

**THIRD SEMESTER**

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CS301T	Applied Mathematics – III	3	1		4	30	70	100

Course Objectives	Course Outcomes
<p>The aim of this course is</p> <ul style="list-style-type: none"><li>To introduce the essential concepts of Theory of Probability.</li><li>To familiarize the students with concepts in linear algebra and statistics..</li><li>To provide general understanding of cyber security relationship with numbers.</li></ul>	<p><b>Students will be able to</b></p> <ul style="list-style-type: none"><li>To compute with integers modulo <math>n</math>, and understand congruence classes, division algorithms, Euler's theorem, and possibly the Chinese Remainder Theorem</li><li>Identify engineering problems related to Matrices: Eigen value &amp; Eigen vectors &amp; Functions of Matrices.</li><li>Apply various concepts of vector spaces.</li><li>Apply various concepts of joint distribution.</li><li>Use statistical methods and tools in engineering problems.</li></ul>

**Unit I [6Hrs]****Analytic Number theory:**

Eulid's Lemma, Euclidean algorithm, basic properties of congruences, residue classes and complete residue system, Euler Fermat theorem, Lagrange's theorem and its applications, Chienes remainder theorem, primitive roots.

**Unit II [8Hrs]**

**Matrices:** Linear dependence of vectors, Characteristics equation, Eigen values and Eigen vectors, Reduction to diagonal form, Reduction of quadratic form to canonical form by orthogonal transformation, Sylvester's theorem.

**Unit III [6Hrs]**

**Vector Space:** Subspaces, Linear Dependence/Independence, Basis, Dimension, Linear transformation, Range Space and Rank, Null Space and Nullity, Rank nullity theorem, Matrix Representation of a linear transformation, Linear Operators on  $R^n$

**Unit IV [8Hrs]**

**Probability:** Baye's rule, Review of discrete and continuous random variables, Joint probability function of discrete random variable, Marginal probability function and Conditional distribution of discrete random variable, Mathematical expectation of discrete random variable, Variance and Standard deviation, and Covariance of joint distribution.

**Unit V [7Hrs]**

**Statistics:** Multiple regression analysis, Regression equation of three variables, Measures of central tendency, Mean, Median, Mode, Mean deviation, Standard deviation, Testing a hypothesis, Null hypothesis, Alternative hypothesis, t-test, F-test and Chi square test.

**Text Books**

S.N	Title	Authors	Edition	Publisher
1	Linear Algebra and Its Application (Paperback)	Gilbert Strang	2007	Nelson Engineering
2	Higher Engineering Mathematics	B.S. Grewal	40th Edition	Khanna Publication
3	Theory & problems of Probability and Statistics	Murray R. Spiegel		Schaum Series, Mc Graw Hills

**Reference Books**

S.N	Title	Authors	Edition	Publisher
1	Advanced Engineering Mathematics	Erwin Kreyszig	8 <sup>th</sup> Edition	Wiley India
2	Linear Algebra	Seymour Lipschutz etal	3 <sup>rd</sup> Edition	Schaum series.
3	First course in Linear Algebra	Nagpaul,	8 <sup>th</sup> Edition	Wiley Eastern Ltd, New Delhi
4	Higher Engineering Mathematics	H.K Dass & Er. Rajesh	3 <sup>rd</sup> Edition	S. Chand Publication.

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# ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

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## B. Tech. Scheme of Examination & Syllabus 2023-24 COMPUTER SCIENCE & ENGINEERING (CYBER SECURITY)

### THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CS302T	Data Structures	4	-	-	4	30	70	100

Course Objectives	Course Outcomes
<p>This course is intended</p> <ul style="list-style-type: none"> <li>To provide knowledge of basic concepts in data structures and algorithms.</li> <li>To choose the appropriate data structure and algorithm design method for a specified application.</li> <li>To efficiently implement the different data structures and solutions for specific problems</li> </ul>	<p><b>Students will be able to</b></p> <ul style="list-style-type: none"> <li>To understand the basic concept of data structures, time complexity and analyse the various sorting and searching algorithms.</li> <li>To implement dynamic data structures like singly, doubly and circular linked list.</li> <li>Apply the different linear data structures like stack and queue to various computing problems.</li> <li>Implement different types of trees and apply them to problem solution.</li> <li>Demonstrate the representation of graphs and their applications in real life problem and infer the use of symbol tables for hashing and collision resolution.</li> </ul>

#### Unit I

[8Hrs]

**Introduction:** - Concept of Data structures, Time and space analysis of algorithms, Big oh, theta notations and omega notations, Average, best and worst case analysis

**Searching and sorting techniques-** Linear search, Binary search, Indexed search, Insertion sort, selection sort, Bubble Sort, radix Sort, Merge Sort, Quick Sort.

#### Unit II

[8Hrs]

**Linked Lists :** Singly linked list, Implementation of linked list using static and dynamic memory allocation, operations on linked list, polynomial representations and manipulations are using linked list, circular linked list, doubly linked list, Generalized list, sparse matrix, polynomial

#### Unit III

[8Hrs]

**Stack and Queue** - Array representation of stacks, Implementation of stack using linked lists, Queues, Dequeue, Circular queue, Polish notation, Application of stack & queue: Conversion from Infix to Postfix, Evaluation of postfix expressions, Priority Queues

#### Unit IV

[8Hrs]

**Trees:** Basic Terminology, Basic trees, Binary tree representations, threaded storage representation, binary tree traversals, binary search trees, Application of trees, Preliminary treatment of AVL Trees, B-Trees.

#### Unit V

[8Hrs]

**Graphs:** Definition & terminology, Graph representation: matrix representation of Graph, List of structure, other representation of graphs, Breadth First Search, Depth First Search, Spanning trees, Shortest path algorithm, topological sorting.

**Symbol Tables:** static tree tables, dynamic tree tables, hash tables, hash functions, Collision resolution, overflow handling, Applications

#### Text Books

S.N	Title	Authors	Edition	Publisher
1	Fundamentals of Data Structure	Horowitz and Sahani	I	CBS Publications
2	Data Structures using	Tanenbaum	IV	C Pearson Education
3	Data structure and Algorithm	Lafore	II	BPB Publication

#### Reference Books

S.N	Title	Authors	Edition	Publisher
1	Data Structure and Program Design in C	Kruse, Leung and Tondo	I	PHI
2	Schaum's outline: Data Structures	Seymour Lipschutz	IV	Tata Mc Graw Hill
3	An Introduction to DS with applications	Trembley and sorenson	II	Mc Graw Hill

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### THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
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23CS302P	Data Structures Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
<p>This course is intended</p> <ul style="list-style-type: none"><li>To emphasize the application of data structures in developing and implementing efficient programs and algorithm</li></ul>	<p><b>Students will be able to</b></p> <ul style="list-style-type: none"><li>Select appropriate data structures as applied to specified problem definition.</li><li>Implement linear and Non-Linear data structures.</li><li>Implement operations like searching, insertion, deletion and traversing mechanism etc. on various data structures.</li><li>Determine and analyze the complexity of given Algorithms.</li></ul>

Expt. No.	Experiments based on
1	To design and implement basic C program using arrays & structures.
2	To implement a Menu driven program for linear & Binary search methods and demonstrate their constraints.
3	To implement a Menu driven program for Sorting methods and analyze their performances.
4	To implement a Program to demonstrate the working of a stack.
5	To implement a Program to demonstrate the working of a Queue
6	To implement a Program to apply the concepts of linked list
7	To implement the non-linear data structure binary tree
8	To implement BFS and DFS in graph

#### Text Books

S.N	Title	Authors	Edition	Publisher
1	Data Structure and Program Design in C	Kruse, Leung and Tondo	IV	Tata Mc Graw Hill
2	Schaum's outline: Data Structures	Seymour Lipschutz	IV	Tata Mc Graw Hill
3	An Introduction to DS with applications	Trembley and sorenson	IV	Mc Graw Hill

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2	Schaum's outline: Data Structures	Seymour Lipschutz	II	Tata Mc Graw Hill
3	An Introduction to DS with applications	Trembley and sorenson	I	Mc Graw Hill

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## B. Tech. Scheme of Examination & Syllabus 2023-24

### Computer Science & Engineering (Cyber Security)

#### THIRD SEMESTER

Course code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CS303T	Digital Circuits and Fundamentals of Microprocessors	3	1	-	4	30	70	100

Course Objectives	Course Outcomes
<p><b>This course is intended</b></p> <ul style="list-style-type: none"> <li>To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.</li> <li>To impart how to design Digital Circuits.</li> <li>Understand 8086 microprocessor concepts, architecture and programming.</li> </ul>	<p><b>Students will be able to</b></p> <ul style="list-style-type: none"> <li>represent numerical values in various number systems and will demonstrate the knowledge of: logic gates (AND, OR, NAND, NOR, XOR, XNOR), Boolean algebra, DeMorgan's Theorems, Karnaugh map.</li> <li>analyze and design digital combinational circuits</li> <li>analyze and design sequential digital circuits.</li> <li>describe the architecture &amp; organization of 8086 microprocessor along with instruction set format list, describe and use different types of instructions, directives &amp; interrupts and develop assembly language program</li> </ul>

#### Unit I [8Hrs]

**Number Systems & Code Conversion:-** Number Systems & Code conversion, Boolean Algebra & Logic Gates, Truth Tables, Universal Gates, Simplification of Boolean functions, SOP and POS methods –Simplification of Boolean functions using K-maps, Signed and Unsigned Binary Numbers.

#### Unit II [8Hrs]

**Combinational Circuits:-** Combinational Logic Circuits: Adders & Subtractors, Multiplexers, Demultiplexers, Encoders, Decoders, Programmable Logic Devices

#### Unit III [8Hrs]

**Sequential Circuits:-** Sequential Logic Circuits: RS, Clocked RS, D, JK, Master Slave JK, T Flip-Flops, Shift Registers, Types of Shift Registers, Counters, Ripple Counter, Synchronous Counters, Asynchronous Counters, Up-Down Counter.

#### Unit IV [8Hrs]

**Fundamentals of 8086 Microprocessors:-** 8086 microprocessor, Functional Diagram, register organization 8086, Flag register of 8086 and its functions, Addressing modes of 8086, Pin diagram of 8086, Minimum mode & Maximum mode operation of 8086, Interrupts in 8086.

#### Unit V [8Hrs]

**Programming of 8086 Micro-processor:-** Instruction set of 8086, Assembler directives, Procedures and Macros, Simple programs involving arithmetic, logical, branch instructions, Ascending, Descending and Block move programs, String Manipulation Instructions.

#### Text Books

S.N	Title	Authors	Edition	Publisher
1	Digital Design	M. Morris Mano, Michael D.Ciletti	5 <sup>th</sup> Edition	Pearson Education
2	Digital Electronics: Principles, Devices and Applications	Anil K. Maini		John Wiley & Sons, Ltd
3	Microprocessor and Microcontrollers	N. Senthil Kumar, M. Saravanan, S. Jeevanathan		Oxford Publishers

#### Reference Books

S.N	Title	Authors	Edition	Publisher
1	Digital Fundamentals –A Systems Approach	Thomas L. Floyd		Pearson
2	Fundamentals of Logic Design	Charles H. Roth	5 <sup>th</sup> Edition	Cengage Learning
3	Microprocessors and Interfacing.	D.V.Hall	2 <sup>nd</sup> Edition	TMGH

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### Computer Science & Engineering (Cyber Security)

#### THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CS303P	Digital Circuits & Fundamentals of Microprocessor lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
<p><b>This course is intended</b></p> <ul style="list-style-type: none"> <li>● To introduce the basic concepts and laws involved in the Boolean algebra and logic families and digital circuits.</li> <li>● To familiarize with the different logic gates, and combinational and sequential circuits utilized in the different digital circuits and systems.</li> <li>● To introduces basic instruction of microprocessor.</li> </ul>	<p><b>Students will be able to</b></p> <ul style="list-style-type: none"> <li>● Understand the Combinational Circuits using Logic Gates.</li> <li>● Design Arithmetic and Logical Circuits.</li> <li>● Demonstrate understanding of flip-flops &amp; Sequential circuits</li> <li>● Understand the Basic Fundamentals of 8086 Microprocessor</li> </ul>

Expt. No.	Experiments based on
1	To verify the truth table of different logic gates.
2	To study and verify the NAND & NOR gates as universal gates.
3	To study and verify truth table of Half adder and Full Adder.
4	To study and verify truth table of Multiplexer & Demultiplexer.
5	To study and verify truth table of different flip flops.
6	To study and verify 4 bit ripple counter.
7	Write and execute an ALP for addition & Subtraction of two 16 bit numbers.
8	Write and execute an ALP to find 1's complement of 16 bit a number.
9	Write and execute an ALP for sorting of data in ascending order and find largest number in an array.
10	Mini -Project

#### Text Books

S.N	Title	Authors	Edition	Publisher
1	Digital Integrated Electronics	Herbert Taub	1 <sup>st</sup> Edition	McGraw Hill.
2	Digital Logic and Computer Design	Morris Mano	5 <sup>th</sup> Edition	PHI
3	Digital Integrated Electronics	Herbert Taub	2 <sup>nd</sup> Edition	McGraw Hill.

#### Reference Books

S.N	Title	Authors	Edition	Publisher
1	Fundamentals of Logic Design	Charles H. Roth	5 <sup>th</sup> Edition	Cengage Learning
2	Microprocessors and Interfacing.	D.V.Hall	2 <sup>nd</sup> Edition	TMGH

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### COMPUTER SCIENCE & ENGINEERING (CYBER SECURITY)

#### THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CS304T	Information Security Fundamentals	4	-	-	4	30	70	100

Course Objectives	Course Outcomes
This course is intended <ul style="list-style-type: none"> <li>Learn fundamentals of cryptography and its application to network security.</li> <li>Understand network security threats, security services, and countermeasures.</li> <li>Understand vulnerability analysis of network security.</li> </ul>	<b>Students will be able to</b> <ul style="list-style-type: none"> <li>Understand and explain the risks faced by computer systems and networks.</li> <li>Analyse Cryptographic techniques.</li> <li>Identify and analyze security problems in computer systems and networks.</li> <li>Explain how standard security mechanisms work.</li> <li>Understand security mechanisms to protect computer systems and networks.</li> </ul>

**Unit I** [6Hrs]

**Security Fundamentals:**  
Introduction of information Security, Security goals, Security Services and mechanisms, Attacks, Authentication, Authorization, Chipher Techniques : substitution and transposition ciphers, One-time Pad, Block chipher and Stream Cipher.

**Unit II** [8Hrs]

**Cryptography:**  
Symmetric and Asymmetric Cryptographic Techniques : DES, AES, Attacks on DES, Modes of operations, Linear cryptanalysis and differential cryptanalysis, Public key algorithms, RSA, Hash functions- SHA-1, MD5

**Unit III** [8Hrs]

**Key management**  
Generation, Distribution, updation, Digital certificate, X.509 certificates, Digital signatures, Diffie hellman key exchange, One way authentication, Kerberos.

**Unit IV** [8Hrs]

**Network Security**  
Security concerns, Introduction to IPSEC, Tunnel mode, Transport mode, Introduction to handshake protocols, Record layer protocol, Internet Key Exchnage protocol(IKE)

**Unit V** [8Hrs]

**Security in Networks:**  
Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security – PGP,S/MIME

#### Text Books

S.N	Title	Authors	Edition	Publisher
1	Applied Cryptography- Protocols, Algorithms and source code in “c”	Bruice Schneier	II Edition	Wiley India Pvt Ltd
2	Network Security and Cryptography	Bernard Menzees	I Edition	Cengage Learning

#### Reference Books

S.N	Title	Authors	Edition	Publisher
1	Cryptography and Network Security Principal and Practice	William Stalling	-	Pearson edition
2	Cryptography and Network Security	Berouz Forouzan	I	Tata Mc Graw Hill

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**B. Tech. Scheme of Examination & Syllabus 2023-24****COMPUTER SCIENCE & ENGINEERING (CYBER SECURITY)****THIRD SEMESTER**

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23ES301T	Value Education Course-I	2	-	-	2	15	35	50

Course Objectives	Course Outcomes
<b>This course is intended</b>  To develop a holistic perspective through self-exploration and development of clarity about harmony between self, family, society and nature.	<b>Students will be able to</b> <ul style="list-style-type: none"><li>• Demonstrate awareness about concepts like self-exploration &amp; natural acceptance.</li><li>• Understand concepts of aspirations and Happiness.</li><li>• Develop clarity of harmony and health in human being.</li><li>• Discuss concepts of conservation of nature and harmony in nature/existence and re-usability.</li></ul>

<b>Unit I : Introduction to Self-Exploration</b>	[6Hrs]
<ul style="list-style-type: none"><li>• Purpose &amp; motivation for studying universal human values.</li><li>• Self-Exploration-what is it? - Its content and process.</li><li>• 'Natural Acceptance' and Experiential Validation- as the process for self-exploration.</li></ul>	
<b>Unit II: Understanding Happiness and Prosperity</b>	[6Hrs]
<ul style="list-style-type: none"><li>• Understanding Happiness and Prosperity correctly.</li><li>• Continuous Happiness and Prosperity- A look at basic Human Aspirations.</li><li>• Right understanding, Relationship and Physical Facility.</li><li>• Method to fulfill the above human aspirations: understanding and living in harmony at various levels.</li></ul>	
<b>Unit III: Understanding Harmony in human being</b>	[6Hrs]
<ul style="list-style-type: none"><li>• Understanding human being as a co-existence of the sentient 'I' and the material 'Body'.</li><li>• Understanding the needs of Self ('I') and 'Body' - happiness and physical facility.</li><li>• Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer).</li><li>• Understanding the characteristics and activities of 'I' and harmony in 'I'.</li><li>• Understanding the harmony of I with the Body: Sanyam and Health.</li></ul>	
<b>Unit IV: Co-existing with nature</b>	[6Hrs]
<ul style="list-style-type: none"><li>• Understanding the harmony in Nature.</li><li>• Interconnection and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature.</li><li>• Understanding Existence as Coexistence of mutually interacting units in all-pervasive space.</li><li>• Holistic perception of harmony at all levels of existence.</li><li>• Pollution, depletion of resources and role of technology.</li></ul>	

**Text Books**

S.N	Title	Authors	Edition	Publisher
1	Human Values and Professional Ethics	Gaur, Sangal, Bagaria	2010	Excel Books, New Delhi

**Reference Books**

S.N	Title	Authors	Edition	Publisher
1	Jeevan Vidya: Ek Parichaya	A. Nagaraj	1999	Jeevan Vidya Prakashan, Amarkantak
2	Human Values	A.N. Tripathi	2004	New Age Intl. Publishers, New Delhi
3	The Story of My Experiments with Truth	M.K.Gandhi	2009	Fingerprint! Publishers

**Online Resources**

1	<a href="https://fdp-si.aicte-india.org/UHV-II%20Class%20Note.php">https://fdp-si.aicte-india.org/UHV-II%20Class%20Note.php</a>
2	<a href="https://fdp-si.aicte-india.org/UHV-II_Lectures_PPTs.php">https://fdp-si.aicte-india.org/UHV-II_Lectures_PPTs.php</a>

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#### THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
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23CS331M (i)	MDM-I Fundamentals of Network Security	2	-	-	2	15	35	50

Course Objectives	Course Outcomes
<p>This course is intended</p> <ul style="list-style-type: none"> <li>Learn fundamentals of application to network security.</li> <li>Understand network security threats, security services, and countermeasures.</li> <li>Understand vulnerability analysis of network security.</li> </ul>	<p><b>Students will be able to</b></p> <ul style="list-style-type: none"> <li>Understand the network security services mechanism and methodology.</li> <li>Identify and design the various types of network architecture.</li> <li>Identify and analyze the working of firewall and IDS</li> <li>Understand the protocols involved in network security.</li> <li>Understand various types of virus and trusted systems.</li> </ul>
<b>Unit I</b>	<b>[6Hrs]</b>
<p><b>Security Fundamentals:</b> Introduction of Security, Security methodology, The three D's of Security, Five steps to better security, Network security model, Security goals, Security Services and mechanisms, Challenges to Network Security, Attacks,</p>	
<b>Unit II</b>	<b>[4Hrs]</b>
<p><b>Network Architecture Fundamentals:</b> Network Segments &amp; Types, Perimeter Defense, Network Address Translation, Basic Architecture Issues, Subnetting, Switching, and VLANs, Address Resolution Protocol and Media Access control,</p>	
<b>Unit III</b>	<b>[6Hrs]</b>
<p><b>Addressing and Firewall:</b> IP addressing, Classes, Rules for assigning Host ID and Network ID, Firewall: Need of Firewall, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Types of IDS, Responses of Intrusion Detection. Methods and modes of IDS.</p>	
<b>Unit IV</b>	<b>[4Hrs]</b>
<p><b>Network Security</b> Security concerns, Introduction to IPSEC, Tunnel mode, Transport mode, Introduction to handshake protocols, Record layer protocol, Internet Key Exchange protocol(IKE)</p>	
<b>Unit V</b>	<b>[4Hrs]</b>
<p><b>Security in Networks:</b> Trusted System, Viruses and related Threats, Taxonomy of malicious programs, Nature of Virus, Types of Virus, Advanced Antivirus techniques.</p>	

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