B.E (Electrical and Computer Science Engineering)

Honors Degree Programme

Semester	Subject Name	Credit
V	Python Programming	3
V	Python Programming Lab	2
VI	Computer Networks	3
VI	Software Engineering	3
VII	Artificial Intelligence and machine learning	3
VII	Fundamentals of Data Science and Analytics	3
VIII	Cyber Security	3

Total Credits : 20

PYTHON PROGRAMMING

Course Objectives:

- ➢ To understand the basics of algorithmic problem solving.
- ➢ To learn to solve problems using Python conditionals and loops.
- ➢ To define Python functions and use function calls to solve problems.
- ➢ To use Python data structures - lists, tuples, dictionaries to represent complex data.
- ➢ To do input/output with files in Python.

COURSE OUTCOMES:

- ➢ Upon completion of the course, students will be able to
- ➢ Develop algorithmic solutions to simple computational problems.
- ➢ Develop and execute simple Python programs.
- ➢ Write simple Python programs using conditionals and loops for solving problems.
- ➢ Decompose a Python program into functions.
- ➢ Represent compound data using Python lists, tuples, dictionaries etc.
- ➢ Read and write data from/to files in Python programs.

UNIT I

INTRODUCTION TO COMPUTING AND PROBLEM SOLVING

Introduction to Python Programming – Python Interpreter and Interactive Mode – Variables and Identifiers – Arithmetic Operators– Values and Types – Statements.

UNIT II

CONDITIONALS AND FUNCTIONS

Operators – Boolean Values – Operator Precedence – Expression – Conditionals: If-Else Constructs– Loop Structures/Iterative Statements – While Loop – For Loop – Break Statement – Function Call and Returning Values – Parameter Passing – Local and Global Scope – Recursive Functions.

UNIT III

SIMPLE DATA STRUCTURES IN PYTHON

 Introduction to Data Structures – List – Adding Items to a List – Finding and Updating an Item – Nested Lists – Cloning Lists – Looping Through a List – Sorting a List – List Concatenation – List Slices – List Methods – List Loop – Mutability – Aliasing – Tuples: Creation, Accessing, Updating,Deleting Elements in a Tuple, Tuple Assignment, Tuple as Return Value, Nested Tuples, Basic Tuple Operations – Sets.

UNIT IV

STRINGS, DICTIONARIES, MODULES

Strings: Introduction, Indexing, Traversing, Concatenating, Appending, Multiplying, Formatting, Slicing, Comparing, Iterating – Basic Built-In String Functions – Dictionary: Creating, Accessing, Adding Items, Modifying, Deleting, Sorting, Looping, Nested Dictionaries Built-in Dictionary Function – Finding Key and Value in a Dictionary – Modules – Module Loading and Execution – Packages – Python Standard Libraries.

UNIT V

FILE HANDLING AND EXCEPTION HANDLING

Introduction to Files – File Path – Opening and Closing Files – Reading and Writing Files – File Position – Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions.

TEXT BOOK:

1. ReemaThareja, "Python Programming using Problem Solving Approach", Oxford University Press, 2017.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition, Shroff/O'Reilly Publishers, 2016. (http://greenteapress.com/wp/thinkpython/).

REFERENCES:

1. Guido van Rossum, Fred L. Drake Jr., "An Introduction to Python – Revised and Updated for Python 3.2", Network Theory Ltd., 2011.
2. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and Expanded Edition, MIT Press , 2013
3. Charles Dierbach, "Introduction to Computer Science using Python", Wiley India Edition, 2016.
4. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015. 5. Kenneth A. Lambert, "Fundamentals of Python: First Programs", Cengage Learning, 2012.

FIFTH SEMESTER

PYTHON PROGRAMMING LABORATORY

CourseObjectives:

- ➢ To write, test, and debug simple Python programs.
- ➢ Read and write data from/to files in Python.
- ➢ Represent compound data using Python lists, tuples, dictionaries.
- ➢ Use functions for structuring Python programs.
- ➢ To implement Python programs with conditionals and loops.

Course Outcomes

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

- ➢ Write, test, and debug simple Python programs.
- ➢ Implement Python programs with conditionals and loops.
- ➢ Develop Python programs step-wise by defining functions and calling them.
- ➢ Use Python lists, tuples, dictionaries for representing compound data.
- ➢ Read and write data from/to files in Python

EXPERIMENTS:

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame
14. PLATFORM NEEDED Python 3 interpreter for Windows/Linux

COMPUTER NETWORKS

Course Objectives:

- To develop an understanding of modern network architectures from a design and performance perspective.
- To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
- To provide an opportunity to do network programming
- To provide a WLAN measurement ideas.

Course Outcomes:

- Explain the functions of the different layer of the OSI Protocol.
- Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block.
- For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component
- For a given problem related TCP/IP protocol developed the network programming.
- Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW,HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

UNIT I

Data communication Components: Representation of data and its flow Networks , Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Introduction to wireless networks:- Wi-Fi : 802.11 wireless LAN, Introduction to SDN (Software Defined Network) ,Introduction to VSN(Visual Sensor Networks) and WSN (Wireless Sensor Networks).

UNIT II

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA,CSMA/CD,CDMA/CA.

UNIT III

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping –ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols. Routing Algorithms, Routing in the Internet, Broadcast and Multicast Routing.

UNIT IV

Transport Layer: Process to Process Communication, User Datagram Protocol(UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

UNIT V

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP,HTTPS, TFTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography.

TEXT BOOKS:

1. Data Communication and Networking, 5th Edition, Behrouz A. Forouzan, McGrawHill.
2. Data and Computer Communication, 10th Edition, William Stallings, Pearson PrenticeHall India

REFERENCES:

1. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
2. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.

TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

SOFTWARE ENGINEERING

Course Objectives:

- Apply software engineering theory, principles, tools and processes, as well as the theory and principles of computer science.
- Design and experiment with software prototypes
- Demonstrate professionalism including continued learning and professional activities
- Build solutions using different technologies, architectures and life-cycle approaches in the context of different organizational structures
- Insist the development, adoption and sustained use of standards of excellence for software engineering practices
- Communicate effectively through software development
- Contribute to society by behaving ethically and responsibly in software development

COURSE OUTCOMES:

- Basic knowledge and understanding of the analysis and design of complex systems.
- Ability to apply software engineering principles and techniques.
- Design and implement innovative features in a development process.

UNIT I

Introduction –Definition-S/W Engineering Paradigm – System engineering –Software characteristics -verification – validation- Software Cost Estimation TechniquesCOCOMO-life cycle models-Water fall, Prototype, Evolutionary, Incremental, spiral, WINWIN Spiral, Agile

UNIT II

System Analysis-Requirements analysis-Functional-Non-Functional-Analysis principlesPrototyping-Software Requirement Specification – data dictionary-data modeling, functional modeling and behavioral Modeling.

UNIT III

Design Process and Principles – Software design and types- Design concepts: Abstraction, Refinement, Modularity and software architecture control hierarchy, structural partitioning and information hiding. Effective modular design: functional independence cohesion and coupling – design documentation.

UNIT IV

Design Standards: -User interface design, Transform mapping and Transaction mapping. Design for Real-time Systems: System Considerations -analysis and simulation of real time Systems, Software Configuration System

UNIT V

Software Testing Techniques: Software testing fundamentals-White Box Testing-Black box testing- Software Testing Strategies: A strategic approach to software testing- Unit testing-Integration testing validation testing-system testing, Software Maintenance, Reverse Engineering and Re-Engineering.

Mini Project Implementation

TEXT BOOK:

1. Roger Pressman.S., " Software Engineering : A Practitioner's Approach",McGraw Hill 7th edition.
2. I Sommerville, " Software Engineering 10th edition: ", Addison Wesley, 2015

REFERENCES:

1. P fleeger, " Software Engineering ",4th Edition, Pearson Education India, 2010.
2. Carlo Ghezzi, Mehdi Jazayari, Dino Mandrioli " Fundamental of Software Engineering ", 2nd illustrated Edition, Prentice Hall of India,2003.
3. Watts S.Humphrey,"A Discipline for Software Engineering", Pearson Education, 2007.

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Course Objectives:

- ➢ Introduce and define the meaning of Intelligence and explore various paradigms for knowledge encoding in computer systems.
- ➢ Introduce subfields of AI such as NLP, Game Playing, Bayesian Models, etc.
- ➢ Introduce the concept of learning patterns from data and develop a strong theoretical foundation for understanding state of the art Machine Learning algorithms.

UNIT - I

Defining Artificial Intelligence, Defining AI techniques - State Space Search and Heuristic Search Techniques - Production systems and characteristics, Hill Climbing, Breadth first and depth first search, Best first search

UNIT - II

Representations and Mappings, Approaches to knowledge representation - Representing simple facts in logic, Computable functions and predicates, Procedural vs Declarative knowledge, Logic Programming, Forward vs backward reasoning- Non-monotonic Reasoning, Logics for non-monotonic reasoning

UNIT - III

Idea of Machines learning from data, Classification of problem – Regression and Classification, Supervised and Unsupervised learning - Model representation for single variable, Single variable Cost Function, Gradient Decent for Linear Regression, Multivariable model representation, Multivariable cost function, Gradient Decent in practice, Normal Equation and non-invertibility

UNIT - IV

Classification, Hypothesis Representation, Decision Boundary, Cost function, Advanced Optimization, Multi-classification (One vs All), Problem of Over fitting, Regularization

UNIT - V

Case Studies: Neural Networks - Support Vector Machines - Recommender Systems

Text Books:

1. Artificial Intelligence: A Modern Approach, Stuart Russel, Peter Norvig,2020

 2. Artificial Intelligence, 2nd Edition, Rich and Knight,2020

3. Machine Learning, Tom M. Mitchell,2018

4. Building Machine Learning Systems with Python, Richert& Coelho,2018

FUNDAMENTALS OF DATA SCIENCE AND ANALYTICS

Course Outcome:

- ➢ Learn about the Data Evolution and understanding the data
- ➢ Understand the basic concepts of data science.
- ➢ Analyze the basic concepts of Bigdata.
- ➢ Understand the fundamental principles of R.
- ➢ Apply the statistical measures of R in real time environment

UNIT I

Linear algebra for data science: algebraic view - vectors, matrices, product of matrix &vector, rank, null space, solution of over-determined set of equations and pseudo-inverse. Linear algebra for data science: geometric view - vectors, distance, projections, eigen value decomposition.

UNIT II

Statistics: descriptive statistics, notion of probability, distributions, mean, variance, covariance, and covariance matrix.

UNIT III

Optimization: Typology of data Science problems and a solution framework. Univariate and multivariate linear regression Model assessment- cross validation.

UNIT IV

Verifying assumptions used in linear regression, Assessing importance of different variables, subset selection

UNIT V

Introduction to classification and classification using logistics regression, Classification using various clustering techniques.

TEXT BOOKS

    1. Jeffrey S.Saltz, Jeffre M. Stanton, "An Introduction to Data Science", Sage Publications,2018

REFERENCES

1. Nina Zumal, John Mount (2014). Practical Data science in R, Managing Publication Company
2. Bernard Kolman, Robert C. Busby and Sharon Ross (2004). Discrete Mathematical Structures,New Delhi: Prentice Hall
3. V. Bhuvaneswari, T. Devi, (2016). Big Data Analytics: A Practitioner's Approach, Bharathiar University
4. https://nptel.ac.in/courses/106/106/106106179/

EIGHTH SEMESTER

CYBER SECURITY

Course Outcome:

➢ To understand the concept of Cyber security and issues and challenges associated with it.

➢ To understand the cyber crimes, their nature, legal remedies and as to how report the crimes through available platforms and procedures.

➢ Able to appreciate various privacy and security concerns on online Social media and understand the reporting procedure of inappropriate content, underlying legal aspects and best practices for the use of Social media platforms.

➢ To understand the basic concepts related to E-Commerce and digital payments

➢ To understand the basic security aspects related to Computer and Mobiles. They will be able to use basic tools and technologies to protect their devices.

Unit I

Introduction to Cyber security

Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.

Unit II

Cyber crime and Cyber law

Classification of cyber crimes, Common cyber crimes- cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi , Reporting of cyber crimes, Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences, Organisations dealing with Cyber crime and Cyber security in India, Case studies.

Unit III

Social Media Overview and Security

Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case studies.

Unit IV

E - C o m m e r c e and Digital Payments

Definition of E- Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commerce threats, E-Commerce security best practices, Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments-Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments, Digital payments related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in unauthorised banking transactions. Relevant provisions of Payament Settlement Act,2007

Unit V Digital Devices S e c u r i t y , Tools and Technologies for Cyber Security

End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions.

References:

1. Cyber Crime Impact in the New Millennium, by R. C Mishra ,Auther Press. Edition 2010.
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by SumitBelapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001)
4. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd.
5. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers, Edition 2020
6. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.
7. Fundamentals of Network Security by E. Maiwald, McGraw Hill., Edition 2020