>Unit 6: Queuing Theory</b> Introduction, Queuing systems, The input or arrival pattern, The service pattern and service discipline, Notation, Performance measures, Little's formula, Relation between the probabilities of states, M/M/1/∞ systems, Examples.	[7]

**Reference/Text books:-**

1. **Kishor S. Trivedi**, Probability, Statistics with Reliability, Queuing and Computer Science Applications, *Wiley India Pvt. Ltd, 2nd Edition, 2001.*
2. **Vijay K. Rohatgi, A. K. Md. Ehsanes Saleh**, An Introduction To Probability And Statistics, *Wiley Publication, 2nd Edition, 2001.*
3. **S. C. Gupta**, Fundamentals of Statistics, *Himalaya Publishing House, 7th Revised and Enlarged Edition, 2016.*
4. **G. V. Kumbhojkar**, Probability and Random Processes, *C. Jammadas and Co., 14th Edition, 2010.*
5. **Erwin Kreyszig**, Advanced Engineering Mathematics, *9th Edition, John Wiley & Sons, 2006.*
6. **Veerarajan T.**, Engineering Mathematics (for semester III), *Tata McGraw-Hill, New Delhi, 2010.*
7. **G. Haribaskaran**, Probability, Queuing Theory and Reliability Engineering, *Laxmi Publications, 2nd Edition, 2009.*
8. **Murray Spiegel, John Schiller, R. ALU Srinivasan**, Probability and Statistics, *Schaum's Outlines, 4th Edition, 2013*



  
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**S.Y. (ARTIFICIAL INTELLIGENCE & DATA SCIENCE) Semester IV**

<b>AD402</b>	<b>PCC</b>	<b>Database Technologies</b>	<b>3-0-0</b>	<b>3 Credits</b>
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<b>Teaching Scheme:</b>	<b>Examination Scheme:</b>
Lecture: 3hrs/week	CA1: 10 Marks CA2: 10Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

**Pre-Requisites:** Knowledge of MS-Access

**Course Outcomes:** At the end of the course, students will be able to:

CO1	Build conceptual data model using Entity Relationship Diagram
CO2	Construct normalize database schemas
CO3	Make use of SQL commands to develop database
CO4	Apply triggers on database and develop procedure and function using PL/SQL.
CO5	Demonstrate database administration skills
CO6	Demonstrate NOSQL Database for applications

**Mapping of course outcomes with program outcomes**

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1									1		1
CO2	2	1	1	1				1		1				1	
CO3	1	1	2					1		2			1		
CO4	1	2	2	1				1		1				1	
CO5	2	2	2		1			1		1				1	1
CO6	2	2	2		1					1				-	1

**Course Contents:**

<p><b>Unit 1: Introductory concepts of DBMS</b></p> <p>Introduction and applications of DBMS, types of Data, Data Independence, Database System architecture and view levels, Mappings cardinalities, Database users and DBA roles ,Structure of relational databases, Domains, Entity-Relationship model, Basic concepts, Design process, constraints, Keys, Design issues, E-R diagrams, weak entity sets, extended E-R features – generalization, specialization, aggregation, reduction to E-R database schema.</p>	[5]
<p><b>Unit 2: Relational Database Design</b></p> <p>The purposes of Normalization, Data Redundancies and Update Anomalies, Functional Dependencies-types of functional dependency, closure of set of functional dependency, canonical cover, The Process of Normalization, First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form, Fourth Normal Form, Fifth Normal Form.</p>	[6]



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<b>Unit 4:PL/SQL Programming</b> Introduction of PL/SQL, The PL/SQL block structure, PL/SQL execution environment, PL/SQL Data types, Variables, Constants. Control structure: Conditional control, Iterative control, Sequential control. Exception handling: Predefined Exception, User defined Exception. Cursors: Implicit and Explicit cursors, Declaring, Opening and Closing a cursor, Fetching a Record from cursor, Cursor for loops, parameterized cursors. Procedures, Functions, Database Triggers	[8]
<b>Unit 5: Transaction management and Concurrency control</b> Transaction concept, A simple transaction model, ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks),Time stamping model, Recovery systems- Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, checkpoint, Shadow paging.	[6]
<b>Unit 6:NoSQLProgramming</b> Introduction to NoSQL Database, Types and examples of NoSQL Database- Key value store, document store, graph, Performance, Distribution Models, Structured verses unstructured data, Comparative study of SQL and NoSQL, NoSQL Data Models, MapReduce Case Study-unstructured data from social media.	[5]


**Text Books**

1. Abraham Silberschatz, Henry F Korth, S Sudharshan, Database System Concepts, 6th Edition, McGraw-Hill International Edition, 2011.
2. Pramod J. Sadalage, Martin Fowler, "NoSQL Distilled-A Brief Guide to the Emerging World of Polyglot Persistence", Pearson Education, Inc-2013.

**Reference Books:**

1. Date CJ, Kannan A, Swamynathan S, An Introduction to Database System , 8th Edition, Pearson Education-2006.
2. Raghu Ramakrishna, Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw Hill, 2003.
3. Ramez Elmasri, Durvasul VLN Somyazulu, Shamkant B Navathe, Shyam K Gupta, Fundamentals of Database Systems, 4th Edition, Pearson Education, 2006.
4. Dan Sullivan, "NoSQL For Mere Mortals", Addison-Wesley Professional, 06-Apr-2015.



  
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S.Y. (ARTIFICIAL INTELLIGENCE & DATA SCIENCE) Semester IV

AD403	PCC	Java Programming	3-0-0	3 Credits
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<b>Teaching Scheme:</b> Lecture: 3hrs/week	<b>Examination Scheme:</b> CA1: 10 Marks CA2: 10Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks
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**Pre-Requisites:** Basic programming skills(C/C++)

**Course Outcomes:** At the end of the course, students will be able to:

CO1	Develop programs using object-oriented methodology in java.
CO2	Apply concept of inheritance for code reusability.
CO3	Develop program using multithreading.
CO4	Implement exception handling.
CO5	Develop programs for handling I/O and file streams.
CO6	Develop programs using graphics and applets.

**Mapping of course outcomes with program outcomes**

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	1	-	-	-	-	-	-	-	1	1	1
CO2	2	1	2	1	1	-	-	-	-	-	-	-	1	1	2
CO3	1	1	2	-	1	-	-	-	-	-	-	-	1	1	1
CO4	1	2	2	1	-	-	-	-	-	-	-	-	1	2	
CO5	2	2	1	1	1	-	-	-	-	-	-	-	1	2	1
CO6	2	2	1	1	1	-	-	-	-	-	-	-	1	2	1

**Course Contents:**

<p><b>Unit 1: Basic Syntactical Constructs In Java</b></p> <p>Java features and java programming environment define class; create object and accessing members, java tokens, data types, constants. Variables dynamic initialization array string type casting etc. Operators, expression Operator precedence, evaluation of expression, mathematical functions. Decision making and looping – If, If-Else, nested If-Else. Switch case Conditional operator, While loop, do-while loop, for loop, Continue, return keywords, nesting loops.</p>	[6]
<p><b>Unit 2: Derived Syntactical Construct In Java</b></p> <p>Constructors and Methods, Types of constructors, Nesting of Methods, This keyword, command line argument. garbage collection, finalize() method, object Class .Visibility control –private, public and protected. Friendly private protected access, default, Examples of visibility control, Arrays and Strings – types</p>	[6]





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<p><b>Unit 4: Exception Handling and Multithreading</b> Errors and Exception, types of errors Try, catch, nested try catch Throws, finally statement, build-in exception , creating own exception Examples of exception handling ,Multithreaded programming – Creating threads – using extending thread class and runnable interface, Thread life cycle – wait(),notify(),sleep(),suspend(),stop(). Thread exceptions, thread priority, methods Thread synchronization, thread communication, deadlock</p>	[6]
<p><b>Unit 5: Managing Input Output Files In Java</b> Introduction and concept of stream, stream classes, Byte stream classes, input stream classes, output stream classes Examples of file handling using stream classesCharacter stream classes Using File IO Class: IO exceptions, creation of files, reading and writing filesHandling primitive data types Examples of handling primitive data types</p>	[6]
<p><b>Unit 6: Graphics in Java</b> Introduction to applet-Applet, Applet Life Cycle.Example of Applet life cycle, html parameters and embeddingApplet Graphics Programming – Classes, Line, Examples of graphic programming using Rectangles, circles,Examples of graphic programming using , arcs, polygons.Colors and Fonts- Examples of color settings-setcolor(),getcolor(),setforeground() etc. Font Class- variables, methods, graphics class environment, Examples of graphic programming using Font methods.</p>	[6]

**Reference Books:**

1. The completeReference Java Herbert ScheildtTMH
2. Computer Programming in JAVA Junaid Khateel &Dr. G. T. Thampi DreamTechPress
3. Core JAVA for Beginners Sharnam Shah &VaishaliShah SPD
4. Programming in JAVAprimer E BalagurusamyTMH
5. ProgramminginJAVA Sachin Malhotra, Saurabh Chaudhary Oxford UniversityPress



  
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**S.Y. (ARTIFICIAL INTELLIGENCE & DATA SCIENCE) Semester IV**

AD404	PCC	Data Communication and Networking	3-0-0	3 Credits
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<b>Teaching Scheme:</b> Lecture: 3 hrs/week	<b>Examination Scheme:</b> CA1: 10 Marks CA2: 10Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks
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**Pre-Requisites:** Knowledge of MS-Access

**Course Outcomes:** At the end of the course, students will be able to:

CO1	Introduce the concepts of data communication.
CO2	Learn Data Communication Methods and Algorithm.
CO3	Introduce the layered model of the internet and its components.
CO4	Provide in-depth knowledge of physical layer and data link layer technologies.

**Mapping of course outcomes with program outcomes**

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1									1		1
CO2	2	1	2	1										1	
CO3	1	1	2										1		
CO4	1	2	2	1										2	

**Course Contents:**

<b>Unit 1: Introduction:</b> Data communication, networks, internet, protocols and standards, network models: OSI, TCP/IP, analog and digital data, periodic analog signal, digital signal, transmission impairments, data rate limits, performance. Signal conversion: digital-to-digital, analog-to digital, analog-to-analog, digital-to-analog conversion.	[6]
<b>Unit 2: Bandwidth Utilization and Transmission Media:</b> Multiplexing spread spectrum, guided media and unguided media.	[6]
<b>Unit 3: Switching:</b> Circuit switched networks, datagram networks, virtual circuit networks, structure of switch. Error Detection and Correction: Types of errors, redundancy, detection vs correction, fec vs retransmission, coding, modular arithmetic, block coding, linear block codes, cyclic codes, checksum, hamming code.	[6]
<b>Unit 4: Data Link Control:</b> Framing, flow control and error control protocols, protocols: stop-and-wait, go-back-n, selective-repeat, piggybacking, HDLC, PPP.	[6]
<b>Unit 5: Medium Access, Ethernet and LAN:</b> Random access: ALOHA, CSMA, CSMA/CD, CSMA/CA, controlled access, channelization, IEEE standards, different Ethernets, connecting devices, backbone networks, VLAN.	[6]



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**Text Books:**

1. Data Communications and Networking, B. A. Forouzan, 4 th Edition, TMH,2009,ISBN-13-9780070634145.
2. Computer Networks, A. S. Tanenbaum, 4 th Edition, Pearson Education, 2005,ISBN-8177581651.
3. Computer Networks: A Systems Approach, Larry L. Peterson, 5 th Edition, Morgan Kaufmann Publishers, 2011, ISBN- 9789380501932.

**Reference Books:**

1. 802.11 Wireless Networks: The Definitive Guide, Matthew S. Gast, 2 nd Edition, O'Reilly,2005, ISBN-13: 978- 0596100520
2. Communication networks- Fundamental concepts and key architectures, Alberto, LeonGarcia, 2 nd edition, TMH, 2004, ISBN-9780070595019.
3. Computer Networking - A Top-Down Approach featuring the Internet, James F. Kurose, 6 th Edition, Pearson Education, 2009, ISBN-13:978-0132856201.
4. Computer and Communication Networks by Nader. F. Mir, 2 nd Edition, Pearson Prentice Hallpublishers, 2010, ISBN-13: 978-0-13-381474-3.



  
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**S.Y. (ARTIFICIAL INTELLIGENCE & DATA SCIENCE) Semester IV**

**Elective 1**

AD405A	PEC	R Programming	3-0-0	3 Credits
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<b>Teaching Scheme:</b> Lecture: 3 hrs/week	<b>Examination Scheme:</b> CA1: 10 Marks CA2: 10Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks
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**Pre-Requisites:** Knowledge of MS-Access

**Course Outcomes:** At the end of the course, students will be able to:

CO1	Understand the basics in R programming in terms of constructs, control statements, string Functions
CO2	Understand the use of R for Big Data analytics
CO3	Learn to apply R programming for Text processing
CO4	Able to appreciate and apply the R programming from a statistical perspective
CO5	Demonstrate data interfacing with different files
CO6	Analyze fundamentals of R charts and graphs

**Mapping of course outcomes with program outcomes**

Course Outcomes	Program Outcomes									PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9						
CO1	2	1	1	1	2			1					1		1
CO2	2	1	2	1	1			1						1	
CO3	1	1	2		1			1					1		
CO4	1	2	2	1	1			1						2	
CO5	2	2	1		1			1						2	1
CO6	2	1	1	1	1			1					1		1

**Course Contents:**

**Unit 1: Introduction:**

Introducing to R – R Data Structures – Help functions in R – Vectors – Scalars – Declarations – recycling – Common Vector operations – Using all and any – Vectorized operations – NA and NULL values – Filtering – Vectorised if-then else – Vector Equality – Vector Element names

[6]

**Unit 2: Matrices, Arrays and Lists**

Creating matrices – Matrix operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns – Vector/Matrix Distinction – Avoiding Dimension

[6]



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<b>Unit 3: Data Frames</b>  Creating Data Frames – Matrix-like operations in frames – Merging Data Frames – Applying functions to Data frames – Factors and Tables – factors and levels – Common functions used with factors – Working with tables - Other factors and table related functions - Control statements – Arithmetic and Boolean operators and values – Default values for arguments - Returning Boolean values – functions are objects – Environment and Scope issues – Writing Upstairs - Recursion – Replacement functions – Tools for composing function code – Math and Simulations in R	[6]
<b>Unit4: OOP</b>  S3 Classes – S4 Classes – Managing your objects – Input/output – accessing keyboard and monitor – reading and writing files – accessing the internet – String Manipulation – Graphics – Creating Graphs – Customizing Graphs – Saving graphs to files – Creating three-dimensional plots	[6]
<b>Unit5: Interfacing</b>  Interfacing R to other languages – Parallel R – Basic Statistics – Linear Model – Generalized Linear models – Non-linear models – Time Series and Auto-correlation – Clustering	[6]
<b>Unit – 6 R Charts and Graphs</b>  R - Pie Charts, R - Bar Charts, R – Boxplots, R – Histograms, R - Line Graphs, R – Scatterplots.	[6]

**Text Books:**

1. Norman Matloff "The Art of R Programming: A Tour of Statistical Software Design" Publication: No Starch Press, 2011
2. Jared P. Lander "R for Everyone: Advanced Analytics and Graphics" Publication: Addison-Wesley Data & Analytics Series, 2013.

**Reference Books:**

1. Mark Gardener " Beginning R – The Statistical Programming Language" Publication: Wiley, 2013
2. Robert Knell "Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R" Publication: Amazon Digital South Asia Services Inc, 2013



  
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**S.Y. (ARTIFICIAL INTELLIGENCE & DATA SCIENCE) Semester IV**

**Elective 2**

<b>AD405B</b>	<b>PEC</b>	<b>Information Security</b>	<b>3-0-0</b>	<b>4 Credits</b>
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<b>Teaching Scheme:</b> Lecture: 3 hrs/week	<b>Examination Scheme:</b> CA1: 10 Marks CA2: 10Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks
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**Pre-Requisites:** Knowledge of Operating System

**Course Outcomes:** At the end of the course, students will be able to:

CO1	Identify security needs.
CO2	Apply cryptographic technics in programs
CO3	To understand authorization and authentication.
CO4	Apply security in networks

**Mapping of course outcomes with program outcomes**

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	2	1	1	1	2			1					1		1
CO2	2	1	2	1	1			1						1	
CO3	1	1	2		1			1					1		
CO4	1	2	2	1	1			1						2	

**Course Contents:**

<b>Unit 1: Introduction to Information Security:</b> Attacks, Vulnerability, Security Goals, Security Services and mechanisms, Understand and apply concepts of confidentiality, integrity and availability. Evaluate and apply security governance principles. Alignment of security function to businessstrategy, goals, mission, and objectives, Organizational processes (e.g., acquisitions,divestitures, governance committees), Organizational roles and responsibilities, Security control frameworks, Due care/due diligence	[6]
<b>Unit 2 Conventional Cryptographic Techniques :</b> Conventional substitution and transposition ciphers, One-time Pad, Block, cipher and Stream Cipher, Steganography	[6]
<b>Unit 3 Symmetric and Asymmetric Cryptographic Techniques:</b> DES, AES, RSA algorithms	[6]
<b>Unit 4 Authentication and Digital Signatures :</b> Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos	[6]





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**Reference Books:**

1. Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education
2. Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall.
3. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall.



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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester IV**

<b>AD405C</b>	<b>PEC</b>	<b>LISP</b>	<b>3-0-0</b>	<b>3 Credits</b>
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<b>Teaching Scheme:</b> Lecture: 3 hrs/week	<b>Examination Scheme:</b> CA1: 10 Marks CA2: 10Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks
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**Pre-Requisites:** Basic Logic, Set, Graph related concept I

**Course Outcomes:** At the end of the course, students will be able to:

<b>CO1</b>	To understand basic commands, Predicates, macro and function
<b>CO2</b>	To understand Recursion and I/O commands, List and arrays and other data structure
<b>CO3</b>	To understand search tools
<b>CO4</b>	To understand Macros, lexical scoping, lexical closures.
<b>CO5</b>	Write programs using pattern matching logic
<b>CO6</b>	Write object-oriented programming code

Course Outcomes	Program Outcomes														
	P O 1	PO 2	PO 3	P O 4	PO 5	PO 6	PO 7	P O 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1	1	1	-	-	-	-	-	-	-	1	1	1	-
CO 2	2	1	2	1	-	-	-	-	-	-	-	1	1	-	1
CO 3	1	1	1	1	1	-	-	-	-	-	-	1	-	1	1
CO 4	2	1	2	2	2	-	-	-	-	-	-	1	-	-	-
CO 5	2	2	2	1	2	-	-	-	-	-	-	2	1	1	1
CO 6	1	1	1	1	1	-	-	-	-	-	-	1	-	1	1

<b>Unit I-Lisp Introduction</b> Atoms, lists, S-expressions, functions, lambdas, predicates, conditionals, recursion, iteration, printing, reading, properties, a-lists.	[6]
<b>Unit – II - Search: The General Problem Solver</b> Means-ends analysis, defining operators, blocks-world planning, Successor Function	[6]



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<b>Unit – IV - Advanced LISP</b> Macros, lexical scoping, lexical closures, special variables, dynamic scoping, multiple values. Consing, destructive functions, and garbage collection. Interning symbols. Caching. Delaying computation. Avoiding unnecessary consing.	[6]
<b>Unit V - Logic Programming</b> Unification pattern matching. Backward chaining inference. Prolog. Writing programs in logic. Writing rules for efficient deduction.	[6]
<b>Natural Language</b> Syntactic parsing with a phrase-structure grammar. Using caching to improve parsing. Semantic and case-frame analysis. Using semantic constraints to resolve ambiguity.	[6]
<b>Unit -VI -Object Oriented Programming in LISP</b> CLOS: Common Lisp Object System. Classes, generic functions, and inheritance.	[6]

**Textbooks:**

ANSI Common Lisp by Paul Graham. It is published by Prentice Hall, 1996. ISBN 0-13-370875-6 (First Edition)

Course notes and other materials will be made available through the course website:  
<http://www.cs.rpi.edu/courses/fall98/lisp/>. Check back there frequently.



  
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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester IV**

<b>AD406</b>	<b>PEC</b>	<b>Database Technology Laboratory</b>	<b>0-0-2</b>	<b>1 Credits</b>
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<b>Teaching Scheme:</b>	<b>Examination Scheme:</b>
Practical: 2hr/week	CA1: 15 Marks CA2: 15Marks Practical and Oral Exam:--20 Marks

**Practical List:**

1. Draw ER model for Bank/ Employee data management/College management.
2. Use DDL commands to design schema for Bank/Employee data management/College management using integrity constraints.
3. Use DML commands and Apply SQL operators to queries.
4. Write SQL queries for implementing functions, sub queries.
5. Execute the queries for implementation of Joins and create views.
6. Set transaction controls for schemas.
7. Write the basic PL/SQL Programs using control structures.
8. Write PLSQL code for functions/procedures, triggers and cursors.
9. Perform backup and recovery operations on database.
10. Create collections and documents in MongoDB using command line



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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester IV**

AD407	PEC	Java Programming Laboratory	0-0-2	1 Credits
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Teaching Scheme:	Examination Scheme:
Practical: 2hr/week	CA1: 15 Marks CA2: 15Marks Practical and Oral Exam:--20 Marks

**Practical List:**

1	Setup java programming environment by using: a) CommandPrompt b) Any IDE(Eclipse, Jcreateoretc.)
2	Test the IDE setup by implementing small program.
3	Develop program to demonstrate use of IF statement and its different forms.
4	Develop programs to demonstrate use of a) Switch Casestatement b) ConditionalIf(?:)
5	Develop programs to demonstrate use of looping statement 'for'
6	Develop programs to demonstrate use of 'while' , 'do while'
7	Develop program for implementation of implicit type casting in Java Part I
8	Develop program for implementation of implicit type casting in Java Part II
9	Develop program for implementation of explicit type conversion in Java
10	a) Develop program for implementation of constructor. b) Develop program for implementation of multiple constructors in a class.
11	Develop program for implementation of different functions of String Class Part I
12	Develop program for implementation of different functions of String Class Part II
13	Develop program for an implementation of arrays in java.
14	Develop program for an implementation of vectors in java.
15	Develop program for an implementation of wrapper class to convert object into primitive.
16	Develop program for an implementation of wrapper class to convert primitive into objects.
17	Develop program which implements concept of overriding
18	Develop program which implements single and multilevel inheritance.
19	Develop program which implements multiple inheritances.
20	Develop a program to import different classes in package



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27	Develop program for implementation of throw, throws clause Part II
28	Develop minimum two basic applets. Display output with applet viewers and graphics. a) Develop program on basicapplet. b) Develop a program using control loops inapplets
29	Write a program to create animated shape using graphics and applets. a) Line andRectangles b) Circles andEllipse c) Arcs d) Polygons with fillPolygonmethods
30	Develop a program to draw following shapes, graphics and applets a) Cone b) Cylinders c) Cube d) Square inside a circle e) Circle inside a square
31	Develop a program to implementation of I/O stream classes
32	Develop a program to implementation of File stream classes



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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester IV**

AD408	PEC	Data Communication And Networking Laboratory	0-0-2	1 Credits
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<b>Teaching Scheme:</b> Practical: 2hr/week	<b>Examination Scheme:</b> CA1: 15 Marks CA2: 15Marks Practical and Oral Exam:--20 Marks
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**Experiment List**

1 Design a Wired LAN using line tester, configuration machine using IP addresses, testing using PING utility and demonstrate the PING packets captured traces using Wireshark Packet AnalyzerTool.
2 Implement a Program with following four options to transfer a. Characters separated by space b. One Strings at a time c. One Sentence at a time d. file between two RS 232D or USB ports using C/C++. (To demonstrate Framing, Flow control, Error control).
3 Implement a program for error detection and correction using Hamming Codes or CRC Experiment 4 Implement a program to simulate Go back N and Selective Repeat Modes of Sliding Window Protocol
5 Implement a program to demonstrate sub netting and find the subnet masks.
6 Implement a program to simulate the behavior of link state routing protocol to find suitable path for transmission.
7 Implement a program using TCP socket for wired network for following a. Say Hello to each other b. File transfer
8 Implement a program for DNS lookup. Given an IP address input, it should return URL and vice versa.
9 Install and configure DHCP server and write a program to install the software on remote machine.
10 Study of any network simulation tools.- To create a network with three nodes and establish a TCP connection between node 0 and node 1 such that node 0 will send TCP packet to node 2 via node 1
11 Configure RIP/OSPF/BGP using packet Tracer.



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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester IV**

<b>AD409A</b>	<b>PEC</b>	<b>R Programming Laboratory</b>	<b>0-0-2</b>	<b>1 Credits</b>
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<b>Teaching Scheme:</b> Practical: 2hr/week	<b>Examination Scheme:</b> CA1: 15 Marks CA2: 15Marks Practical and Oral Exam:--20 Marks
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**Practical List**

Lab1 : Introduction to R and RStudio , Installing R and R Studio (Linux& Windows) Lab 2: Getting started with loops and vectors -Create vectors.
Lab 3 : Perform vector indexing and slicing.
Lab 4: Creating matrices – Matrix operations – Applying Functions to Matrix Rows and Columns. Lab 5 :Creating lists – General list operations
Lab 6: Creating Data Frames – Matrix-like operations in frames – Merging Data Frames Lab 7 :S3 Classes – S4 Classes – Managing your objects – Input/Output
Lab 8: Math and Simulations in R Lab 9: Creating a JSON file
Lab 10 :Create a connection between R and MySql
Lab 11 : Create visualization in R -Line Graph and Histogram



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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester IV**

<b>AD409B</b>	<b>PEC</b>	<b>Information SecurityLaboratory</b>	<b>0-0-2</b>	<b>1 Credits</b>
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<b>Teaching Scheme:</b> Practical: 2hr/week	<b>Examination Scheme:</b> CA1: 15 Marks CA2: 15Marks Practical and Oral Exam:--20 Marks
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**List of experiments:**

01 Implement CeaserCipher
02 Implement Affine Cipher with equation $c=3x+12$
03 Implement Playfair Cipher with key entered by user.
04 Implement polyalphabeticCipher
05 Implement AutoKey Cipher 06 Implement Hill Cipher.
07 Implement Rail fence technique
08 Implement Simple Columner Transposition technique
09 Implement Advanced Columner Transposition technique. 10 Implement Simple RSA Algorithm with small numbers. 11 Implement Simplified DES
12 Make a study of one IDS (For ex. Snort)



  
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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester IV**

AD409C	PEC	LISPLaboratory	0-0-2	1 Credits
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<b>Teaching Scheme:</b> Practical: 2hr/week	<b>Examination Scheme:</b> CA1: 15 Marks CA2: 15Marks Practical and Oral Exam:--20 Marks
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### Experiment List

1. Development of Composite RotationMatrix.
2. Develop and arm matrix for Adept-1 SCARARobot.
3. Inverse Kinematics for Adept-I SCARARobot.
4. Eight QueenProblem.
5. Graph Structures andPaths.
6. Wumpus world problem.
7. Water Jug Problem.
8. KnightisTour.
9. Crypto ArithmeticProblems.
10. Implementing Searchingalgorithm.
11. Implement Breadth first search algorithm for Romanian mapproblem.
12. Implement Iterative deep depth first search for Romanian mapproblem.
13. Implement A* search algorithm for Romanian mapproblem.
14. Implement recursive best-first search algorithm for Romanian map problem.
15. Implement decision tree learning algorithm for the restaurant waiting problem.
16. Implement feed forward back propagation neural network learning algorithm for the restaurant waiting problem.



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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester IV**

<b>PRJ03</b>	<b>PROJ</b>	<b>Mini Project III</b>	<b>0-0-1</b>	<b>1 Credits</b>
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<b>Teaching Scheme:</b>	<b>Examination Scheme:</b>
Lecture: -- Practical: 2hr/week	CA1: 25 marks CA1: 25 marks ESE: --

**Pre-Requisites:** Basic knowledge of Communication skills (LSRW)

**Course Outcomes:** At the end of the course, students will be able to:

CO1	Acquire practical knowledge within the chosen area of technology for project development
CO2	Identify, analyze and handle programming projects with a comprehensive and systematic approach
CO3	Contribute as an individual or in a team in development of technical projects
CO4	Develop effective communication skills for presentation of project related activities
CO5	Formulate and propose a plan for creating a solution for the problem identified

**Course Content:**

The mini-project should be undertaken preferably by a group of 4 students who will jointly work and implement the mini-project. The group will select a project with the approval of the guide. A batch of practical / Tutorial will be divided into mini project groups. Mini project topics and the work for these groups in the batch will be guided by a teacher for the batch, preferably on one of the topics like Compiler Construction, Database Engineering, Operating System, Computer Graphics and Multimedia, Advanced Programming and latest developments and trends in Computer Science and Technology. The teacher will periodically assess the performance of individual student in the mini project, jointly with a teacher of another batch. Project group will submit hardcopy project report along with project demonstration software in CD and/or project hardware gadget at the term end.



  
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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester IV**

<b>MDC01</b>	<b>MC</b>	<b>Constitutions of India</b>	<b>1-0-0</b>	<b>Audit</b>
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<b>Teaching Scheme:</b>	<b>Examination Scheme:</b>
Lecture:-1hr/week	CA1:25marks CA1:25 marks

### **Constitution of India – Basic features and fundamental principles**

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state.

### **Course content**

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India





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11. Emergency Provisions : National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21.



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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester IV**

<b>HMS03</b>	<b>HSMC</b>	<b>Aptitude Skill- II</b>	<b>1-0-0</b>	<b>Audit</b>
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<b>Teaching Scheme:</b>	<b>Examination Scheme:</b>
Lecture: 1 hrs/week Tutorial: NA Practical: NA	CA1:25marks CA1:25 marks

**Pre-Requisites:** Communication Skills, Aptitude Skill- I

Group A

**Verbal Ability (12Hrs) (Compulsory)**

**Course Objectives:**

1	To study basics of sentences and its structure
2	To study the tenses and its use in daily life
3	To study the basics of speeches and voices
4	To study the basic concepts of modal verbs
5	To study the different Phrases, Idioms and Proverbs
6	To build the vocabulary for day to day life

**Course Outcomes:** At the end of the course, students will be able to:

1	Understand basic concepts of sentences and its structure
2	Understand the tenses and its use in daily life
3	Explain basic uses of speeches and voices in day to day life
4	Understand the use of modal verbs in sentence construction
5	Summarize various Phrases, Idioms and Proverbs
6	Summarize different words used in daily life

Mapping of course outcomes with program outcomes

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2													2
CO2	2													2
CO3	1					1								2
CO4	2													2
CO5						1		1		2				2
CO6						1		1		2				2



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<b>Course Contents:</b>	
<b>Unit1:EnglishGrammar</b> Structure and Types of Sentences, Conditional Sentences	[2]
<b>Unit2: Tenses</b> Present tense, Past tense, Future tense, Use of Tenses in Sentence forming	[2]
<b>Unit 3: Speeches and Voices</b> Direct and Indirect Speech, Active and Passive Voice	[2]
<b>Unit4: Modal</b> Use of Modal verbs in Sentence Forming, Substitution and Elimination	[2]
<b>Unit 5: Proverbs, Idioms and Phrases</b> Use of Proverbs, Idioms and Phrases in Sentence Construction, Judgment and Inference Sentence	[2]
<b>Unit6: Vocabulary</b> Vocabulary Building in Various Situations	[2]

**Text Books:**

1. Raymond Murphy, Essential English Grammar withAnswers,Murphy
2. Objective General English by R.S. Aggarwal, S Chand Publishing; Revised edition (15March2017)

**Reference Books:**

1. RaoN,D,V,Prasada,Wren&MartinHighSchoolEnglishGrammar andCompositionBook,S. Chand Publishing,2017
2. Murphy, Intermediate English Grammar with Answers, Cambridge University Press;Secondedition



  
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Group B

### Aptitude (12Hrs) (Compulsory)

#### Course Objectives:

1	To study multiplications, squares, square roots, cubes and cube roots to solve aptitude problems
2	To understand the concepts of Number system
3	To study the basics of aptitude skills like percentage, average, ratio and proportion, etc.
4	To study the various speed, time and distance basic concepts
5	To understand the concepts of business aptitude
6	To understand the Concepts of Geometry and Venn diagram in Aptitude

**Course Outcomes:** At the end of the course, students will be able to:

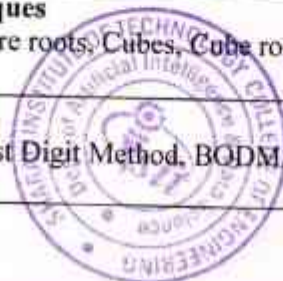
1	Understand speed math techniques to solve aptitude problems
2	Summarize number systems in detail.
3	Explain basic aptitude techniques related to Percentage, Average, Ratio Proportion and Fraction
4	Understand speed, time and distance concepts
5	Summarize the concepts of Business aptitude using basic aptitude
6	Solve the aptitude problems on Geometry and Venn Diagram

#### Mapping of course outcomes with program outcomes

Course Outcomes	Program Outcomes													
	PO 1	PO2	PO3	PO4	PO5	PO 6	PO7	PO 8	PO9	PO 10	PO1 1	PO12	PSO 1	PS O2
CO1	2													
CO2	2													2
CO3	1					1								2
CO4	2													2
CO5						1		1		2				2
CO6						1		1		2				2

#### Course Contents:

<b>Unit 1: Speed Math Techniques</b> Multiplication, Squares, Square roots, Cubes, Cube roots	[1]
<b>Unit 2: Number System</b> Types of Number System, Last Digit Method, BODMAS Calculation, HCF and LCM, Progressions	[2]





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<b>Unit 3:Basic Aptitude</b> Percentage, Average, Ratio and Proportion, Fraction, Partnership	[3]
<b>Unit4:Speed-Time-Distance</b> Speed, Time, and Distance, Trains, Boats, Streams, Races	[2]
<b>Unit5:BusinessAptitude</b> Profit & Loss, Simple Interest, Compound Interest	[2]
<b>Unit 6: Geometry and Venn Diagram</b> 2D and 3D Mensuration, Venn diagram	[2]
<b>Text Books:</b> Arun Shrama - Quantitative aptitudeforCAT. RS Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. Chand Publisher; 2016 edition RS Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Publisher; 2016 edition	
<b>Reference Books:</b> Fast Track Objective Arithmetic Paperback, by Rajesh Verma-2018 Teach Yourself Quantitative Aptitude, Arun Sharma The Pearson Guide To Quantitative Aptitude For Competitive Examination by Dinesh Khattar	



  
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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester IV**

HMS04	HSMC	Language Skill- II	0-0-2	1 Credit
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Teaching Scheme:	Examination Scheme:
Lecture: NA Tutorial: NA Practical: 2 hrs/week	CA1:25marks CA1:25 marks

**Pre-Requisites:** Communication Skills, Language Skill- I

**Languages (Any One)**

### C Programming (Technical Language) (24Hrs)

Syllabus for C Programming

**Course Objectives:**

This course provides an opportunity to enhance acquisition of the fundamental elements of the C programming language. Emphasis is on the progressive development of basic programming syntaxes and essentials used in C programming

**Course Outcomes:** At the end of the course, students will be able to:

1	Illustrate the concept of Function Types, and its type
2	Make use of Structures and Unions.
3	Make use of Pointers
4	Illustrate the concept of File handling in C programming.

Mapping of course outcomes with program outcomes

Course Outcomes	Program Outcomes													
	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	1	0	0	0	1	1	1	0	1	1	2
CO2	1	2	2	1	0	0	0	1	1	1	0	1	1	2
CO3	1	2	2	1	0	0	0	1	1	1	0	1	1	2
CO4	1	2	2	1	0	0	0	1	1	1	0	1	1	2

<b>Unit1: Function</b> Editing, Basic of functions, Types of functions, returning non-integers external variables, scope rules, Recursion Function.	[6]
<b>Unit 2: Structures and Unions</b> Variable Defining a Structure, Advantage of Structure, Size of Structure, Arrays of Structures, Structures and Functions, Defining Unions.	[6]





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<b>Unit3: Pointers</b> Pointers to integers, characters, floats, arrays, structures.	[6]
<b>Unit4: File handling</b> Initializing, Introduction to dynamic memory allocation- Malloc, Calloc, Realloc, Introduction to file management, Opening/Closing a file, Input/ Output operations on Files, Error handling during I/O Operations.	[6]


**Text Books**

1. C Programming Absolute Beginner's Guide, Que Publishing; 3rd edition (22August2013)
2. C Programming Language 2nd Edition, Pearson Publication

**Reference Books**

1. C: The Complete Reference, McGraw Hill Education; 4th edition (1July2017)
2. C Programming in easy steps, 5th Edition, In EasySteps Limited
3. The C Programming Language, Second Edition, By Pearson Education India (1January2015)



  
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### Foreign Languages (Any One)

#### Japanese Language Course I (12Hrs)

#### Course Objectives:

This course is designed to introduce students to the everyday language of Japan. Units will be organized around natural conversational topics, leading students from fundamental aspects of grammar to readings in simple texts. Students will learn vocabulary, expressions, and sentence structures to become able to meet basic communication needs in Japanese. This course comprises all four skills (speaking, listening, reading, and writing) of language.

**Course Outcomes:** At the end of the course, students will be able to:

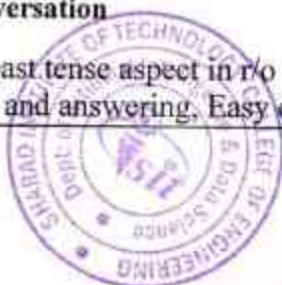
1	Converse in Standard Japanese to perform basic communicative tasks (e.g., exchange greetings/personal information, give time/directions/daily activities)
2	Make use of Japanese vocabulary effectively.
3	Demonstrate reading comprehension

Mapping of course outcomes with program outcomes

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1										1		1		
CO2										1		1		
CO3										2		1		

#### Course Contents:

<b>Unit 1: basic communicative tasks</b> Learning expressions involving “---ni---gaimasu” pattern, Introduction of counters, simple translations, Communicative situations—shopping, Grammar: Introduction of adjectives, na-Adjectives	[4]
<b>Unit2: Communicative situations</b> Time relations, Communicative situations-confirming schedules etc, Particles and their functional use in Japanese sentences, Reading comprehension—a story	[4]
<b>Unit 3: Easy conversation</b> Introduction of past tense aspect in r/o verbs, and adjectives, Communicative situation: asking questions and answering, Easy conversation, Overall revision, and discussion	[4]





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**Text Book:**

1. Nihongo Shoho I (JapanFoundationPubl.)
2. GENKI I: An Integrated Course in Elementary Japanese (English andJapaneseEdition)
3. Japanese for Busy People I: Kana Version (Japanese for Busy People Series)3rdEdition

**Reference Book:**

1. Minna No Nihongo I (3ACorporation,Japan)
2. JapanesefromZero!!:ProvenTechniquetoLearnJapaneseforStudentsandProfessionals6th Edition by GeorgeTrombl



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### Foreign Languages

### German Language Course I (12Hrs)

#### Course Objectives:

Choice Based Soft Skills program offers students a choice to select the course that will meet the requirements of their overall personality development. Particularly this course helps the student in developing and improving his/her literary comprehension skills.

**Course Outcomes:** At the end of the course, students will be able to:

1	Introduce herself or himself in German.
2	Understand alphabets, numbers in German language
3	Make basic and easy sentences required in day to day situations
4	Read, write, speak and listen basic and simple text in German.

#### Mapping of course outcomes with program outcomes

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PS
CO1										0				
CO2										1			1	
CO3										1			1	
CO4										2			1	
										2			1	

#### Course Contents:

<b>Unit1: Introduce oneself</b> Introduction, Greetings, German Alphabets, Numbers (1 -100), Giving and asking Information related to numbers	[3]
<b>Unit 2: Formal and Informal form</b> Difference between Formal and Informal form, Personal Pronouns, verb conjugation	[3]
<b>Unit3: Everyday situations</b> Learning about the things in the classroom, Definite, indefinite, negative articles, Possessive Articles of all the nouns	[3]



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**Unit 4: Simple activities**

Watch timings learning, Routine activities

[3]

**Text Books**

1. Netzwerk Arbetisbuch AIGoyalPublisher.
2. "TheEverythingLearningGermanBook:Speak,WriteandUnderstandBasicGermaninNoTime"byEd Swick
3. "German Made Simple: Learn to Speak and Understand German QuicklyandEasily"

**Reference Books**

1. by Eugene Jackson andAdolphGeiger
2. "Hammer's German Grammar and Usage" (Fifth Edition) by ProfessorMartinDurrell
3. "Learn German with Stories: Café in Berlin" by AndréKlein



  
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**S.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester IV**

IFT01	PROJ	<b>Internship/Field Training</b>	0-0-0	Audit
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Teaching Scheme:	Examination Scheme:
Lecture: NA Tutorial: NA Practical: 2 hrs/week	CA1: -- CA2: -- ESE: 50 Marks

### Course Description

Internship / Training is educational and career development opportunity, providing practical experience in a field or discipline. At the end of the fourth semester, every student should undergo practical training in an industry / professional organization / Research laboratory with the prior approval of the HoD/TPO/Principal of the college and submit the report along with the completion certification from the Industry/ Organization. The report will be evaluated during the fifth semester by the department.

#### Course Learning Outcomes:-

After successful completion of the course, students will be able to

1. Verify the Technical knowledge in real industrial situations.
2. Develop interpersonal communication skills.
3. Discuss activities and functions of the industry in which the Internship/training has done.
4. Write the technical report.

**Prerequisite:** - Basics of (Programme) Engineering, Good written and Oral Communication.

#### Guideline for Students:-

1. Arrive at work as per schedule, ready to work and stay for the agreed upon time.
2. Present yourself in a professional manner at all times, including being appropriately dressed at workplace.
3. Communicate any concerns with your supervisor and the internship/Training coordinator in a timely manner and respectfully.
4. Demonstrate enthusiasm and interest in what you are doing, ask questions and take the initiative as appropriate.
5. Complete and submit assigned tasks by designated timelines. Meet all deadlines.

#### Student's Diary/ Daily Log

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches &



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drawings related to the observations made by the students.
The daily training diary should be signed after every day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor.
Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the SITCOE immediately after the completion of the training. It will be evaluated on the basis of the following criteria:
• Regularity in maintenance of the diary.
• Adequacy & quality of information recorded.
• Drawings, sketches and data recorded.
• Thought process and recording techniques used.
• Organization of the information.
<b>Internship Report</b>
After completing the internship, the student should prepare a comprehensive report to indicate what he/she has observed and learned in the training period. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The competent authority should sign the training report. The Internship report should be evaluated on the basis of following criteria:
i. Originality.
Adequacy and purposeful write-up.
Organization, format, drawings, sketches, style, language etc.
Variety and relevance of learning experience.
v. Practical applications, relationships with basic theory and concepts taught in the course.



*BN*

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**Evaluation of Internship/Training**

The student should be evaluated based on his training report and presentation, before an expert committee constituted by the concerned department as per norms. The evaluation will be based on the following criteria:

- Quality of content presented.
- Proper planning for presentation.
- Effectiveness of presentation.
- Depth of knowledge and skills.
- Attendance record, daily diary, departmental reports shall also be analyzed along with the Internship Report.



  
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