



Shri Shamrao Patil (Yadavkar) Educational & Charitable Trust's

Sharad Institute of Technology College of Engineering

(An Autonomous Institute)

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Department: Computer Science Engineering

Rev: Course Structure/01/NEP/2023-24

Class: S.Y. B.Tech.

Semester: III

Sr No	Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
				L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
1	23CS2301	PCC	Mathematics for Computer Science	3		-	3	10	10	30	50	100	3
2	23CS2302	PCC	Data Structure and Its Application	3	-	-	3	10	10	30	50	100	3
3	23CS2303	PCC	Computer Networks	3	-	-	3	10	10	30	50	100	3
4	23CS2304	PCC	Data Structure and Its Application Laboratory	-	-	2	2	15	15	-	20	50	1
5	23CS2305	PCC	Computer Networks Laboratory	-	-	2	2	15	15	-	20	50	1
6	23CS2306	PCC	Web Technology Laboratory	-	-	2	2	15	15	-	20	50	1
7	23CS2307	VEC	Environmental Sciences	2	-	-	2	25	25	-	-	50	2
8	23CS2308	CEP	Mini Project – II	-	-	2	2	25	25	-	-	50	1
9	23CS2309	EEM	Intellectual Property Rights	1	-	-	1	25	25	-	-	50	1
10	23CSMDXX	MDM	Multidisciplinary Minor	2	-	-	2	10	10	30	50	100	2
11	23OECS21	OE	Open Elective I	2	-	-	2	10	10	30	50	100	2
12	23HSSM01	VEC	Aptitude Skills-I	1	-	-	1	25	25	-	-	50	1
13	23HSSM02	VEC	Language Skills-I	-	-	2	2	25	25	-	-	50	1
Total				17	-	10	27	220	220	150	310	900	22

*Open Elective I: Software Testing

Note- Open Elective course will be offered to students of other programs and will not be offered to students of the same program.

Multidisciplinary Minor-

Basket	Agriculture	Management	Healthcare
Course Code, Name	Agriculture Informatics (23CSMDA1)	Fundamentals of Finance and Management (23CSMDB1)	Medical Imaging and Image Processing (23CSMDC1)




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23CS2301	PCC	Mathematics for Computer Science	3-0-0	3 Credits
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Teaching Scheme	Examination Scheme
Lecture 3 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic Logic & Probability, Set, Graph related Concepts

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

CO1	Apply the operations of sets, use Venn diagrams to represent sets and Identify different types of binary relations on the basis of its properties
CO2	Define an argument using logical notation and determine if the argument is valid or invalid
CO3	Identify the appropriate algebraic structure and lattice
CO4	Illustrate and formulate fundamental probability distribution and density functions, as well as functions of random variable.
CO5	Apply different methods to find the correlation between the variables. Develop basic mathematical tools for regression analysis.
CO6	Apply various statistical tests to test the hypothesis.

Course Contents:

Unit 1: Set theory Basic concepts of set theory, Operations on sets, Ordered pairs, Cartesian Products, Representation of discrete structures, Relation and ordering - properties of binary relations in a set, Relation matrix and the graph of a relation, Partition and Covering of set, Equivalence relations, Composition of Binary relations, Partial ordering, POSET and Hasse diagram, Functions – types, composition of functions, Inverse functions.	[6]
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Unit 2: Mathematical logic Statements and Notations, Connectives , Statement formulas and truth tables, well-formed formulas, Tautologies, Equivalence of formulas, Duality law, Tautological implications, functionally complete sets of connectives, other connectives, Normal and principal normal forms, completely parenthesized infix and polish notations, Theory of Inference for statement calculus – validity using truth table, rules of inference.	[6]
Unit 3: Algebraic systems Algebraic systems, properties and examples, Semigroups and Monoids, properties and examples, Homomorphism of Semigroups and Monoids, Groups: Definition and examples, Subgroups and homomorphism.	[6]
Unit 4: Basic Probability Basic concepts of probability, Random variables, Probability distributions, Probability mass function, Probability density function. Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial & Poisson's distributions, Properties of binomial, Poisson and normal distributions.	[6]
Unit 5: Correlation & Linear Regression Analysis Introduction, Types of correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation Coefficient, Probable errors 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]
Unit 6: Testing of Hypothesis Test of significance for Large sample size (z tests) for single mean, difference of means, proportion, difference of proportions, Test of significance for small sample size (t test)	[6]
Textbooks:- 1. Discrete Mathematics Structures with Applications to computer science-J.P.Tremblay & R.Manohar (MGH International) 2. C.L.Liu , Elements of Discrete Mathematics , Mc Graw- Hill Publication, 3 rd Edition , 2008, Kenneth H.Rosen, Discrete Mathematics and its Applications, Mc Graw- Hill Publication, 6 th Edition , 2010	




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3. G. V. Kumbhojkar, Probability and Random Processes, C. Jannadas and Co., 14th Edition, 2010.
4. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010

Reference Boks:

1. Lipschutz, Discrete Mathematics, McGraw-Hill Publication, 3rd Edition, 2009
2. V.K. Balakrishnan, Schaum's Outline of Graph Theory, Mc Graw-Hill Publication, 1st 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.
Dr. Sukhendu Dey, Graph Theory with Application, SPD Publication, 1st Edition, 2012
5. Kishor S. Trivedi, Probability, Statistics with Reliability, Queuing and Computer Science Applications, Wiley India Pvt. Ltd, 2nd Edition, 2001



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23CS2302	PCC	Data Structure and its Application	3-0-0	3 Credits
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Teaching Scheme	Examination Scheme
Lecture:3 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basics of c programming


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

CO1	Interpret the basics of data structure and its application.
CO2	Outline Concepts of stack and queue to solve real-time problems.
CO3	Apply various operations on Linked List.
CO4	Make use of the concepts of Trees and its traversal techniques.
CO5	Examine searching and hashing algorithms.
CO6	Make use of basic terminologies of graph and its representation.

Course Contents:

Unit 1: Introduction to Data Structure Introduction: Basic Terminologies, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. Searching: Linear Search and Binary Search Techniques and their complexity analysis.	[6]
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Unit 2: Stack, Queue Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. Recursion - Factorial, GCD, Fibonacci Sequence, Tower of Hanoi .ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.	[6]
Unit 3: Linked List Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.	[6]
Unit 4: Tree Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, and Application of Binary Trees. Tree variants: AVL Tree, height of an AVL Tree, insertion, deletion of node in AVL Trees, Single and Double rotation of AVL Trees	[6]
Unit 5: Sorting & Hashing Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.	[6]
Unit 6: Graph Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis. Terminology and representation of graphs using adjacency matrix, Wars hall's algorithm and analysis.	[6]
Textbooks:- 1. Thomas Cormen, Introduction to Algorithms, PHIP ublication, 2 nd Edition, 2002. 2. E. Horowitz, S. Sahani, Fundamentals of Data Structures, Galgotia Publication, 1 st Edition, 1983.	




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Reference Books:-

1. Kyle Loudon, Mastering Algorithms with C: Useful Techniques from Sorting to Encryption, O'Reilly Media, 1st Edition, 1999
2. Mark Allen Weiss, Data structures and algorithms analysis in C++, Pearson Education, 4th Edition, 2013.
3. S. Lipschutz, Data Structures, McGraw-Hill Publication, Revised 1st Edition, 2014.
4. Y. Langsam, M. Augenstein, A. Tanenbaum, Data Structure using C and C++, Prentice Hall India Learning Private Limited, 2nd Edition, 1998.
5. Trembley and Sorenson, Introduction to Data Structures, PHI Publication, 2nd Revised Edition, 1983




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23CS2303	PCC	Computer Networks	3-0-0	3 Credits
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Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Nil

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

CO1	Define the basic concepts of computer network.
CO2	Outline the OSI layered architecture.
CO3	Explain the concept of network layer.
CO4	Explain the concept of transport layer.
CO5	Demonstrate the concept of file transfer.
CO6	Apply the concepts of Network security on its applications.

Course Contents:

Unit 1: Fundamentals of Computer Network Definition And Need of Computer Network, Applications, Data communication process and its components, protocols, standards, transmission rate, Modes of data communication, Classification Of Network: LAN, WAN, MAN, Network connecting devices, network topologies.	[6]
Unit 2: OSI Model The OSI model: Layered Architecture, Encapsulation, Layers in OSI Model, introduction to Physical Layer, functions of physical layer, Data Link Layer, services provided by the DLC, Data link layer protocols.	[6]




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Unit 3: Network Layer Network layer services, routing algorithms- Link State Routing algorithm, Distance Vector Routing Algorithm, packet switching, Addressing: Physical Address, Logical Address, Port Address, IP Address-Concept, IPv4 Addressing: Address Space, Classful and Classless Addressing, DHCP, IPv6 addressing and basic structure, IPv4 and IPv6 difference.	[6]
Unit 4: Transport Layer Introduction to transport layer, transport layer services, multiplexing and Demultiplexing, Connectionless transport UDP, UDP segment structure, UDP Checksum, Pipelined reliable data transfer protocols, connection oriented transport.	[6]
Unit 5: File Transfer File transfer, FTP Commands, Electronic Mail in the internet, SMTP, Mail Message format, Mail Access protocol, DNS, Service provided by the DNS, Working of DNS, DNS Records and Messages, Peer-to-Peer Application, P2P File Distribution, Distributed Hash Function, Socket Programming with UDP, Socket Programming with TCP.	[6]
Unit 6: Network Security Overview of network security, classification of network attacks, security methods, Symmetric key Cryptography: Data Encryption Standard (DES), Advance Encryption Standard (AES), And Public key Cryptography: RSA Algorithm, Digital signature, Firewall and packet filtering.	[6]
Textbooks:- 1. Behrouz and Forouzan, Data communication and networking –fourth edition, by McGraw Hill Indian Edition. 2. Andrew S Tanenbaum, computer network, fifth edition, Pearson	




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23CS2304	PCC	Data Structure and its Application Laboratory	0-0-2	1 Credit
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Teaching Scheme	Examination Scheme
Practical: 2 hrs/week	CA I: 15 Marks CA II: 15 Marks Practical Oral Exam: 20 Marks

Pre-Requisites: Basics of C programming

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

CO1	Interpret the basics of data structure and its application.
CO2	Outline Concepts of stack and queue to solve real-time problems.
CO3	Apply various operations on Linked List.
CO4	Make use of the concepts of Trees and its traversal techniques.
CO5	Examine searching and hashing algorithms.
CO6	Make use of basic terminologies of graph and its representation.

Course Contents:

List of Experiments:

1. Design C program to traverse array for inserting and deleting an element.
2. Write program for linear search and Binary search.
3. Design program for stack operations (Push, Pop and Display).
4. Design a program on recursion for Factorial, GCD, and Fibonacci.
5. Write a program for infix to postfix and postfix to infix conversion.
6. Write a program for linear queue operations.
7. Write a program for circular queue operations.




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8. Write a program for singly and doubly Linked list.
9. Design a program for tree traversal in order, preorder and post order.
10. Write a program to create n vertices using adjacency list.
11. Write a program for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort (Any Three).
12. Write a program for search an element using hashing techniques.



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23CS2305	PCC	Computer Networks Laboratory	0-0-2	1 Credit
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Teaching Scheme	Examination Scheme
Practical: 2 hrs/week	CA I: 15 Marks CA II: 15 Marks Practical Oral Exam: 20 Marks

Pre-Requisites: Nil

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

CO1	Define the basic concepts of computer network.
CO2	Outline the OSI layered architecture.
CO3	Explain the concept of network layer.
CO4	Explain the concept of transport layer.
CO5	Demonstrate the concept of file transfer.
CO6	Apply the concepts of Network security on its applications.

Course Contents:

List of Experiments:

1. Analyze the type of network topology used in your lab and prepare technical specifications for it.
2. Connect computer using given topology with wired media.
3. Configure static and dynamic IP addresses.
4. Simulate and understand IP forwarding with a LAN and across a router.
5. Understand the working of connection establishment in TCP using a network simulator.




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6. Run basic utilities and network commands: ipconfig, ping, tracert, netstat, pathping, route.
7. Study how data rate of wireless LAN (IEEE 802.11) network varies as distance between the access point and wireless node is varied.
8. Study the working and routing table format of interior routing protocol i.e. routing information protocol (RIP) and Open shortest path first (OSPF).
9. Write a client server program using TCP/IP socket.
10. Implement encryption & decryption algorithm.



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23CS2306	PCC	Web Technology Laboratory	0-0-2	1 Credit
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Teaching Scheme	Examination Scheme
Practical: 2 hrs/week	CA I: 15 Marks CA II: 15 Marks Practical Oral Exam: 20 Marks

Pre-Requisites: Basics of Programming

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


CO1	Develop web pages using HTML.
CO2	Develop web pages using Cascading Styles sheets.
CO3	Develop a dynamic web pages using JavaScript (client side programming).
CO4	Develop an interactive web applications using HTML, Java Scripts
CO5	Develop a Program using XML.
CO6	Apply Server side technologies for Web development

Course Contents:

List of Experiments:

1. Design web pages for your college containing a description of the courses, departments, faculties, library etc, use href, list tags.
2. Create user Student feedback form (use textbox, text area, checkbox, radio button, select box etc.).
3. Create your resume using HTML tags also experiment with colors, text, link, size and also other tags you studied.
4. Use Inline CSS to format your resume that you created.
5. Use External CSS to format your class timetable as you created.




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6. Use External, Internal, and Inline CSS to format college web page that you created.
7. Develop simple calculator for addition, subtraction, and multiplication and division operation using JavaScript.
8. Create HTML Page that contains form with fields Name, Email, Mobile No, Gender, Favorite Color and a button now write a JavaScript code to combine and display the information in textbox when the button is clicked.
9. Write a program to create a web page using xml.
10. Write a php program to check if number is prime or not.
11. Write PHP Script for storing and retrieving user information from MySQL table.
 1. Design a HTML page which takes Name, Address, Email and Mobile No. From user (register.php).
 2. Store this data in Mysql database / text file.
 3. Next page display all user in html table using PHP (display.php).

Reference Books:-

1. Steven Holzner, "HTML. Black Book", Dreamtech press.
2. Web Technologies, Black Book, Dreamtech Press.
3. Web Applications: Concepts and Real World Design, Knuckles, Wiley-India.
4. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson.




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23CS2307	VEC	Environmental Science	2-0-0	2 Credits
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Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week	CA I: 25 Marks CA II: 25 Marks

Pre-Requisites: Nil

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

CO1	Explain nature of environmental studies
CO2	Explain various natural resources and associated Problems
CO3	Summarize various ecosystems
CO4	Explain the importance of conservation of biodiversity and its importance in balancing the earth.
CO5	Recognize various causes of environmental pollution along with various protection acts in India to limit the pollution
CO6	Interpret the information based on field study and prepare a report.

Course Contents

Unit 1: Nature of Environmental studies Definition, scope and importance, Multidisciplinary nature of environmental studies. Need for public awareness.	[2]
Unit 2: Natural Resources and Associated Problems Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, conflicts over water. Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources.	[6]



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<p>Energy resources: Growing energy needs, renewable and nonrenewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy. Land resources: land degradation, man induced landslides, soil erosion and desertification. Role of individuals in conservation of natural resources.</p>	
<p>Unit 3: Ecosystems</p> <p>Concept of an ecosystem, types of ecosystem, structure and function of an ecosystem, producers, consumer and decomposers. Energy flow in the ecosystem, food chain, food web and ecological pyramids, ecological succession. Different types of ecosystem a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystem</p>	[4]
<p>Unit 4: Biodiversity</p> <p>Introduction-Definition: genetic, species and ecosystem diversity, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Western Ghat as a biodiversity region Hot spot of biodiversity. Threats to biodiversity, man and wildlife conflicts. Conservation of biodiversity. In-situ conservation and Ex-situ conservation.</p>	[4]
<p>Unit 5: Environmental Pollution and Environmental Protection</p> <p>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. Environmental Protection Act. Air (Prevention and Control of pollution) Act. Water (Prevention and Control of pollution) Act. Forest conservation Act. Wildlife Protection Act. Human Rights.</p>	[4]
<p>Unit 6: Field work</p> <p>Visit to a local area to document Environmental assets-River, Forest, and Grassland. Visit to local polluted site. Study of common plants, insects, birds. Study of ecosystem river, ponds etc.</p>	[4]




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Textbooks:-

1. P. N. Wartkar & J. N. Wartkar, 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, New Delhi.
3. C. R. Wylie & L. C. Barrett, Advanced Engineering Mathematics, McGraw Hill Publishing Company Ltd.

Reference Books:-

1. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publications, New Delhi.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
4. Peter O'Neil, a Text Book of Engineering Mathematics, Thomson Asia Pvt. Ltd. Singapore.



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23HSSM01	VEC	Aptitude Skills-I (Numerical Ability)	1-0-0	1 Credit
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Teaching Scheme	Examination Scheme
Lecture: 1 hr/week	CA I: 25 Marks CA II: 25 Marks

Pre-Requisites: Basic Mathematics.

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

CO1	Make use of multiplications, squares, square roots, cubes and cube roots to solve aptitude problems
CO2	Solve questions based on Number system
CO3	Solve questions based on percentage, average, ratio, proportion, Speed, Time and Distance
CO4	Solve questions based on Profit & Loss and mensurations.

Course Contents

Unit 1: Speed Math Techniques Multiplication, Squares, Square roots, Cubes, Cube roots.	[3]
Unit 2: Number System Types of Number System, Last Digit Method, BODMAS Calculation, HCF and LCM, Progressions.	[3]
Unit 3: Basic Aptitude Percentage, Average, Ratio and Proportion, Fraction, Partnership. Speed- Time- Distance	[3]



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Speed, Time, and Distance, Trains, Boats, Streams, Races.	
Unit 4: Business Aptitude Profit & Loss, Simple Interest, Compound Interest Geometry and Venn Diagram 2D and 3D Mensuration, Venn diagram	[3]

Textbooks:-

1. Arun Shrama - Quantitative aptitude for CAT.
2. RS Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. Chand Publisher; 2016 edition

Reference Book:-

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




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23HSSM02	VEC	Language Skills-I	0-0-2	1 Credit
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Teaching Scheme	Examination Scheme
Practical: 2 hrs/week	CA I: 25 Marks CA II: 25 Marks

Pre-Requisites: Basics of Programming.

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

CO1	Develop flowchart and Algorithm to solve the given problem statements
CO2	Develops programs using Data Types and Operators
CO3	Make use of Decision Making and Looping Statements to develop conditional programs
CO4	Make use of Arrays to develop programs in C language

Course Contents

Experiment No.	Name of Experiment	
1	Explain basics of C such as Editing, Compiling, Error Checking, executing, testing and debugging of Programs and Design Algorithms and Flowcharts.	[2]
2	Explain basics of Variable, Data types and operators and develop programs on arithmetic Operators.	[2]
3	Develop programs on Conditional, logical and Bitwise Operators.	[2]
4	Develop programs on sizeof () and typecasting operator.	[2]
5	Develop programs on increment and decrement operator.	[2]
6	Develop programs on simple if and if-else statement.	[2]




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7	Develop programs on simple if-else ladder and Nested if-else.	[2]
8	Develop programs on Switch case statement.	[2]
9	Develop programs on For-loop & Nested For-loop.	[2]
10	Develop programs on while and do-while loop.	[2]
11	Develop programs on one dimensional array.	[2]
12	Develop programs on two dimensional array.	[2]
13	Develop programs on string handling functions.	[2]


Textbooks:-

1. C Programming Absolute Beginner's Guide, Que Publishing, 3rd edition (22 August 2013)
2. C Programming Language 2nd Edition, Pearson Publication

Reference Books:-

1. Programming in C Practical Approach by Ajay Mittal, Pearson.
2. Let Us C, By Yashwat Kanetkar.




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23CS2308	CEP	Mini Project-II	0-0-2	1 Credit
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Teaching Scheme	Examination Scheme
Practical: 2 hrs/week	CA I: 25 Marks CA II: 25 Marks

Pre-Requisites: None.

About Ideathon

The project is a part of addressing societal and industrial needs. An ideathon is a brief, intense event where students can work on some of the most important problems that the world is facing today. Ideation's are brainstorming events where people with diverse knowledge backgrounds, skill sets and interests get together to predetermined problems, and come up with substantive, innovative and comprehensive solutions. An ideathon's output might be ideas, a roadmap or an actionable plan. Teams leverage design thinking and cutting-edge techniques to brainstorm and collaborate on potential solutions within a given time frame.

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

CO1	Identify problems based on societal /research needs
CO2	Apply Knowledge and interpersonal skills to solve societal problems in a group.
CO3	Draw the proper inferences from available results through theoretical/ experimental/simulations.
CO4	Analyze the impact of solutions in societal and environmental context for sustainable development.
CO5	Demonstrate capabilities of self-learning in a group, which leads to lifelong learning.
CO6	Demonstrate project management principles during project work.

Course Contents:

Week 1: Higher Education and Case Study Pedagogy <ul style="list-style-type: none">• Students shall form a group of 3 to 4 students, while forming a group shall not be allowed less than three or more than four students, as it is a group activity.• Allocation of mentor	[2]
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Week 2: Topic Selection <ul style="list-style-type: none">Briefly interact with students to provide hand-holding for topic selection.Students should do survey and identify needs, which shall be converted into problem statement for mini project in consultation with faculty supervisorIllustrative Examples : Any Industry or Societal ProblemFinalization of Title.	[2]
Week 3: Case Study Design/Ideathon: Part 1 <ul style="list-style-type: none">If needed, provide hand-holding to students for finalizing objectives.Review the objectives of the case study groups.Identify what can be quantified related to your topic and how.Decide objectives for your case study.Continue reading especially recent work specific to your topic.	[2]
Week 4: Case Study Design/Ideathon: Part 2 <ul style="list-style-type: none">Prepare a roadmap of your case study, identify what is to be measured on the field.Ensure student groups have finalized the objectives.	[2]
Week 5: Survey Design <ul style="list-style-type: none">Prepare a questionnaire and try it out with your group members as mock.Decide sampling strategy.	[2]
Week 6: Analysis Phase-1 <ul style="list-style-type: none">Students in a group shall understand problem effectively, propose multiple solution.The students have to work on different approaches and search for the different methodology to solve the problem in consultation with the project guide.	[2]
Week 7 Analysis Phase-2 <ul style="list-style-type: none">The students have to finalize the best methodology to solve the problem in consultation with the project guide.25% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 8: Analysis-3 <ul style="list-style-type: none">Identify appropriate data visualization tools for your case study.Analyze the data	[2]
Week 9: Analysis-4	[2]



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<ul style="list-style-type: none">Identify appropriate data visualization tools for your case study.Analyze the data	
Week 10: Report writing Part:1 <ul style="list-style-type: none">Prepare an outline of the report and start organizing the write-up for the first draft.Prepare and submit the first draft of the report to the course coordinator.	[2]
Week 11: Report writing Part:2 <ul style="list-style-type: none">Make necessary corrections if any as per the suggestions of course coordinator.Submit the final draft of the case study	[2]
Week 12: Final Presentation <ul style="list-style-type: none">50% Presentation has to be conducted by mentor/guide based on above activity.	[2]




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23CS2309	EEM	Intellectual Property Rights	1-0-0	1 Credit
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Teaching Scheme	Examination Scheme
Lecture: 1 hrs/week	CA I: 25 Marks CA II: 25 Marks

Pre-Requisites: Nil

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

CO1	Explain key principles of intellectual property rights
CO2	Illustrate information about patents, including registration, writing, and searching, both in India and outside.
CO3	Outline awareness of copyrights, the rights associated with them, and the registration process; to spread awareness of trademarks and the registration process
CO4	Illustrate information about design, geographical indication (GI), plant variety, and layout design protection, as well as registration aspects.

Course Contents

Unit 1: Introduction and the need for intellectual property right (IPR) Types of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design. Genetic Resources and Traditional Knowledge – Trade Secrets, IPR in India: Genesis and development, IPR in abroad.	[3]
Unit 2: Patents Elements of Patentability: Novelty, Non Obviousness (Inventive Steps), Industrial Application - Non - Patentable Subject Matter – Registration. Procedure, Rights and Duties of Patentee, Assignment and license, Restoration of lapsed Patents, Surrender and Revocation of Patents Patent Infringement, Remedies & Penalties – Patent Office and Appellate Board. Patent/Prior art search: Types and tools of patent search. Patent drafting: Elements in patent drafting	[3]




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Unit 3: Copyrights Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings, Registration Procedure, Term of protection, Ownership of copyright, Assignment and license of copyright Infringement, Remedies & Penalties – Related Rights -Distinction between related rights and copyrights.	[3]
Unit 4: Trademarks Concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols, well-known marks, certification marks and service marks) - Non Registrable Trademarks, Registration of Trademarks - Rights of holder and assignment and licensing of marks. Trademark Infringement, Remedies & Penalties - Trademarks registry and appellate board	[3]

Textbooks:-

1. B.L. Wadera, Patents, trademarks, copyright, Designs and Geographical Judications.
2. P. Narayanan (Eastern Law House), Intellectual Property Law.
3. Nithyananda, K V. (2019). Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited.
4. Neeraj, P., &Khusdeep, D. (2014). Intellectual Property Rights. India, IN: PHI learning Private Limited.

Reference Books:-

1. Ahuja, V K. (2017). Law relating to Intellectual Property Rights. India, IN: Lexis Nexis.
2. Subramanian, N., &Sundaraman, M. (2018). Intellectual Property Rights – An Overview. Retrieved from <http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf>
3. World Intellectual Property Organisation. (2004). WIPO Intellectual property Handbook. Retrieved from https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf
4. Journal of Intellectual Property Rights (JIPR): NISCAIR



B.N.

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23CSMDA1	MDM	Agriculture Informatics	2-0-0	2 Credits
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Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic knowledge of computer.


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

CO1	Relate concepts from agriculture, computer science, and information technology.
CO2	Explain the role of information systems in the agricultural sector and their impact on productivity and sustainability.
CO3	Demonstrate proficiency in data collection, management, and analysis specific to agricultural data.
CO4	Apply principles of precision agriculture to optimize field-level management regarding crop farming.
CO5	Demonstrate decision support systems (DSS) for farm management and other agricultural operations.
CO6	Make use of ethical standards and legal regulations related to data privacy and security in agricultural informatics.

Course Contents

Unit 1: Introduction to Agriculture Informatics Overview of agriculture informatics, Importance and scope of informatics in agriculture, Trends and developments in agricultural technology, Traditional vs. modern data collection methods, Principles of Agronomy, Soil Science and Crop Production, Plant Breeding and Genetics, Pest and Disease Management.	[4]
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Unit 2: Information Technology in Agriculture Introduction to ICT in Agriculture, Role of IoT in Agriculture, Geographic Information Systems (GIS) and Remote Sensing, Big Data Analytics in Agriculture, Cloud Computing in Agriculture, Sensors and Actuators in Agricultural Systems, Autonomous Vehicles and Drones.	[4]
Unit 3: Data Management in Agriculture Data Collection Methods and Tools, Data Storage and Management Systems, Data Analysis and Interpretation, Overview of Supply Chain in Agriculture, ICT in Supply Chain Management.	[4]
Unit 4: Precision Agriculture Automated Machinery and Equipment, Robotics in Agriculture, Concepts and principles of precision farming, Sensor-based monitoring systems, Yield mapping and variable rate technology, Concepts of Smart Farming, Smart Greenhouses and Vertical Farming, Smart Irrigation Systems.	[4]
Unit 5: Agricultural Decision Support Systems Livestock Monitoring and Management, Role of Artificial Intelligence and Machine Learning in Agriculture, Farm Management Software, Simulation and Modeling Tools, Mobile Applications for Farmers, Emerging Technologies in Agricultural Software.	[4]
Unit 6: Software and Tools for Agriculture Informatics Case Studies of Successful ICT Applications in Agriculture, Real-world Applications and Projects, Analysis of Agricultural Informatics Startups and Innovations, Intellectual Property Rights in Agriculture, Data Privacy and Security in Agricultural Informatics, Ethical Issues and Sustainability.	[4]

Reference Books:-

1. "Agricultural Informatics" Rajeev K. Sinha and Deepak S. Mishra
2. "Precision Agriculture Technology for Crop Farming" Qin Zhang




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3. "Big Data in Agriculture: A Guide to Transforming the Industry" Vikas Kumar and Shivani Pathak
4. "Information and Communication Technology for Agriculture and Rural Development" R.K. Samanta



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23CSMDB1	MDM	Fundamentals of Finance and Management	2-0-0	2 Credits
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Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Communication Skills.


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

CO1	Explain the concept & different terms of Financial Management
CO2	Outline different types of Annuity and Perpetuity
CO3	Compare Different sources of finance
CO4	Analyze Capital Expenditure Decisions
CO5	Illustrate Dividend Decisions
CO6	Outline Liquidity Management

Course Contents

Unit 1: Introduction & Basic Concepts Important functions of Financial Management, Objectives of the firm: Profit maximization vs. Value maximization, Role of Chief Financial Officer, Time Value of Money: concept and reasons, Compounding and Discounting techniques	[4]
Unit 2: Annuity and Perpetuity Types of Annuity: Deferred annuity, Fixed annuity, Immediate annuity, Variable annuity, Indexed annuity, Life annuity, Group annuity contracts, Fixed annuity, Perpetuity, Annuity payable for guaranteed time, Types of Perpetuity	[4]
Unit 3: Sources of Finance and Cost of Capital Different sources of finance; long term and short term sources, Cost of capital	[4]




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concept, relevance of cost of capital, Implicit and Explicit cost, specific costs (its computation) and weighted average cost (its computation)	
Unit 4: Capital Expenditure Decisions Objectives of Capital Budgeting Process, Concept of Cash flow, Methods of long term Investment decisions - Discounted Payback Period, Net Present Value, Profitability Index, Average Rate of Return / Accounting Rate of Return, Internal Rate of Return (Including relative merits and demerits of each of the methods)	[4]
Unit 5: Dividend Decisions Meaning, Nature and Types of Dividend, concept of pay-out ratio, retention ratio, Decisions and growth, Dividend policies and formulating a dividend policy, Dividend Theories: Walter's Model, Gordon's Model	[4]
Unit 6: Liquidity Management Various concepts of Working Capital, Management of Working Capital and Issues in Working Capital, Estimating Working Capital Needs; Operating or Working Capital Cycle, Policies relating to Current Assets – Conservative, Aggressive and Balance, Various sources of finance to meet working capital requirements	[4]

Reference Books:-

1. Fundamentals of Financial Management, Vandana Dangi, V.K. Global Pvt. Ltd., New Delhi.
2. Parasuraman – Financial Management: A Step by Step Approach, Cengage Learning.
3. Rostogi, Fundamentals of Financial Management, Taxmann Publications.
4. Fundamental of Financial Management, Sharma, Gupta, Kalyani Publishers, New Delhi.



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23CSMDC1	MDM	Medical Imaging and Image Processing	2-0-0	2 Credits
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Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basics of Computer.


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

CO1	Explain the basic principles behind various medical imaging modalities.
CO2	Illustrate fundamental techniques for processing and analyzing medical images
CO3	Demonstrate image processing techniques to enhance and interpret medical images.
CO4	Explain the basic principles behind various X-ray medical images.
CO5	Demonstrate various reconstruction technics on medical images.
CO6	Illustrate advanced image processing techniques.

Course Contents

Unit 1: Introduction to Medical Imaging Overview of medical imaging modalities (X-ray, CT, MRI, ultrasound, PET, etc.), Basic principles of image formation in medical imaging, Image representation (pixels, grayscale, color), Image enhancement techniques (histogram equalization, contrast stretching), Image filtering (convolution, smoothing, sharpening), Spatial domain vs. frequency domain processing.	[4]
Unit 2: Image Transformation and Registration Geometric transformations (translation, rotation, scaling), Image registration	[4]




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techniques, Image warping and morphing, Image Segmentation: Thresholding methods, Edge detection algorithms (Sobel, Canny), Region-based segmentation (watershed, region growing).	
Unit 3: Feature Extraction and Pattern Recognition	[4]
Texture analysis, Shape analysis, Object detection and classification, Anatomical and functional imaging, Tumor detection and classification, Image-based diagnosis and prognosis.	
Unit 4: X-ray Imaging	[4]
Principles of X-ray production, X-ray detectors and image formation, Digital radiography and fluoroscopy, Applications.	
Unit 5: Image Reconstruction Techniques	[4]
Principles of computed tomography (CT) reconstruction, MRI image reconstruction, Ultrasound image formation and reconstruction.	
Unit 6: Advanced Image Processing Techniques	[4]
Machine learning and deep learning in medical imaging, Pattern recognition and classification, Quantitative image analysis, Applications in computer-aided diagnosis (CAD)	

Reference Books:-

1. "Medical Imaging: Principles and Practices" by James H. Thrall.
2. "Digital Image Processing" by Rafael C. Gonzalez and Richard E. Woods.
3. "Principles of Magnetic Resonance Imaging: A Signal Processing Perspective" by Zhi-Pei Liang and Paul C. Lauterbur.
4. "Handbook of Medical Imaging" edited by Jacob Beutel, Harold L. Kundel, and Richard L. Van Metter.




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