



Shri Shamrao Patil (Yadavkar) Educational & Charitable Trust's
Sharad Institute of Technology College of Engineering
(An Autonomous Institute)

Accredited by NAAC 'A' Grade, ISO 9001:2015 Certified
Yadav (Ichalkaranji)-416121, Dist. – Kolhapur

Department: Artificial Intelligence and Data Science

Rev: Course Structure/00/2021-22

Class: T.Y. B.Tech

Semester: V

Sr. No.	Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
				L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
1	AD501	PCC	Software Engineering	3	-	-	3	10	10	30	50	100	3
2	AD502	PCC	Data Science and Visualization	3	-	-	3	10	10	30	50	100	3
3	AD503	PCC	Design & Analysis of Algorithm	3	-	-	3	10	10	30	50	100	3
4	AD504	PCC	Advanced JAVA Programming	3	-	-	3	10	10	30	50	100	3
5	OEC01	OEC	Open Elective-I(Data Structure)	3	-	-	3	10	10	30	50	100	3
6	AD505	PEC	Elective-II	1	-	2	3	15	15	-	20	50	2
7	AD506	PCC	Data Science and Visualization Laboratory	-	-	2	2	15	15	-	20	50	1
8	AD507	PCC	Design & Analysis of Algorithm Laboratory	-	-	2	2	15	15	-	20	50	1
9	AD508	PCC	Advanced JAVA programming Laboratory	-	-	2	2	15	15	-	20	50	1
10	HMS05	HSMC	Aptitude Skills-III	1	-	-	1	25	25	-	-	50	1
11	HMS06	HSMC	Language Skills-III	-	-	2	2	25	25	-	-	50	Audit
12	PRJ04	PROJ	Mini Project –IV	-	-	2	2	25	25	-	-	50	1
Total				17	-	12	29	135	185	150	330	850	22

Elective –II: AD505A-Android Application Development
AD505B-UNIX shell programming
AD505C-Network Programming

Open Elective-I: OEC01- Data Structure



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T.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester V

AD501	PCC	Software Engineering	3-0-0	3 Credits
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Teaching Scheme: Lecture: 3hrs/week Tutorial: --	Examination Scheme: CA 1: 10 Marks CA 2 : 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks
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Pre-Requisites: --

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

CO1	Apply generic models to structure the software development process.
CO2	Illustrate fundamental concepts of requirements engineering and requirements specification.
CO3	Explain different notion of complexity at both the module and system level
CO4	Make use of some widely known design methods.
CO5	Summarize the role and contents of testing activities in different life cycle phases.
CO6	Explain agile software development

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	2	2	1	1	-	1	1	2	2	2	2	1
CO2	2	2	2	2	2	-	-	1	1	1	2	2	2	2	1
CO3	2	2	2	2	2	-	-	-	-	1	2	2	2	2	1
CO4	2	2	2	2	2	-	-	-	-	1	2	2	2	2	1
CO5	2	2	2	2	2	-	-	-	-	1	2	2	2	2	1
CO6	2	2	2	2	2	-	-	-	-	1	2	2	2	2	1

Course Contents:	Hours
Unit 1: The Evolving role of Software – Software – The changing Nature of Software – Legacy software – A generic view of process– A layered Technology – A Process Framework – The Capability Maturity Model Integration (CMMI) – Process Assessment – Personal and Team Process Models, Product and Process, Process Models – The Waterfall Model – Incremental Process Models – Incremental Model – The RAD Model – Evolutionary Process Models – Prototyping – The Spiral Model – The Concurrent Development Model – Specialized Process Models – the Unified Process.	7





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Unit 2: Software Engineering Practice – communication Practice – Planning practice Modeling practice– Construction Practice –Deployment. Requirements Engineering - Requirements Engineering tasks – Initiating the requirements Engineering Process Eliciting Requirements – Developing Use cases – Building the Analysis Models – Elements of the Analysis Model – Analysis pattern – Negotiating Requirements – Validating Requirements.	7
Unit 3: Requirements Analysis – Analysis Modeling approaches – data modeling concepts – Object oriented Analysis – Scenario based modeling – Flow oriented Modeling – Class based modeling – creating a behavior model.	6
Unit 4: Design Engineering – Design process -Design Quality-Design model-User interface Design – Testing strategies- strategies Issues for conventional and object oriented software-validation testing –system testing –Art of debugging – Project management	6
Unit 5: Software evolution - Verification and Validation -Critical Systems Validation – Metrics for Process, Project and Product-Quality Management -Process Improvement –Risk Management- Configuration Management	6
Unit 6: Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values	6

Text Book:

1. Roger S.Pressman, Software Engineering: A Practitioner's Approach, McGraw Hill International edition, Sixth edition, 2005.
2. Ian Sommerville, Software Engineering, 8th Edition, Pearson Education, 2008(UNIT V)
3. David J. Anderson and Eli Schragenheim, —Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results!, Prentice Hall, 2003

Reference Book:

1. Stephan Schach, Software Engineering, Tata McGraw Hill, 2007.
2. Pfleeger and Lawrence Software Engineering: Theory and Practice, Pearson Education, second edition, 2001
3. Craig Larman, —Agile and Iterative Development: A Manager_s Guidel, Addison-Wesley, 2004.
4. Kevin C. Desouza, —Agile Information Systems: Conceptualization, Construction, and Management!, Butterworth-Heinemann, 2007.





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T.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester V

AD502	PCC	Data Science and Visualization	3-0-0	3 Credits
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Teaching Scheme: Lecture: 3hrs/week Tutorial: --	Examination Scheme: CA 1: 10 Marks CA 2 : 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks
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Pre-Requisites: 'C' Language

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

CO1	Apply preprocessing techniques on data.
CO2	Explain basics of data science.
CO3	Apply different data visualization techniques to understand the data.
CO4	Model multidimensional data and visualize it using appropriate tool.
CO5	Analyze the data using suitable method; visualize using the open source tool.
CO6	Apply data science libraries on data.

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	-	2	2	1	1	1	1	1
CO2	2	1	1	-	2	-	-	-	2	1	1	1	-	1	1
CO3	2	1	1	-	2	-	-	-	2	1	1	1	-	1	1
CO4	2	1	1	-	2	-	-	-	2	1	1	1	-	1	1
CO5	2	1	1	-	2	-	-	-	2	1	1	1	-	1	1
CO6	2	1	1	-	2	-	-	-	2	1	1	1	-	1	1

Course Contents:	Hours
Unit 1: Introduction to Data Science Defining Data Science and Big Data, Recognizing Different Types of Data, Gaining Insight Into DataScience Process, Data Science Process: Overview, Different Steps, Machine Learning Definition and Relation with Data Science.	6
Unit 2: Data Pre-processing Data Preprocessing: Data Quality, Major Tasks in Data Preprocessing, Entity Identification Problem, Redundancy and Correlation Analysis, Tuple Duplication, Data	6





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Value Conflict Detection and Resolution, Data Reduction, Overview of Data Reduction Strategies.	
Unit 3: Basics of Data Visualization Introduction to Data Visualization, Challenges of Data Visualization, Definition and Types of Dashboard, Evolution of Dashboard, Dashboard Design and Principles, Display Media for Dashboard.	6
Unit 4: Data Visualization using Python Types of Data Visualization: Basic Charts Scatter Plots, Histogram, Advanced Visualization Techniques Like Streamline and Statistical Measures, Plots, Graphs, Networks, Hierarchies, Reports.	6
Unit 5: Data visualization of multidimensional data Need of Data Modeling, Multidimensional Data Models, Mapping of High Dimensional Data Into Suitable Visualization Method-Principal Component Analysis, Clustering Study of High Dimensional Data, Visualization Tools.	6
Unit 6: Data Analyzing and Visualization using python Data Analysis Libraries: Will Learn to Use Pandas Dataframes, Numpy Multi-Dimensional Arrays, and Scipy Libraries to Work with a Various Dataset, Pandas, An Open-Source Library: Load, Manipulate, Analyze and Visualize Various Datasets. Matplotlib, Scikit-Learn.	6

Text Book:

Data Analysis Libraries: Will Learn to Use Pandas Dataframes, Numpy Multi-Dimensional Arrays, and Scipy Libraries to Work with a Various Dataset, Pandas, An Open-Source Library: Load, Manipulate, Analyze and Visualize Various Datasets. Matplotlib, Scikit-Learn.

Reference Book:

1. Alice Zheng- Evaluating Machine Learning Models: A Beginner's Guide to Key Concepts and Pitfalls, O'Reilly Media, 2015, ISBN 1491932465, 9781491932469.
2. Big data black book, Dream Tech Publication.
3. Ben Fry- Visualizing Data. Released December 2007. Publisher(s): O'Reilly Media, Inc. ISBN: 9780596514556.
4. Data Science Using Python and R by Chantal D. Larose and Daniel T. Larose, Wiley Publication.
5. Python for Data Science and Visualization -Beginners to Pro, Udemy.





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T.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester V

AD503	PCC	Design Analysis & Algorithm	3-0-0	3 Credits
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Teaching Scheme: Lecture: 3hrs/week Tutorial: --	Examination Scheme: CA 1: 10 Marks CA 2 : 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks
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Pre-Requisites: Data Structure

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

CO1	Understand basics of algorithm and analyze performance of different algorithms using Divide and conquer.
CO2	Understand greedy Approach and Analyze the performance by taking different examples
CO3	Understand dynamic approach and Analyze the performance by taking different examples.
CO4	Design algorithm by applying backtracking technique.
CO5	Understand and Design NP Hard and NP Complete Problems
CO6	Understand concepts of branch and bound, compare performance with backtracking.

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	2	2	1	-	-	-	-	2	2	3	3	1
CO2	2	2	2	2	2	-	1	-	-	-	2	2	3	3	1
CO3	2	2	2	2	2	-	-	-	-	-	2	2	3	3	1
CO4	2	2	2	2	2	-	-	1	-	-	2	2	3	3	1
CO5	2	2	2	2	2	-	-	-	1	-	2	2	3	3	1
CO6	2	2	2	2	2	-	-	-	-	1	2	2	3	3	1

Course Contents:	Hours
Unit 1: Divide and Conquer What is algorithm, Algorithm Specification, Performance Analysis, and Randomized Algorithms, Divide and Conquer-The general method, Binary search, finding the maximum and minimum, Merge sort, Quick sort, Selection sort and analysis of these algorithms.	6
Unit 2: Greedy Method The general method, Activity Selection Problem, Huffman Coding Knapsack problem, Job sequencing with deadlines, Minimum-cost spanning trees – Prim's	6





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and Kruskal's Algorithms Optimal storage on tapes Optimal merge patterns analysis, Single source shortest paths notations.	
Unit 3: Dynamic Programming Introduction, Characteristics of Dynamic Programming, Shortest paths: Bellman Ford, Floyd, Warshall, Multistage graphs, All pair shortest paths, Optimal binary search trees, 0/1 knapsack, Reliability design, Traveling Sales person problem	6
Unit 4: Basic Traversal and Search Techniques and Backtracking Techniques for Binary Trees, Techniques for Graphs – Breadth First Search & Traversal Depth First Search & Traversal, AND/OR graphs; Backtracking Concept, N-Queens Problem, Four-Queens Problem, Eight-Queen Problem, Hamiltonian Cycle, Sum of Subsets Problem, Graph Coloring Problem.	6
Unit 5: Hard and NP Complete Problems Basic Concepts NP Complete Problems, Introduction to NP, Hard Graph Problems.	6
Unit 6: Branch and Bound Introduction, Traveling Salesperson Problem, 15-Puzzle Problem, Comparisons between Backtracking and dynamic programming, Comparisons between Backtracking and greedy programming, Branch and Bound.	6

Text Book:

1. Fundamentals of Computer Algorithms - Ellis Horowitz, Satraj Sahani, Saguthevar Rajasejaram, Universities Press, Second Edition
2. Fundamentals of Algorithmic – Gilles Brassard, Paul Bratley (Pearson Education).
3. Computer Algorithms- Introduction to Design and Analysis – Sara Baase, Allen Van Gelder (Pearson Education).

Reference Book:

1. Computer Algorithms- Introduction to Design and Analysis – Sara Baase, Allen Van Gelder (Pearson Education).
2. Michel Goodrich, Roberto Tamassia, Algorithm Design – Foundation, Analysis & Internet Examples, Wiley Publication, 2nd Edition, 2006





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T.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester V

AD504	PCC	Advanced Java Programming	3-0-0	3 Credits
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Teaching Scheme:	Examination Scheme:
Lecture: 3hrs/week Tutorial: --	CA 1:10 Marks CA 2:10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Java Programming

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

CO1	Develop programs using GUI Framework (AWT and Swing)
CO2	Handle events of AWT and Swings components.
CO3	Develop programs to handle events in Java Programming
CO4	Develop Java programs using networking concepts.
CO5	Develop programs using database
CO6	Develop programs using Servlet

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	2	2	-	-	-	1	1	1	1	1	2	2
CO2	2	2	2	2	2	-	-	-	1	1	1	1	1	2	2
CO3	2	2	2	2	2	1	1	1	1	1	1	1	1	2	2
CO4	2	2	2	2	2	1	1	1	1	1	1	1	1	2	2
CO5	2	2	2	2	2	1	1	1	1	1	1	1	1	2	2
CO6	2	2	2	2	2	-	-	-	1	1	1	1	1	2	2

Course Contents:	Hours
Unit 1: Component, container, window, frame, panel. Creating windowed programs and applets. AWT controls and layout managers: use of AWT controls: labels, buttons, checkbox, checkbox group, scroll bars, text area, Use of layout managers: flow Layout, border Layout (), grid Layout, card Layout, grid bag Layout, menu bars, menus, dialog boxes, file dialog.	6
Unit 2: Introduction to swing: Swing features, Difference between AWT and Swing. Swing Components: JApplet, Icons and Labels, Text Fields, ComboBoxes. Buttons: The JButton, Check Boxes, Radio Buttons. Advanced Swing Components:	6





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Tabbed Panes, Scroll Panes, Trees, Tables, Progress bar, tool tips.MVC Architecture.	
Unit 3: The delegation Event sources, Event listeners Model: Event classes: The Action Eventclass, the Item Event class, the Key Event class, the Mouse Event class, the Text Event class, the Window Event class. Adapter classes. Inner classes. Event listener interfaces: ActionListener Interface, ItemListener Interface, KeyListener Interface, MouseListenerInterface, MotiseMotion Interface, TextListener Interface, WindowsListener Interface	6
Unit 4: Socket Overview: Client/Server, Reserved Sockets, Proxy Servers Internet addressing Java and the Net: The Networking Classes and interfaces. InetAddress: Factory Methods, Instance Methods. TCP/IP Client Sockets URL: Format, The URI Class. URLConnection : TCP/IP Server Sockets, Datagrams : Datagram Packet , Datagram server and Client	6
Unit 5: Introduction to JDDC,ODBC JDBC Architecture: Two tier & Three tier models Types of JDBC DriversDriver Interfaces and Driver, Manager class: Connection Interface, Statement Interface, Prepared Statement Interface, Result Set Interface, The essential JDBC Program	6
Unit 6: The Life Cycle of a Servlet Creating simpleServlet: The Servlet API, javax. servlet Package, ServletInterface, Servlet Config Interface ,Servlet Context Interface, Servlet Request Interface, Servlet Response Interface, Generic Servlet Class The javax.servlet. http Package:HttpServletRequest Interface ,HttpServletResponse Interface,HttpSession Interface , Cookie Class, HttpServlet Class, HttpSessionEvent Class , HttpSession BindingEvent Class. Handling HTTP Requests and Responses Handling HTTP GETRequests Handling HTTP POST Requests. Cookies and Session Tracking	6

Reference/Text Book:

1. Complete Reference Java 2 Programming
2. Black book Java programming





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T.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester V

AD505A	PEC	Android Application Development	1-0-2	2 Credits
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Teaching Scheme:	Examination Scheme:
Lecture: 1hr/week Tutorial: --	CA 1: 15 Marks CA 2 : 15 Marks Mid Semester Exam: -- End Semester Exam: 20 Marks

Pre-Requisites: JAVA programming

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

CO1	Organize Android environment and development tools.
CO2	Develop user Interfaces by using layouts and controls.
CO3	Make use of different UI components
CO4	Apply the given Intents and service in Application development.
CO5	Create Android application using database.
CO6	Develop application using telephony manager and map based activity

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	2	1	-	-	-	2	1	1	1	1	1	1
CO2	2	2	2	2	1	-	-	-	2	1	1	1	1	1	1
CO3	2	2	2	2	2	-	-	-	2	1	1	1	1	1	1
CO4	2	2	2	2	2	-	-	-	2	1	1	1	1	1	1
CO5	2	2	2	2	2	1	1	1	2	1	1	1	1	2	1
CO6	2	2	2	2	2	2	1	1	2	1	1	1	1	2	2

Course Contents:	Hours
Unit 1: Introduction to Android OS Android OS design and Features, Android Ecosystem, need of Android, , Architecture of android, JDK, SDK, Android Development Tools(ADT),Android Virtual Devices(AVDs), Dalvik Virtual Machine DVM, Downloading and Installing Android studio	2
Unit 2: Android User Interface and Layouts . Android Directory Structure, Components of a screen, Fundamental UI Design, Layouts: Linear, Frame, Relative, Table Layout	3





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Unit 3: Working UI components Text View, Edit Text Button, Image Button, Toggle Button, Radio Button And Radio Group, Checkbox, List View; Grid View, Image View, Scroll View, Time And Date Picker.	3
Unit 4: Intents and Broadcasts Intent, Intent Filter, Activity Lifecycle; Broadcast Lifecycle, Content provider, Fragments, Android services, Lifecycle of Android Service, Methods of android services.	2
Unit 5: Multimedia and Database Multimedia framework, Play Audio and Video, Sensors, Async tasks, Audio Capture, Camera, Bluetooth, Animation SQLite Database, Creation and connection of the database.	2
Unit 6: SMS Telephony and location based services Android SMS, Working with Google Maps, Location Based Services – Finding Current Location and showing location on the Map.	2

Practical List:

1	Install and configure android studio and JDK, android SDK and ADT plug-in
2	Develop program using linear layout and frame layout
3	Develop a program to implement table layout and relative layout.
4	Develop a program to implement Text View, Edit Text and Button.
5	Develop a program to implement Image Button and Toggle Button.
6	Develop a program to implement checkbox, Radio Button and Radio Group.
7	Develop a program to implement List View, Grid View, Image View and Scroll View.
8	Develop a program to implement Date and Time Picker.
9	Develop a program to create activity using explicit intent and implicit intent.
10	Program to play audio, video file
11	Develop a program to build Camera.
12	Develop a program for providing Bluetooth connectivity.
13	Develop program to insert data in database.
14	Develop a program to send and receive SMS
15	Develop a program to locate the user's current location.





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Text Book:

1. Android Programming for Beginners- Horton, John Packet Publication, 2015, ISBN: 978-1-78588-326-2
2. Android™ Programming Unleashed- B.M. Harwani Copyright © 2013 by Pearson Education, Inc.

Reference Book:

1. Android - Dixit, Prasanna Kumar Vikas Publications, New Delhi 2014, ISBN: 9789325977884
2. Lee, Beginning Android™ 4 Application Development, Wrox Publication, 2011.





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T.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester V

AD505B	PEC	UNIX Shell Programming	1-0-1	3 Credits
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Teaching Scheme:	Examination Scheme:
Lecture:	CA 1: 15 Marks
1hrs/week Tutorial: --	CA 2 : 15 Marks
	Mid Semester Exam: --
	End Semester Exam: 20 Marks

Pre-Requisites: Operating system

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

CO1	Demonstration of various commands using UNIX file system
CO2	Outline different types of UNIX and PONIX file system
CO3	Make use of UNIX process concepts to solve the real time problems
CO4	Illustrate Signals and Daemon Processes
CO5	Make use of interprocesses communication to solve real time problems.

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

Course Contents:	Hours
Unit 1: Introduction to UNIX and its Commands: UNIX and ANSI Standards: The ANSI C Standard, The ANSI/ISO C++ Standards, Difference between ANSI C and C++, The POSIX Standards, The POSIX.1 FIPS Standard. UNIX and POSIX APIs: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics, The File System: The File, What's in a (File)name, The Parent-Child relationship, The UNIX File System, pwd, Absolute pathnames, cd, Relative pathnames, mkdir, rmdir, cp, rm, mv, cat, ls.	3
Unit 2: UNIX Files File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, General File APIs, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs, File and Record Locking.	2





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Unit 3: UNIX Processes File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, General File APIs, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs, File and Record Locking.	3
Unit 4: Signals and Daemon Processes: Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and waitpid API, The sigsetjmp and siglongjmp Functions, kill, alarm, Interval Timers.	3
Unit 5: Inter-process Communication: Introduction, Pipes, popen and pclose Functions, Co-processes, FIFOs, Message Queues, Semaphores, Shared Memory	2

List of experiments	
1.	Write a C/C++ POSIX compliant program to check the following limits: (i) No. of clock ticks (ii) Max. no. of child processes (iii) Max. path length (iv) Max. no. of characters in a file name (v) Max. no. of open files/ process
2.	Write a C/C++ POSIX compliant program that prints the POSIX defined configuration options supported on any given system using feature test macros.
3.	Consider the last 100 bytes as a region. Write a C/C++ program to check whether the region is locked or not. If the region is locked, print pid of the process which has locked. If the region is not locked, lock the region with an exclusive lock, read the last 50 bytes and unlock the region.
4.	Write a C/C++ program which demonstrates interposes communication between a reader process and a writer process. Use mkfifo, open, read, write and close APIs in your program.
5.	a) Write a C/C++ program that outputs the contents of its Environment list b) Write a C / C++ program to emulate the unix ln command
6.	Write a C/C++ program to illustrate the race condition.
7.	Write a C/C++ program that creates a zombie and then calls system to execute the ps command to Verify that the process is zombie.
8.	Write a C/C++ program to avoid zombie process by forking twice.
9.	Write a C/C++ program to implement 'system' function.
10.	Write a C/C++ program to set up a real-time clock interval timer using the alarm API.

Text Book:

1. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff: "UNIX Network Programming". Volume 1, Third Edition, Pearson 2004 and onwards.

Reference Book:

1. Barry Nance: "Network Programming in C", PHI 2002 3. Bob Quinn, Dave Shute: "Windows Socket Network Programming", Pearson 2003 and onwards.
2. Richard Stevens: "UNIX Network Programming". Volume 1, Second Edition 2006 and onwards.





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T.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester V

AD505C	PEC	Network Programming	1-0-1	2 Credits
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Teaching Scheme: Lecture: 1hrs/week Tutorial: ---	Examination Scheme: CA 1: 15 Marks CA 2 : 15 Marks Mid Semester Exam: -- End Semester Exam: 20 Marks
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Pre-Requisites: Data communication

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

CO1	Understand Client-server communication model
CO2	Demonstrate socket concept
CO3	Demonstrate Elementary UDP socket
CO4	Make use of IPv4 and IPv6 Interoperability
CO5	Make use of broadcasting and multicasting concept to solve real time problems.

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	1	-	1	-	1	1	1	1	2	1	1
CO2	2	2	2	1	1	-	1	-	1	1	1	1	2	1	1
CO3	2	2	2	1	1	-	1	-	1	1	1	1	2	1	1
CO4	2	2	2	1	1	1	1	-	1	2	1	2	2	1	2
CO5	2	2	2	2	1	1	1	1	1	2	2	2	2	1	2
CO6	2	2	2	1	1	-	1	-	1	1	1	1	2	1	1

Course Contents:	Hours
Unit 1: Introduction: Introduction, Client/server communication, OSI Model, BSD Networking history, Test Networks and Hosts, Unix Standards, 64-bit architectures. Transport Layer: TCP, UDP and SCTP, TCP Connection Establishment and Termination.	3
Unit 2: Sockets Introduction Introduction, Socket Address Structures, Value-Result Arguments, Byte Ordering and Manipulation Functions. Elementary TCP Sockets: socket, connect, bind, listen, accept, fork and exec, Concurrent Server design, getsockname and getpeername functions.	3
Unit 3: Elementary UDP Sockets recvfrom and sendto Functions, UDP Echo Client/Server- main, dg_echo and dg_cli Functions, Lost Datagrams, Verifying received Responses, Server Not Running, connect	3





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Function with UDP, Lack of Flow control with UDP, Determining Outgoing Interface with UDP, TCP and UDP Echo Server using select. Elementary SCTP Sockets: Interface Models, shutdown function, Notifications.	
Unit 4: Advanced Sockets 1 Ipv4 and IPv6 Interoperability: IPv4 Client and IPv6 Server, IPV6 Client ad IPv4 Server, IPv6 Address-Testing Macros, Source Code Portability Daemon Processes: syslogd Daemon , syslog Function.	2
Unit 5: Advanced Sockets 2 Broadcasting: Introduction, Broadcast Addresses, Unicast vs Broadcast, dg_cli Function using Broadcasting, Race Conditions. Multicasting: Introduction, Multicast Addresses, Multicast vs Broadcast on a LAN, Multicast on a WAN, Source-Specific Multicast.	3

Text Book:

1. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff: "UNIX Network Programming". Volume 1, Third Edition, Pearson 2004 and onwards.

Reference Book:

1. Barry Nance: "Network Programming in C", PHI 2002
3. Bob Quinn, Dave Shute: "Windows Socket Network Programming", Pearson 2003 and onwards.
2. Richard Stevens: "UNIX Network Programming". Volume 2, Second Edition 2006 and onwards.





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T.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester V

AD506	PCC	Data Science and Visualization Laboratory	0-0-1	1 Credits
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Teaching Scheme:	Examination Scheme:
Practical: 2hr/week	CA1: 15 Marks CA2: 15Marks Practical and Oral Exam:--20 Marks

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

CO1	Understand and describe the main concepts of data visualization.
CO2	Analyze data using exploratory visualization.
CO3	Create useful, performant visualizations from real-world data sources, including large and complex datasets.
CO4	Model data visualization and dashboards.

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	-	2	-	1	-	2	2	1	2	1	1	1
CO2	2	1	1	-	2	-	-	-	2	1	1	1	-	1	1
CO3	2	1	1	-	2	-	-	-	2	1	1	1	-	1	1
CO4	2	1	1	-	2	-	-	-	2	2	1	2	-	2	1

Practical List:

1	To study data science basics.
2	To download and observe different datasets from Kaggle.com
3	To understand different operations on data.
4	Access an open source dataset "Titanic". Apply pre-processing techniques on the raw dataset.
5	Build training and testing dataset of assignment 1 to predict the probability of a survival of a person based on gender, age and passenger-class.
6	Use Netflix Movies and TV Shows dataset from Kaggle and perform following operation: a. Make a visualization showing the total number of movies watched by children





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	b. Make a visualization showing the total number of standup comedies c. Make a visualization showing most watched shows d. Make a visualization showing highest rated show make a dashboard (DASHBOARD A) containing all of these above visualizations.
7	Explore New York City -311 Complaints and Housing datasets.
8	Analyze and visualize data using Python.
9	Perform feature engineering exercise using Python.
10	Build and validate predictive machine learning model using Python.





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T.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester V

AD507	PCC	Design and Analysis of Algorithm Laboratory	0-0-2	1 Credits
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Practical Scheme: Practical: 2 hrs/batch	Examination Scheme: CA 1: 15 Marks CA 2 : 15 Marks Mid Semester Exam: -- End Semester Exam: 20 Marks
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Pre-Requisites: Basics related to C programming.

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

CO1	Design and implement algorithm by taking simple problems.
CO2	Implement algorithm on greedy Approach and Analyze the performance.
CO3	Develop an algorithm on dynamic approach and Analyze the performance.
CO4	Implement algorithm by applying backtracking technique.
CO5	Design and Implement algorithm on NP Hard and NP Complete Problems
CO6	Implement algorithm on branch and bound technique.

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	-	-
CO2	2	2	-	-	2	-	-	-	-	-	-	1	2	-	-
CO3	3	2	1	-	2	-	-	-	-	-	-	1	1	-	-
CO4	3	2	-	-	2	-	-	-	-	-	-	1	1	-	-
CO5	3	2	-	-	2	-	-	-	-	-	-	2	2	-	-
CO6	3	2	-	-	2	-	-	-	-	-	-	2	2	-	-

Practical List

1. Implement Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements.
2. Implement Quick Sort algorithm and determine the time required to sort the elements
3. Implement Insertion Sort algorithm and determine the time required to sort the elements
4. Implement Heap Sort algorithm and determine the time required to sort the elements
5. From a given vertex in a weighted connected graph, find shortest paths to other vertices using





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| 6. Find the Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm. |
| 7. Find the Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm. |
| 8. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm. |
| 9. Implement 0/1 Knapsack problem using Dynamic Programming. |
| 10 Implement N Queen's problem using Back Tracking. |





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T.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester V

AD508	PCC	Advanced Java Programming Laboratory	0-0-2	1 Credits
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Practical Scheme: Practical: 2 hrs/week	Examination Scheme: CA 1: 15 Marks CA 2 : 15 Marks Mid Semester Exam: -- End Semester Exam: 20 Marks
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Pre-Requisites: Basics related to C programming.

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

CO1	Develop programs using GUI Framework (AWT and Swing)
CO2	Handle events of AWT and Swings components
CO3	Develop programs to handle events in Java Programming
CO4	Develop Java programs using networking concepts.
CO5	Develop programs using database
CO6	Develop programs using Servlet

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	2	2				1	1	1	1	1	2	2
CO2	2	2	2	2	2				1	1	1	1	1	2	2
CO3	2	2	2	2	2	1	1	1	1	1	1	1	1	2	2
CO4	2	2	2	2	2	1	1	1	1	1	1	1	1	2	2
CO5	2	2	2	2	2	1	1	1	1	1	1	1	1	2	2
CO6	2	2	2	2	2				1	1	1	1	1	2	2

Practical List

1. Write a program to demonstrate use of AWT controls.
2. Write a program to demonstrate different layouts.
3. Write a program to make use of swing controls
4. Write a program to handle different events.
5. Write a program to demonstrate use of Adapter class.
6. Write a program to retrieve hostname and IP address in InetAddress class.





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| 7. Write a program that demonstrates TCP/IP based communication between client and server. |
| 8. Write a program to establish successful connection to database. |
| 9. Write a servlet to display the user name and password accepted from the client. |
| 10. Write a servlet for demonstrating the concept of session and cookies. |





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HMS05	HSMC	Aptitude Skill III	1-0-0	Audit
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Teaching Scheme: Lecture: 1hrs/week Tutorial: NA Practical: NA	Examination Scheme: CA 1: 15 Marks CA 2 : 15 Marks Mid Semester Exam: -- End Semester Exam: --
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Pre-Requisites: Communication Skills, Aptitude Skills I,II

Group A

Aptitude (12Hrs) (Compulsory)

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

1	Solve the problems on system of equation
2	Solve the problems on seating arrangement
3	Solve the logical reasoning problems
4	Solve the critical analysis problems
5	Solve the problems of Data interpretation
6	Solve the problems of permutations and Combinations

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													
CO2	2													
CO3	2													
CO4	2													
CO5	2													
CO6	2													

Course Contents:	Hours
Unit 1: System of equations quadratic equations, Surds and indices, solution of equations, Ages,	[2]
Unit 2: Seating Arrangements Linear seating Arrangement, Circular seating arrangement, Complex seating arrangement,	[2]





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Unit 3: Logical Reasoning Numerical based on sense of direction, Blood relations, Odd man Out	[2]
Unit 4: Critical analysis Clocks and Calendar based problems, Crypt arithmetic, heights and distances	[2]
Unit 5: Data Interpretation Table form, Bar form, Line for Pi chart form	[2]
Unit 6: Permutations and Combinations Numbers and Words Repetition allowed and Repetition not allowed	[2]

Text Books:

1. RS Aggarwal "A Modern Approach to Verbal & Non-Verbal Reasoning ", S. Chand Publisher; 2016 edition
2. RS Aggarwal, " Quantitative Aptitude for Competitive Examinations ", S. Chand Publisher; 2016 edition
3. Raymond Murphy "Essential English Grammar with Answers", Murphy

Reference Books:

1. Rao N,D,V,Prasada, Wren & Martin High School English Grammar and Composition Book, S Chand Publishing, 2017
2. Murphy, Intermediate English Grammar with Answers, Cambridge University Press; Second edition
3. RS Aggarwal, Objective General English, S. Chand Publisher; 2016 edition





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T.Y. (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) Semester V

PRJ04	PROJ	Mini Project-IV	0-0-2	1 Credits
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Teaching Scheme: Lecture: -- Tutorial: NA Practical: 2 hr/week	Examination Scheme: CA 1: 25 Marks CA 2 : 25 Marks Mid Semester Exam: -- End Semester Exam: 20 Marks
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Prerequisites: Basic knowledge of Communication skills and Computer programming, artificial intelligence and data science.

Course Outcomes:

Upon successful completion of this course, the students will be able to:

1	Select the appropriate method for solving the problem
2	Make use of various engineering techniques and tools to give a solution
3	Justify the method/tools used to develop the solution.
4	Demonstrate tangible solutions to the problem
5	Describe the solution with the help of a project report and presentation.

About Mini Project

The project is a part of addressing societal and industrial needs. Mini project is one of the platforms that students will use to solve real-world challenges. This course focuses on the selection of methods/engineering tools/analytical techniques for problem-solving. Through this course, students gain a thorough understanding of engineering basics and ideas, gain practical experience, have the opportunity to display their skills and learn about teamwork, financial management, communication skills, and responsibility.

Guidelines

1. Every student shall undertake the Mini project activity for semester V.
2. Minimum three and maximum of five students should work together in Mini project.





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3. The students have to work on different approaches and finalize the best methodology to solve the problem in consultation with the project guide.
4. The students should use different tools /Techniques for the development of the solution to the problem.
5. While developing solutions, the student can take care of effective use of resources, follow ethical practices, finance management,
6. The solution should be optimal, affordable, user-friendly and environment friendly.
7. Critically analysis and testing of the solution provided.
8. By using IPR, students should reserve their rights of innovations as well as communicate new findings to society with the help of research papers.

The committee of senior faculty members and a project guide will be appointed to monitor the progress and continuous evaluation of each project. The assessment shall be done jointly by the guide and committee members.

