Bharatiya Vidya Bhavan

BHAVAN'S VIVEKANANDA COLLEGE

OF SCIENCE, HUMANITIES AND COMMERCE
Sainikpuri
Autonomous College | Affiliated to Osmania University
Reaccredited with 'A' grade by NAAC

PROGRAM NAME: B Sc (Honours) Data Science

COURSE NAME: Numerical Analysis

Effective from academic Year 2025-26

(75 Hours)

PAPER CODE: HDS521A **PPW: 5L+1T**
YEAR/SEMESTER: III/V **NO. OF CREDITS: 5**

COURSE OBJECTIVE: The main objective of this course is to provide students with an introduction to the field of Numerical Analysis.

UNIT-WISE COURSE OBJECTIVES:

COb1: To solve the equations of one variable.
COb2: To solve interpolating polynomials and find values.
COb3: To fit curves to experimental data and obtain derivative, integration of a function using Numerical techniques
COb4: To analyse the solutions of differential equations using Numerical methods.

Unit I: SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS

18Hrs

Introduction, Bisection method, Method of False Position, Iteration method, Newton-Raphson method, Muller's method.

UNIT II: INTERPOLATION

20 Hrs

Interpolation with equal spacing: Finite Differences, Differences of Polynomials, Newton's formulae for Interpolation, Gauss's central differences formulae, Stirling's formula, Interpolation with unequal spacing: Lagrange's Interpolation Polynomial, Divided Differences,Newton's General Interpolation formula, Inverse Interpolation.

Unit III: CURVE FITTING, NUMERICAL DIFFERENTIATION & INTEGRATION

20Hrs

Curve Fitting: Least Square Curve Fitting: Fitting a Straight Line, Nonlinear Curve Fitting. Numerical Differentiation. Numerical Integration: Newton's Cotes Integration Formula, Trapezoidal Rule, Simpson's 1/3rd-Rule, Simpson's 3/8th-Rule, Boole's and Weddle's Rule.

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UNIT–IV: NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS 17 Hrs

Numerical Solutions of Ordinary Differential Equations: Taylor's Series Method, Picard's Method, Euler's Methods, Runge Kutta Methods.

PRESCRIBED BOOK:

S.S.Sastry, Introductory Methods of Numerical Analysis, PHI, 5th Edition, 2010

Unit 1- Chapters: 2.1 to 2.5 & 2.8
Unit 2- Chapters: 3.3, 3.5, 3.6, 3.7.1, 3.7.2, 3.9.1, 3.10.1 & 3.11
Unit 3- Chapters: 4.1, 4.2.1, 4.2.4, 4.2.5, 6.2, 6.4.1 to 6.4.4
Unit 4- Chapters: 8.1 to 8.3, 8.4.2 & 8.5

REFERENCE BOOKS:

1. Richard L. Burden and J. Douglas Faires, Numerical Analysis, 9th Edition, Cengage Learning, Inc; 2010
2. M K Jain, S R K Iyengar and R K Jain, Numerical Methods for Scientific and Engineering computation, New Age International Pvt Ltd Publishers; 3rd edition, 1996
3. B. Bradie, A Friendly introduction to Numerical Analysis, Pearson India; 1st edition, 2007

COURSE OUTCOMES: At the end of the course students will be able to

CO1: Calculate the solutions of equations in one variable.
CO2: Evaluate Interpolating polynomials and values.
CO3: Design curves to experimental data and obtain derivative, integration of a function using Numerical techniques
CO4: Compute the solutions of differential equations using Numerical methods.

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PROGRAM NAME: B.Sc (Honours) in Data Science
COURSE NAME: Integral Transforms

COURSE CODE: HDS 521B **PPW: 5L+1T**
YEAR/SEMESTER: III/V **NO. OF CREDITS: 5**

Effective from academic Year 2024-25
(75 Hours)

COURSE OBJECTIVE: The main aim of this course is to expose Students to Integral Transforms and its Applications.

UNIT-WISE COURSE OBJECTIVES:

COb1: To learn concepts of Laplace Transforms.
COb2: To acquire knowledge about Inverse Laplace Transformations.
COb3: To apply Laplace Transforms to ordinary differential equations & Partial differential equations.
COb4: To analyse and apply Fourier Transforms.

UNIT – I: LAPLACE TRANSFORMATIONS **20 Hrs**

Intergal transform, Laplace Transforms, Linearity property of Laplace transformation, Piecewise continuous function, Existence of Laplace transform(statement), Functions of exponential order,

A function of class A, First translation theorem, Second translation theorem, Change of scale property, Laplace transforms of derivatives and integrals, Multiplication by powers of t, Division by t, Evaluation of integral, Periodic functions and Gamma Function.

UNIT – II: INVERSE LAPLACE TRANSFORMATIONS **15 Hrs**

Inverse Laplace Transform, Linearity property, First translation theorem, Second translation theorem, Change of scale property, Inverse Laplace Transform of derivatives, Inverse Laplace Transform of integrals, Multiplication by powers of p, Division by powers of p, Convolution definition, Convolution theorem, Heaviside's expansion formula, Beta function.

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UNIT – III: APPLICATIONS OF LAPLACE TRANSFORMATIONS TO SOLUTIONS OF DIFFERENTIAL EQUATIONS **20 Hrs**

Solutions of ordinary differential equations with constant coefficient, Solutions of ordinary differential equations with variable coefficient, Solutions of simultaneous ordinary differential equations, Solutions of Partial differential equations.

UNIT – IV: FOURIER TRANSFORMS AND FINITE FOURIER TRANSFORMS **20 Hrs**

Fourier series, Fourier Integral formula, Fourier Transforms, Inversion theorem, Fourier Sine and cosine transforms, Inverse Fourier Sine and cosine Transforms, Linearity property of Fourier Transforms, change of scale property, Shifting property, Modulation theorem, Convolution definition, Convolution theorem for Fourier Transforms, Parseval's identity for transforms, Relationship between Fourier and Laplace Transforms. Finite Fourier Sine and cosine Transforms, Inversion Formula for Fourier Sine and cosine Transforms.

PRESCRIBED BOOK:

A.R. Vasishta and Dr. R.K. Gupta, Laplace Transforms, Krishna Prakashan Media Pvt. Ltd. Meerut, 2016

Unit 1-Chapters: [1]
Unit 2- Chapters: [2.1 to 2.17]
Unit 3-Chapters: 3[3.1 to 3.4]
Unit 4-Chapters: 6 [6.1 to 6.15, 6.17 to 6.20]; 7[7.1 to 7.4]

REFERENCE BOOKS:

1. Baidyanath Patra, An introduction to Integral Transforms, 1st Edition, CRC Press, 2018.
2. Dr. S. Sreenadh, Fourier Series and Integral Transforms, S. Chand (G/L) & Company Ltd, 2014.
3. Dr. J.K. Goyal and K.P. Gupta, Laplace and Fourier Transforms, Pragati Prakashan, 2016.
4. M.D. Raisinghania, H.C. Saxsena and H.K. Dass, Integral Transforms, S. Chand (G/L) & Company Ltd, 2014.

COURSE OUTCOMES: At the end of the course students will be able to

CO1: Solve the problems using Laplace Transforms.
CO2: Demonstrate the use of Inverse Laplace Transform in Convolution theorem & Heaviside's expansion formula.
CO3: Evaluate the solutions of ordinary differential equations & Partial differential equations using Laplace transformations.
CO4: Synthesise the concepts of Fourier Transforms.

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PROGRAM NAME: B.Sc (Honours) in Data Science
COURSE NAME: MACHINE LEARNING

COURSE CODE: HDS 522 **PPW: 4**
YEAR/SEMESTER: III/V **NO. OF CREDITS: 4**

Effective from academic Year 2024-25
(60 Hours)

COURSE OBJECTIVES:

COb1: To focus on Analytics for supervised and unsupervised statistical learning.
COb2: To understand the techniques of supervised machine learning concepts classification, k-Nearest Neighbor Classification, and Support Vector Machines Classifiers.
COb3: To develop the skills of applying machine learning techniques for solving Artificial Neural Network problems
COb4: To understand different methods of cluster analysis and identify the different groups with similar properties.

UNIT-I: **15 Hrs**

Introduction: Multivariate techniques – Concept and Applications, Supervised and Unsupervised Learning.
Data pre-processing: Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization, and Concept Hierarchy Generation.

Supervised learning-Classification, Issues Regarding Classification, Bayesian Classification Classification by Decision Tree Induction - Decision Trees- Regression Trees, Growing Trees, Regression Tree Issues, Pruning Trees, Combining Classifiers- Bootstrap Aggregation (Bagging), Boosting, Random Forest.

UNIT-II: **15 Hrs**

Classification techniques: K-nearest –Neighbour classifiers – Estimation and Rule, Metrics and Nearest Neighbor Classification, Support Vector Machines- linear SVM, Nonlinear SVM's, Kernel trick, Multi-class SVMs, Maximal Classifier, Metrics for Evaluating Classifier Performance, Holdout Method, and Random Subsampling.

UNIT-III: **15 Hrs**

Neural Networks: Overview, Artificial Neural Network(ANN) -Artificial Neurons, Components of ANN- Network Architecture (Feedforward & Feedback Network), Weights, Activation Function; Input Layer - Hidden Layers - Output Layer; Single Layer Perceptron Network, Multilayer Perceptron Network, Radial Basis Function Neural Network, Adaline and Medaline Networks, Back Propagation, Applications of Neural Network.

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UNIT-IV: **15 Hrs**

Unsupervised Learning: Measures of distance - Different clustering methods (Distance, Density, Hierarchical, Grid) – Partitional clustering; Dealing with continuous, categorical values in K-Means, K-Medoids,k-Mode; Constructing a hierarchical Clustering-Agglomerative, Divisive; and density-based clustering.

PRESCRIBED BOOK:

1. C. M. Bishop. Pattern Recognition and Machine Learning. 2nd Edition, Springer, 2015.
2. S. J. Russell, P. Norvig. Artificial Intelligence: A Modern Approach. Third Edition, Prentice-Hall, 2010.
3. Vincy Joseph, Anuradha Srinivasa Raghavan. Machine Learning, John Wiley & Sons, Wiley Edition, First Edition, 2019.

REFERENCE BOOKS:

1. P. Flach. Machine Learning: The Art and Science of Algorithms that Make Sense of Data. First Edition, Cambridge University Press, 2012.
2. B. Yegnanarayanan. Artificial Neural Networks, Publisher: Prentice-Hall of India Pvt.Ltd, 2003.
3. Y. S. Abu-Mostafa, M. Magdon-Ismail, H.-T. Lin. Learning from Data: A Short Course. First Edition, 2012.
4. Drew Conway, Joh Myles White. Machine Learning for Hackers. O'Reilly Media, Inc., Safari books online service, January 2012.
5. Oliver Theobald. Machine Learning For Absolute Beginners, Second Edition, Kindle, January 2018.
6. Chistopher M Bishop. Pattern Recognition and Machine Learning, Springer Edition, February 2010.
7. John D Kelleher, Brian Mac Namee, Aoife D'Arcy. Fundamentals of Machine Learning for Predictive Data Analytics- Algorithms, Worked Examples, and Case Studies, MIT Press, September 2015.
8. T. Hastie, R. Tibshirani and J. Friedman, Elements of Statistical Learning, Springer, 2009.
9. E. Alpaydin. Machine Learning, MIT Press, 2010.
10. K. Murphy. Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
11. Shai Shalev-Shwartz, Shai Ben-David. Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press, 2014.
12. John Mueller and Luca Massaron. Machine Learning For Dummies, John Wiley & Sons, 2016.

COURSE OUTCOMES: At the end of the course, students will be able to

CO1: apply the skills in using recent machine learning software for solving real-life problems.

CO2: develop and use various quantitative and classification models based on various regression and decision tree methods

CO3: learn how to evaluate the soundness, appropriateness, and validity of the ANN model to forecast the future outcomes

CO4: explain the difference between different clustering methods.

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PROGRAM NAME: B.Sc (Honours) in Data Science
COURSE NAME: MACHINE LEARNING PRACTICAL Using Python

COURSE CODE: HDS522P **PPW: 3**
YEAR/SEMESTER: III/V **NO. OF CREDITS: 1**
Effective from academic Year 2024-25

COURSE OBJECTIVE:

COb1: To familiarize the mathematical and statistical techniques used in machine learning.
COb2: To develop skills in using recent machine learning software for solving practical problems.

1. Computation of Decision Tree Analysis Using Python.
2. Computation of Naive Bayes Classification Analysis Using Python.
3. Computation of K -Nearest Neighbor Classifier Using Python.
4. Computation of Support Vector Machine Analysis Using Python.
5. Computation of Artificial Neural Network Analysis Using Python.
6. Computation of Cluster Analysis Using Python.

COURSE OUTCOMES: At the end of the practical course students will be able to

CO1: Select an appropriate pattern analysis tool for analyzing data.
CO2: Demonstrate proficiency in applying the scientific method to machine learning models.

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PROGRAM NAME: B.Sc (Honours) in Data Science
COURSE NAME: PREDICTIVE ANALYTICS

COURSE CODE: HDS523 **PPW: 4**
YEAR/SEMESTER: III/V **NO. OF CREDITS: 4**

Effective from academic Year 2024-25
(60 Hours)

COURSE OBJECTIVE:

COb1: Recommend appropriate types of predictive modeling for use in data analysis scenarios.
COb2: To understand the concept of various components of time series modeling.
COb3: To learn, how to develop AR(p), MA(q), ARMA (p, q) and ARIMA (p, q) models to forecast the future outcomes.
COb4: To understand and develop the skills in using Non-Linear Models ARCH and GARCH for solving practical problems

UNIT-I: **15 Hrs**

Introduction: Predictive Analytics, Data Types- Structured, Semi-structured, Unstructured-Data visualization.

Linear Methods for Regression: Linear regression models and least squares, Multiple regression, Multiple outputs, Subset selection, Ridge regression, Lasso regression, Linear Discriminant Analysis, Logistic regression, Estimation of Regression Parameters, Model Diagnostics, and Model Selection.

UNIT-II: **15 Hrs**

Time Series: Various Components of time series, Additive & Multiplicative models, Moving Average Method, Seasonal indices by Ratio to Moving Average, Ratio to Trend, and Link Relative Methods.

Stochastic Process and Model Building - Stochastic process, Stationarity, Data transformation, Autocorrelation, Autocorrelation Function (ACF), Partial Autocorrelation Function (PACF), Correlogram, Root Mean Squared Error (RMSE), Mean Absolute Percentage Error (MAPE), Mean Absolute Deviation (MAD).

UNIT-III: **15 Hrs**

Time Series forecasting Models: Principles of Forecasting, Linear Models for time series-Random Walk, White noise Process, Augmented Dickey-Fuller unit root test for stationary, Autoregressive Processes AR(p), Moving Average Processes MA(q), Autoregressive Moving

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Average Processes ARMA(p,q), and Autoregressive Integrated Moving Average Processes ARIMA(p,d,q) - Estimation of Parameters, Diagnostic Check- Ljung box test, Forecasting Accuracy.

UNIT-IV: **15 Hrs**

Non-linear Time Series Models: Introduction – Non-Linear Model- Autoregressive Conditional Heteroscedasticity (ARCH) models, Generalized Autoregressive Conditional Heteroskedasticity (GARCH)process, Parameter estimation, diagnostic checking, and forecasting. Evaluate ARCH (1) properties. GARCH (Concept only) process of modeling volatility.

PRESCRIBED BOOK:

1. George E. P. Box, Gwilym M. Jenkins, Gregory C. Reinsel, Greta M. Ljung. Time Series Analysis: Forecasting and Control, 5th Edition, John Wiley & Sons, 2016.
2. Douglas C. Montgomery, Cheryl L. Jennings, Murat Kulahci. Introduction to Time Series Analysis and Forecasting, Second Edition, John Wiley & Sons Publication, 2016.
3. James D. Hamilton, Time Series Analysis, Princeton University Press, 2014.

REFERENCE BOOKS:

1. Ruey S. Tsay. Analysis of Financial Time Series, 3rd Edition, John Wiley & Sons, 2009.
2. A.C. Harvey. Time Series Models, 2nd Edition, Pearson Education Print, 2003.
3. Alexander, C, Market models: A guide to financial data analysis. John Wiley & Sons, 2001.
4. Bauwens, L., Hafner, C. M., & Laurent, S., Handbook of volatility models and their applications, John Wiley & Sons, 2012.
5. Francq C and Zakoian, J. M., GARCH models: structure, statistical inference and financial applications. John Wiley & Sons, 2011.
6. Satchell, S., & Knight, J, Forecasting volatility in the financial markets. Butterworth-Heinemann, 2011.
7. W A Fuller. Introduction to Statistical Series, 2nd Edition, John Wiley & Sons, 1995.
8. Chatfield C. Analysis of Time Series, An Introduction, CRC Press, 2003.
9. Giuseppe Ciaburro. Matlab for Machine Learning, Packt Publishing, 2017.

COURSE OUTCOMES: At the end of the course students will be able to

CO1: apply various regression techniques to predict the value of continuous variables.
CO2: Summarize and visualize datasets using appropriate predictive analytical tools.
CO3: learn how to apply and evaluate Box Jenkins Methodology to Forecast the future outcomes
CO4: Apply Non-linear predictive modeling approaches using a suitable package such as SPSS Modeler.

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PROGRAM NAME: B.Sc (Honours) in Data Science
COURSE NAME: PREDICTIVE ANALYTICS PRACTICAL Using SPSS

COURSE CODE: HDS523P **PPW: 3**
YEAR/SEMESTER: III/V **NO. OF CREDITS: 1**
Effective from academic Year 2024-25

COURSE OBJECTIVE:

COb1: Understand how to evaluate models generated from data.
COb2: Discover how to build predictive modeling, prepare data, and use different techniques using SPSS.

1. Computation of Multiple Regression Analysis.
2. Computation of Binary Regression Analysis.
3. Computation of Logistic Regression Analysis.
4. Computation of Method of Moving Average.
5. Computation of ACF and PACF plots.
6. Computation of Autoregressive Process (p).
7. Computation of Moving Average Process(q).
8. Computation of Autoregressive Moving Average Process (p,q).
9. Computation of ARIMA (p,d,q).
10. Computation of GARCH.

***Case Studies will be done based on the above models**

COURSE OUTCOMES: At the end of the practical course students will be able to

CO1: Implement different predictive modeling algorithm techniques.
CO2: Identify and apply predictive modeling to solve real-world problems.

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PROGRAM NAME: B.Sc (Honours) in Data Science
COURSE NAME: SOFTWARE ENGINEERING (Elective)

COURSE CODE: HDS524A **PPW: 4**
YEAR/SEMESTER: III/V **NO. OF CREDITS: 4**

Effective from academic Year 2024-25
(60 Hours)

COURSE OBJECTIVE: To impart the knowledge of software concepts, importance of software development within time and budget.

UNIT-WISE COURSE OBJECTIVES:

COb1: To explain the basics of software, its process and types of process models.
COb2: To discuss Requirements Engineering, design concepts and Architectural styles of Software Engineering.
COb3: To describe about Software Quality and software testing strategies.
COb4: To identify Software Configuration Management process, software risks and reverse engineering.

UNIT-I: **15 Hrs**

Software Engineering: Software, Software Process.
Software Process Models- Waterfall Model, Incremental Model, Spiral Model, Personal Software Process, Team Software Process.
Agility: Agility, Agile Process, Extreme Programming.
Requirements Engineering: Inception, Elicitation, Elaboration, Negotiation, Specification, Validation.
(Ch: 1, 2, 3 and 5)

UNIT-II: **15 Hrs**

Developing Use Cases: UML Models That Supplement the Use Cases- Class Based Model, Data Flow Model (DFD), Relationships (ERD).
Design Concepts: The Design Process, Design Model -Architectural Design.
Architectural Styles: Data – Centered Architecture, Data Flow Architectures, Layered Architectures.
Architectural Design: Definition, Class-Based Design, Component-Level Design, User-Interface Design.
(Ch: 6, 7, 8, 9, 10 and 11)

UNIT-III: **15 Hrs**

Software Quality: Software Quality Factors-Mccall's Quality Factors, ISO 9126 Quality Factors, Achieving Software Quality.

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Software Quality Assurance: Elements of Software Quality Assurance, ISO 9000 Quality Standards.
Software Testing Strategies: Strategic Approach to Software Testing, Verification and Validation, Integration Testing, Regression Testing, Debugging Process, Black Box Testing, White Box Testing.
(Ch: 14, 16, 17 and 18)

UNIT-IV: **15 Hrs**
Software Risks: Risk Mitigation, Monitoring and Management, Software Re-engineering, Reverse Engineering and Forward Engineering.
Software Configuration Management: Definition, SCM Process, Version Control, Change Control, Configuration Audit, Status Reporting.
(Ch: 22, 28 and 29)

PRESCRIBED BOOK:

1. Roger S Pressman, B R Maxim, Software Engineering–A Practitioner's Approach (7e), MC Graw Hill 2010.

REFERENCE BOOKS:

1. Ian Sommerville, Software Engineering, 9th Edition, 2004.
2. Hans Van Vliet, Software Engineering Practices, 3rd Edition, 2008.

COURSE OUTCOMES: At the end of the course students will be able to

CO1: Summarize the basics of software, its process and types of process models.
CO2: Interpret about Requirements Engineering, design concepts and Architectural styles of Software Engineering.
CO3: Analyze about Software Quality and software testing strategies.
CO4: Explain Software Configuration Management process, software risks and Reverse engineering.

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PROGRAM NAME: B.Sc (Honours) in Data Science
COURSE NAME: SOFTWARE ENGINEERING LAB

COURSE CODE: HDS524AP **PPW: 2**
YEAR/SEMESTER: III/V **NO. OF CREDITS: 1**

Effective from academic Year 2024-25

COURSE OBJECTIVE: To Impart the knowledge of different Data Models, E-R Diagrams and case tools in designing the software.
COb1: To inculcate knowledge in defining problem statement and its specifications.
COb2: To demonstrate various UML models using below Case studies.

Case Studies:

1. Banking System.
2. Hotel management system.
3. Inventory Control System.
4. Library management system.
5. Railway Reservation System.

Choose any two of above case studies and do the following exercises for that case studies:

1. Write the complete problem statement.
2. Write the software requirements specification document.
3. Draw the entity relationship diagram.
4. Draw the data flow diagrams.
5. Draw use case diagrams.
6. Draw activity diagrams for all use cases.
7. Draw sequence diagrams for all use cases.
8. Draw collaboration diagram.
9. Assign objects in sequence diagrams to classes and make class diagram.

Note:

To draw dataflow diagrams using Microsoft Visio Software, SmartDraw, etc.
To draw UML diagrams using Rational Rose Software, StarUML, etc.

COURSE OUTCOMES: At the end of the practical course students will be able to
CO1: Write problem statement.
CO2: Use tools to draw various UML models.

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PROGRAM NAME: B.Sc (Honours) in Data Science
COURSE NAME: SYSTEM AND NETWORK ADMINISTRATION (ELECTIVE-IIB)

COURSE CODE: HDS524B **PPW: 4**
YEAR/SEMESTER: III/V **NO. OF CREDITS: 4**
Effective from academic Year 2024-25
(60 Hours)

COURSE OBJECTIVE: To educate the students in System and Network Administration utilities.

UNIT-WISE COURSE OBJECTIVES:

COb1: To learn UNIX Essential Administrative Tools and Techniques.
COb2: To acquire knowledge about User and Groups Account Management and Managing System Resources.
COb3: To provide the concepts related to Maintenance of File System, Secondary Storage Devices and Backup Techniques.
COb4: To explain the functionalities of TCP/IP and E-Mail.

UNIT-I: **15 Hrs**

Introduction to System Administration: Thinking about System Administration, Becoming Superuser, Communicating with Users.
The UNIX Way: Files – File Ownership – File Protection – Mapping Files to Disk, Process - Interactive Processes – Batch Processes – Daemons – Process Attributes, Devices, The Root Directory.
Essential Administrative Tools and Techniques: Getting the most from Common Commands - Piping into grep and awk - Finding Files - Repeating Commands, Essential Administrative Techniques – Periodic Program Execution: The cron Facility – System Messages, Administrative Log Files.
(Ch: 1, 2 and 3)

UNIT-II: **15 Hrs**

Managing Users and Groups: UNIX Users and Groups – The Password File – The Shadow Password File - The Group File – Dynamic Group Memberships – User Account Database File Protections, Managing User Accounts – Adding a New User Account – Defining a New User Account – Assigning a Shell, Creating a Home Directory – User Environment

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Initialization Files – Setting File Ownership – Disabling and Removing User Accounts, Administering User Passwords – Selecting Effective Passwords.

Managing System Resources: Thinking about System Performance, Monitoring and Controlling Processes – The ps command – The /proc File System – Kernel Idle Processes – Process Resource Limits, Managing CPU Recourses – Nice Numbers and Process Priorities – Monitoring CPU Usage, Managing Memory, Disk I/O Performance Issues – Monitoring Disk I/O Performance – Getting the Most from the Disk Subsystem.

(Ch: 6 and 15)

UNIT-III: **15 Hrs**

File Systems and Disks: File System Types, Managing File Systems – Mounting and Dismounting File Systems – Disk Special File Naming Conventions – The Mount and Unmount Commands – Figuring out who's using a File – The File System Configuring File – Automatic File System Mounting – Using fsck to validate a File System, From Disks to File systems – Defining Disk Partitions – Adding Disks- Logical Volume Managers.

Backup and Restore: Planning for Disasters and Everyday Needs – Backup Capacity Planning – Backup Strategies – Backup Media – Comparing Backup Media, Backing Up Files and File system, Backing Up Individual File systems with Dump, Restoring Files from Backups – Restores from tar and cpio Archives – Restoring from Dump Archives – Moving Data Between Systems.

(Ch: 10 and 11)

UNIT-IV: **15 Hrs**

TCP / IP Networking: Administrative Commands, Adding a New Network Host – Configuring the Network Interface with ifconfig.

Managing Network Services: Managing DNS Servers – Name Server Types, about BIND – Configuring Named.

Electronic Mail: About Electronic Mail – Mail Addressing and Delivery- Electronic Mail Policies, Configuring User Mail Programs.

(Ch– 5, 8 and 9)

PRESCRIBED BOOK:

1. Aeleon Frisch, Essential System Administration, O'Reilly, Third Edition, 2002.

REFERENCE BOOKS:

1. Nemeth, UNIX System Administration, Pearson Education, 2000.
2. Thomas A. Limocelli, The Practice of System and Network Administration, Pearson Education, 2007, Second Edition.

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PROGRAM NAME: B.Sc (Honours) in Data Science
COURSE NAME: SYSTEM ADMINISTRATION USING UNIX LAB
Effective from academic Year 2024-25

COURSE CODE: HDS524BP **PPW: 2**
YEAR/SEMESTER: III/V **NO. OF CREDITS: 1**

COURSE OBJECTIVE: To impart knowledge about UNIX system administration commands.

COb1: To implement the system administrative commands, system calls in Unix.
COb2: To program the implementation of system calls in Unix.

1. Creating users and groups (Execution of various system administration Commands such as useradd, usermod, password, groupmod, uname, permission(r,w,x)(4,2,1), umask, chmod and chown.
2. Write a shell script that takes a command line argument and reports on whether it is directory, a file or something else.
3. Program to search for a given pattern in a file.
4. Write a shells script that accepts one or more file names as arguments and converts all of them into Uppercase, provided they exist in the current directory.
5. Write a shells script to delete all the temporary files.
6. Write a program to create a child process using fork() and exec() system calls.
7. Write a program using open(), read() and write() system calls.
8. Implementation of Signals in UNIX.
9. Write a shells script to check and list attributes of a processes.
10. Write a shells script to display list of users currently logged in.
11. Write a C program to illustrate the Race Condition.
12. Write a C Program which demonstrates inter process communication between a reader process and a writer process.
13. Write a C program for Inter process communication using pipes.

COURSE OUTCOMES: At the end of the practical course students will be able to

CO1: Implement the System administrative commands in Unix.
CO2: Program the system calls in Unix.

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PROGRAM NAME: B.Sc (Honours) in Data Science

COURSE NAME: BIOINFORMATICS (GE)

COURSE CODE: HDS525 **PPW: 4**
YEAR/SEMESTER: III/V **NO. OF CREDITS: 4**
Effective from academic Year 2024-25

Course Objective: The objective of this course is to explain the application of data science and bioinformatic tools in analyzing biomolecules.

Unit wise course objectives
Cob1 To explain the structure of nucleic acids and proteins.
Cob2 To discuss the various databases available in bioinformatics
Cob3 To describe the sequence analysis of DNA/RNA
Cob4 To discuss protein databases and protein sequence analysis

Unit 1: Introduction to nucleic acids and biopython package **15 hrs**

1.Structural organization of Cell
2.Structure and composition of DNA(Deoxyribonucleic acid) and RNA(Ribonucleic acid)
3.Basic definition of genes, genome sequences
4.Gene annotation: Open reading frames (ORFs), introns, exons, splice variants, promoter regions
5. CpG islands, isochores, satellite regions in DNA sequence
6. Biopython- Introduction of Biopython package and its applications
7. Identification and prediction of ORFs and promoter regions using biopython.

Unit 2: Biological Databases and Next generation sequencing **15hrs**
1.Overview of biological databases-private and public data sources.
2. Literature databases
3.Nucleotide databases- NCBI, DDBJ
4.Sequence information resources: EMBL GENBANK Entrez Unigene
5. Next generation sequencing (NGS) technology and its applications
6. Overview of NGS file formats and data analysis
7.Databases for NGS Data (SRA and SNP databases)

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Unit 3: Nucleotide sequence analysis **15 hrs**

1.Introduction to Basic Local Alignment Search Tool (BLAST) algorithm
2.Types of BLAST
2.Nucleotide sequence alignment using BLAST (Basic and Local alignment)
3.Alignment of sequences using biopython
4.Phylogenetic tree construction
5.Outline of Transcription
6.Structure of RNA
7.Basic sequence analysis such as reverse complementing, transcription and translation

Unit 4:Protein – structure and analysis **15 hrs**

1.Outline of translation and standard genetic code
2.Structural organization of Proteins
3.Protein Structure databases (FSSP, CATH, SCOP) and Protein Information resources (Protein Data Bank (PDB), MMDB, Swiss-Prot, TrEMBL
4.Multiple sequence alignments of proteins
5.Phylogenetic tree construction
6. Finding a protein in multiple databases using biopython
7. Physico chemical properties (molecular weight, isoelectric point etc) of proteins and their computation using biopython

At the end of the course students will be able to

CO1. To distinguish the structure and function of nucleic acids and proteins
CO2.To retrieve the sequences of biomolecules from relevant databases
CO3.To implement the use of bioinformatics tools to analyse nucleotide sequences using biopython
CO4.To evaluate the structure and sequences of proteins using biopython tools

References:

Fundamental Concepts of Bioinformatics, by Dan E. Krane, Michael L. Raymer.
Bioinformatics and Functional Genomics, by Jonathan Pevsner.
Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, by Andreas D. Baxevanis and B. F. Francis Ouellette.
Bioinformatics with Python Cookbook Third edition by Tiago Antao

Resources

1. URL : http://www.biopython.org

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PROGRAM NAME: B.Sc (Honours) in Data Science
COURSE NAME: ARTIFICIAL INTELLIGENCE

COURSE CODE: HDS621 **PPW: 4**
YEAR/SEMESTER: III/VI **NO. OF CREDITS: 4**

Effective from academic Year 2024-25
(60 Hours)

COURSE OBJECTIVE: To enable students relate to the concepts of game playing and problem solving through various methods in Artificial Intelligence.

UNIT-WISE COURSE OBJECTIVES:

COb1: To identify Problem, Problem Space and Problem Search.
COb2: To implement various Search techniques that help in different types of problem solving.
COb3: To explain on the intelligent agents, their performance measures and Learning Concepts.
COb4: To interpret Game playing as a Problem search and applications of Artificial Intelligence in real-world.

UNIT-I: **15 Hrs**
Introduction to Artificial Intelligence- Introduction, AI Techniques, Problem Solving with AI, AI Models, Data acquisition and Learning Aspects in AI, **Problem Solving-** Problem Solving Process, Formulating Problems, Problem Types and Characteristics, Performance Measuring, Problem Space and Search, Problem Reduction Methods, Real-World Problems.
(Ch: 1 and 2)

UNIT-II: **15 Hrs**
Uninformed Search: General Search Algorithm, Uninformed Search Methods: Breadth-First Search (BFS), Uniform Cost Search, Depth-First Search.

Informed Search: Generate and Test, Best First Search, A* search, Local Search Algorithms and Optimisation Problems- Hill Climbing Search, Adversarial Search Methods- Minimax Algorithm.
(Ch: 3 and 4)

UNIT-III: **15 Hrs**
Intelligent Agent: What is an intelligent agent? Rationality and Rational Agent, Performance Measures, Rationality and Performance, Flexibility and Intelligent Agents, Task Environment and its Properties.

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Learning: What is Machine Learning? Learning Paradigms, Learning Concepts, Methods and Models.
(Ch: 5 and 10)

UNIT-IV: **15 Hrs**

Game Playing: Important Concepts of Game Playing, Game Playing and Knowledge Structure, Game as a Search Problem.

Applications of Artificial Intelligence: Range of Applications, AI: Applications and Examples.
(Ch: 15 and 19)

PRESCRIBED BOOK:

1. Parag Kulkarni, Prachi Joshi, Artificial Intelligence- Building Intelligent Systems, First Edition, 2021.

REFERENCE BOOKS:

1. Elaine Rich, Artificial Intelligence, Tata-McGraw Hill, Third Edition, 2012.
2. Stuart Russell and Peter Norvig, Artificial Intelligence: A modern Approach, Third Edition, 2018.

COURSE OUTCOMES: At the end of the course students will be able to

CO1: Outline problem, problem space based on problem characteristics.
CO2: Choose the appropriate search technique for various problems.
CO3: Summarize about various intelligent agents and the learning concepts.
CO4: Articulate game playing as a problem search and the real-world applications of Artificial Intelligence.

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PROGRAM NAME: B.Sc (Honours) in Data Science
COURSE NAME: CLOUD COMPUTING (ELECTIVE – IA)

COURSE CODE: HDS622A **PPW: 4**
YEAR/SEMESTER: III/VI **NO. OF CREDITS: 4**

Effective from academic Year 2024-25
(60 Hours)

COURSE OBJECTIVE: To impart knowledge in students with the concepts of Cloud Computing and Virtualization.

UNIT-WISE COURSE OBJECTIVES:

COb1: To explain the concepts of cloud computing, cloud computing reference model, characteristics and its benefits.
COb2: To discuss the concepts of parallel computing, distributed computing and components of a distributed system.
COb3: To identify the characteristics of virtualization, pros and cons of virtualization.
COb4: To describe the cloud reference model, cloud computing architecture, and types of clouds.

UNIT-I: **15 Hrs**

Fundamentals: Introduction, Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, The Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms And Technologies (Amazon Web Services(AWS),Google App Engine, Microsoft Azure).
(Ch: 1)

UNIT-II: **15 Hrs**

Principles of Parallel and Distributed Computing: Eras of Computing, Parallel Vs. Distributed Computing, Elements of Parallel Computing, What is Parallel Processing? , Hardware Architectures for Parallel Processing, Approaches to Parallel Programming, Levels of Parallelism, Laws of Caution, Elements of Distributed Computing, General Concepts and Definitions, Components of a Distributed System, Architectural Styles for Distributed Computing, Models for Inter-process Communication, Technologies for Distributed Computing, Remote Procedure Call, Distributed Object Frameworks, Service-Oriented Computing.
(Ch: 2)

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UNIT - III: **15 Hrs**

Virtualization: Introduction, Characteristics of Virtualized Environments, Increased Security, Managed Execution, Portability, Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Advantages of Virtualization, The Other Side of the coin: Disadvantages, Technology Examples, Xen: Paravirtualization, VMware: Full Virtualization, Microsoft Hyper-V.

(Ch: 3)

UNIT-IV: **15 Hrs**

Cloud Computing Architecture: Introduction, Cloud Reference Model, Architecture, Infrastructure/Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open challenges, Cloud definition, Cloud Interoperability and Standards, Scalability and Fault Tolerance, Security, Trust, and Privacy, Organizational Aspects.

(Ch: 4)

PRESCRIBED BOOK:

1. Raj kumar Buyya, ChristianVecchiola, S.Thamarai Selvi, Mastering Cloud Computing, McGraw Hill Education (India) Private Limited, 2013.

REFERENCE BOOKS:

1. Rajkumar Buyya, James Broberg, Andrzej Goscinski , Cloud Computing: Principles and Paradigms , Wiley Publisher, 2011.
2. Thomas Erl,Zaigham Mahmood and Ricardo Puttini , Cloud Computing: Concepts, Technology & Architecture, Pearson Education India; 1st edition, 2014.

COURSE OUTCOMES: At the end of the course, students will be able to

CO1: Explain cloud computing, cloud computing reference model and characteristics.
CO2: Paraphrase parallel computing, distributed computing and components of a distributed system.
CO3: Apprehend characteristics of Virtualization, technology examples of virtualization.
CO4: Identify cloud reference model, cloud computing architecture, and types of clouds.

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PROGRAM NAME: B.Sc (Honours) in Data Science
COURSE NAME: BLOCKCHAIN TECHNOLOGY (ELECTIVE – IB)

COURSE CODE: HDS622B **PPW: 4**
YEAR/SEMESTER: III/VI **NO. OF CREDITS: 4**

Effective from academic Year 2024-25
(60 Hours)

COURSE OBJECTIVE: To impart knowledge in students to develop web-based applications.

UNIT-WISE COURSE OBJECTIVES:

COb1: To describe the concepts of Blockchain and Decentralized Systems.
COb2: To demonstrate Hash Functions and Consensus Methods.
COb3: To discuss Blockchain Components and its Allied Technologies.
COb4: To illustrate the concepts of Smart Contracts and Blockchain Usecases.

UNIT-I: **15 Hrs**

Basics of Blockchain: Introduction, Concept of Blockchain, History, Definition of Blockchain, Fundamentals of Blockchain, Characteristics of Blockchain, Consensus in Trust-Building Exercise; Public, Private, and Hybrid Blockchains, Distributed Ledger Technologies, DLT Decentralized Applications and Databases, Architecture of Blockchain, Transactions, Chaining Blocks, Value Proposition of Blockchain Technology.

Decentralized System: Introduction, Distributed Decentralized Databases, Decentralized Enterprise, Decentralization, Disintermediation, Decentralized Enterprise Regulation.

(Ch: 1 and 2)

UNIT-II: **15 Hrs**

Hash Functions: Introduction, Hashing, Message Authentication Code, Secure Hash Algorithm (SHA-1), Secure Hash Algorithm Version, Distributed Hash Tables, Hashing and Data Structures, Hashing in Blockchain Mining.

Consensus: Introduction, Consensus Approach, Consensus Algorithms, Byzantine Agreement Methods.

(Ch: 3 and 4)

UNIT-III: **15 Hrs**

Blockchain Components: Introduction, Ethereum, History, Ethereum Virtual Machine, Working of Ethereum, Ethereum Clients, Ethereum Key Pairs, Ethereum Addresses, Ethereum Wallets, Ethereum Transactions, Ethereum Languages, Ethereum Development Tools.

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Blockchain and Allied Technologies: Blockchain and Cloud Computing, Characteristics of Blockchain Cloud, Blockchain and Artificial Intelligence, Blockchain and IoT, Blockchain and Machine Learning, Blockchain and Robotic Process Automation.
(Ch: 5 and 11)

UNIT-IV: **15 Hrs**

Smart Contracts: Introduction, Smart Contracts, Absolute and Immutable, Contractual Confidentiality, Law Implementation and Settlement, Chracteristics, Internet of Things, Utilities: Smart Grid, Proof of Origin, Supply Chain Management, Medical Sciences, Finance, Media and Entertainment, Public Services, Legal Services, Darknet, The Future.
Blockchain Vertical Solutions and Use Cases: Blockchain, Blockchain in Insurance, Assets Management, Smart Assets, Electronic Currency, Maufacturing.
(Ch: 7 and 10)

PRESCRIBED BOOK:

1. Kumar Saurabh, Ashutosh Saxena, Blockchain Technology Concpets and Applications, Wiley Publications, First Edition, 2020.

REFERENCE BOOKS:

1. Daniel Hellwig, Goran Karlic, Arnd Huchzermeier, Build Your Own Blockchain – A Practical guide to Distributed Ledger Technolog, Springer,2020.
2. Arshdeep Bahga, Vijay Madisetti, Blockchain Applications – A Hands-on Approach, VPT Publications, 2018.
3. Debajani Mohanty, Blockchain from Concept to Execution, BPB Publications, 2018.

COURSE OUTCOMES: At the end of the course students will be able to

CO1: Explain the concepts of Blockchain and Decentralized Systems.
CO2: Implement Hash Functions and Consensum Methods.
CO3: Summarize Blockchain Components and its Allied Technologies.
CO4: Paraphrase the concepts of Smart Contracts and Blockchain Usecases

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PROGRAM NAME: B.Sc (Honours) in Data Science
COURSE NAME: NETWORK SECURITY (ELECTIVE-IIA)

COURSE CODE: HDS623A **PPW: 4**
YEAR/SEMESTER: III/VI **NO. OF CREDITS: 4**

Effective from academic Year 2024-25
(60 Hours)

COURSE OBJECTIVE: To enhance the student's knowledge on security issues those are seen in the present society and understand the ways to overcome them.

UNIT-WISE COURSE OBJECTIVES:

CObj1: To discuss the overview of security attacks, encryption techniques.
CObj2: To describe public key cryptology and principles.
CObj3: To illustrate authentication systems and hash functions.
CObj4: To apply about different cryptographic algorithms

UNIT-I: **15 Hrs**
Security attacks, Security Services, Model for network security, conventional encryption model, Classical encryption techniques, DES, Triple DES, international data encryption algorithm.
(Ch: 1, 2, 3 and 6)

UNIT-II: **15 Hrs**
Public – key cryptology, principles of public – key cryptosystems, RSA algorithm, key management, distribution of public keys, public key – distribution of secret keys.
(Ch: 9 and 14)

UNIT - III: **15 Hrs**
Authentication and digital systems, authenticate requirements – functions, cryptographic checksum, hash function, digital signatures, authentication protocols, Kerberos, X-509 directory, authentication services.
(Ch: 12, 13 and 15)

UNIT-IV: **15 Hrs**
Diffie – Hellmann key exchange, digital signature standards.
Cryptographic algorithms, The MD 5 message digest algorithm, Secure Hash algorithm, Electronic mail and management security – pretty good privacy (PGP).
(Ch: 12, 13 and 15)

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PRESCRIBED BOOK:

1. William Stallings, Cryptography and Network Security – Principles and Practice, Sixth Edition, Kindle Edition, 2017.

REFERENCE BOOKS:

1. Behrouz A Forouzan, Debdeep Mukhopadhyay, Cryptography and Network Security, McGraw-Hill Education, SIE, Third Edition, 2015.
2. Atul Kahate, Cryptography and Network Security, Mc Graw Hill, 2nd Edition, 2009.
3. Bernard Menezes, Network Security and Cryptography, CENGAGE Learning, First Edition, 2010.

COURSE OUTCOMES: At the end of the course students will be able to

CO1: Paraphrase security attacks, encryption techniques.
CO2: Explain public key cryptology and principles.
CO3: Apply authentication systems and hash functions.
CO4: Illustrate different cryptographic algorithms.

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PROGRAM NAME: B.Sc (Honours) in Data Science
COURSE NAME: INTERNET OF THINGS (ELECTIVE –IIB)

COURSE CODE: HDS623B **PPW: 4**
YEAR/SEMESTER: III/VI **NO. OF CREDITS: 4**

Effective from academic Year 2024-25
(60 Hours)

COURSE OBJECTIVE: To enhance the student's knowledge to understand the advancements in sensor networks, mobile devices, wireless communications, networking and cloud technologies.

UNIT-WISE COURSE OBJECTIVES:

COb1: To explain the overview of internet of things, IoT enabling technologies, domain-specific IoTs, know the similarities and differences between IoT and M2M.
COb2: To describe the generic design methodology for Internet of Things and the basics of python.
COb3: To demonstrate a new device called as Raspberry Pi device and usage of cloud platforms and frameworks and services.
COb4: To summarize different case studies and various approaches to collect and analyze the data generated.

UNIT-I: **15 Hrs**
Introduction to Internet of Things (IoT): physical, logical design of IoT, IoT enabled technologies, IoT levels & development templates.
Domain specific IoTs, IoT and M2M: Introduction, M2M, Difference between IoT and M2M.
(Ch:1, 2 and 3)

UNIT-II: **15 Hrs**
IoT platforms Design Methodology: Introduction, IoT design Methodology, Case Study on IoT system for weather monitoring.
IoT Systems: logical design with Python: Python data types & data structures, control flow, functions, modules, packages, date/time operations, Python packages for interest of IoT.
(Ch: 5 and 6)

UNIT - III: **15 Hrs**
IoT Physical Devices and Endpoints: What is IoT Device, Exemplary Device- Raspberry Pi, about the board, Programming Raspberry Pi with Python, about other IoT devices.
IoT physical servers and cloud offerings: Introduction, WAMP, Python Web Application Framework –Django, Amazon Web Services for IoT.
(Ch:7 and 8)

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UNIT-IV: **15 Hrs**

Case Study illustrating IoT Design: Introduction, Home Automation, Home Intrusion Detection, Cities, Weather Monitoring System, Agriculture.

Data Analytics for IoT: Introduction, MapReduce programming model, MapReduce job execution workflow, Hadoop cluster setup, Introduction to Apache Oozie, Define Apache Spark, Apache Storm environment introduction

Tools For IoT: Introduction, chef components.

(Ch: 9, 10 and 11)

PRESCRIBED BOOK:

1. Arshdeep Bahga, Vijay Madisetti, Internets of Things – a Hands-on Approach, Second edition, 2016.

REFERENCE BOOKS:

1. Don Deloache, Emil Berthelsen and Wael Elrifai, The future of IoT: leveraging the shift to a data-centric world, self published., 2017.
2. Adrian McEwen(author), hakim cassimally, Designing the Internet of Things, 1st edition, ISBN- 13:978-1118430620., 2014.
3. Raj Kumar buyya (editor), Amir vahiddastjerdi (editor), Internet of things: principles and paradigms 1st edition, ISBN-13: 978-0128053959, 2016.

COURSE OUTCOMES: At the end of the course, students will be able to

CO1: Paraphrase the internet of things, IoT enabling technologies.
CO2: Summarize the generic design methodology for the Internet of Things and the basics of python.
CO3: Identify Raspberry Pi device, cloud platforms, frameworks, and services.
CO4: Categorize various case studies and approaches to collect and analyze the data generated.

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PROGRAM NAME: B Sc (Honours) Data Science

COURSE NAME: Economic Theory and Financial Markets

Effective from academic Year 2025-26

(60 Hours)

COURSE CODE: HDS624
YEAR/SEMESTER: III/VI

PPW: 4
NO. OF CREDITS: 4

Course Objective: This course is designed to introduce the basic concepts and principles of microeconomics and macroeconomics theory and acquaint the students with the elementary understanding of the financial markets.

Unit Wise Objectives:

COb1: To familiarize with the concept of microeconomics principles, equilibrium, and the role of prices in allocating scarce resources for optimum use.
COb2: To learn the different approaches for the calculation of national Income and understand the concept of circular flow of Income and inflation
COb3: To enable the students to acquaint the elementary understanding of the financial markets.
COb4: To equip with the basic understanding of the portfolio selection and the trade-off between risk and return.

Unit 1: Introduction to Microeconomics

Resource allocation – economic laws – market and market mechanism – demand and supply – determinants of demand/supply; demand/supply schedule and demand/supply curve - shifts in the demand/supply curve, demand, and supply together - concept of equilibrium - how prices allocate resources; Concept of elasticity

Unit 2: Introduction to Macroeconomics

Basic concepts in macroeconomics – stocks and flows – static and dynamic equilibrium – national income concepts – simple problems on National Income concepts - circular flow of income – measurement of national income - Real versus Nominal GDP – GDP Deflator, Inflation and its types- Trade cycles- Features and its phases.

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Unit 3: Financial Markets

Basics of financial markets and financial environment – major players in financial markets – instruments of financial markets – financial intermediation – investment banking and brokerage services – securities – types of securities – market for securities – how and where traded – initial public offering (IPO) – secondary markets

Unit 4: Introduction to Security Analysis

Portfolio theory and portfolio selection – Investment – gambling and speculation -Risk and Return – Concepts - Relationship Between Risk and Return- trade-off between risk and return- Risk Diversification- Systemic and Systemic risk; Measuring the Risk-Variance and Standard Deviation.

Course Outcomes:

At the end of the course the students will be able to:

CO1: Examine the role of market mechanism in the allocation of scarce resources for optimum use.
CO2: Demonstrate the knowledge to understand the concepts for the calculation of national income.
CO3: Describe the functioning of the financial markets.
CO4: Evaluate the risk and return of an investment for portfolio selection.

Suggested Reading:

1. Ahuja, A.L: Principles of Economics. S. Chand and company Ltd.
2. Chopra, P. N: Microeconomics. Kalyani Publications.
3. Ahuja, H.L: Macro Economic Theory policy, S. Chand Publishing.
4. Jhingan, M. L: Macro Economic Theory, Vrinda Publications.
5. Investment Analysis and Portfolio Management: Prasanna Chandra, TMH, third edition.
6. Security Analysis and Portfolio Management: Punithavathy Pandian, Vikas publishing House.

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PROGRAM NAME: B.Sc (Honours) in Data Science

COURSE NAME: PROJECT

COURSE CODE: HDS625
YEAR/SEMESTER: III/VI **NO. OF CREDITS: 8**

Project Course shall be evaluated for 200 marks, out of which, 60 marks shall be for Internal Evaluation and 140 marks for the End Examination (Viva–Voce). Every student shall be required to submit a thesis or dissertation on a topic approved by the Supervisor.

Rules and Regulation

All final year undergraduate students are mandatory to take Project Work as a partial fulfilment in awarding Bachelor's Degree in Honours Data Science from Bhavan's Vivekananda College of Science, Humanities and Commerce. Read the following rules and regulations clearly before submitting the proposal.

- **Internal Assessment (25 marks)**
  - First seminar (25 marks- between 25 to 30 days after commencement of class work). This seminar includes studying the existing system, literature survey, and problem definition.
  - Second seminar(25 marks - between 55 to 60 days after commencement of class work). This seminar includes the requirements specification, analysis, design, and partial implementation.
- **External Assessment (150 marks)**

  The students should submit one page of synopsis on the project work for display on the notice board.

  The project presentation is for 10 minutes, followed by 05 minutes for discussion.

  The student should submit a dissertation/technical write-up on the project. At least three faculties will be associated with the project seminar to evaluate students for the award of seasonal marks, which will be on the basis of performance in all three items (synopsis, presentation, dissertation/technical write-up).

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Dissertation	:	80 Marks
Presentation	:	30 Marks
Viva	:	40 Marks

Rules for Students

Basic rules and regulations that each student group needs to follow:

1. Each student must work in a group or individually, and a Maximum of **ONLY FOUR (04)** Students are allowed in a group.

2. Decide a research/project topic, preferably based on your area of interest and expertise.

3. Each student is encouraged to propose some research topics and work on a research-based project

4. Students must register their chosen topics by filling out the Final Year Project Proposal Form, signed by the supervisor, and submit to the Coordinator.

5. Plan the work properly and prepare a work schedule for 3 Months with the guidance of the supervisors.

6. Students must strictly follow the work schedule to complete the project within the stipulated time frame.

7. Each student must meet his/her supervisor regularly four hrs a week, so that the progress of their work can be monitored closely.

8. Submit the Project work by the end of semester 6 to the supervisor and examiners.

9. Students are required to prepare a project presentation and **Show their working project during Presentation/Viva.**

10. Ensure there are no grammatical errors in the project work before submitting it to respective supervisors.

11. Students are strictly notified that they are **NOT Allowed to COPY or PURCHASE** the project from the market and present it as their own.

12. Students are **NOT allowed** to use previously made project and claim it as their own.

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13. ONE copy of the project work certified by the supervisor and Course Coordinator shall be submitted to the Exam Section after getting a plagiarism check (Similarity index should be less than 40%).

14. The Principal shall appoint the external examiner from a panel of one or two examiners who are eminent in that particular field given by the HOD.

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