Computer Networks
(CSGE301)
Generic Elective - (GE) Credit:6

Course Objective

This course covers the fundamental concepts of computer networks, standard models of computer networks having layered architecture, data communication, network topologies, web technologies and internet applications.

Course Learning Outcomes

On successful completion of this course, a student will be able to:

1. state the use of computer networks and different network topologies.
2. distinguish between LAN, MAN, WAN.
3. distinguish between Intranet, Extranet and Internet.
4. compare OSI and TCP/IP architectures
5. enumerate different transmission media and describe the use of each of them.
6. design web pages using HTML.

Unit 1

Computer Networks: Introduction to computer network, data communication, components of data communication, data transmission mode, data communication measurement, LAN, MAN, WAN, wireless LAN, internet, intranet, extranet.

Unit II

Network Models: Client/ server network and Peer-to-peer network, OSI, TCP/IP, layers and functionalities.

Unit III

Transmission Media: Introduction, Guided Media: Twisted pair, Coaxial cable, Optical fiber. Unguided media: Microwave, Radio frequency propagation, Satellite.

Unit IV

LAN Topologies: Ring, bus, star, mesh and tree topologies. Network Devices: NIC, repeaters, hub, bridge, switch, gateway and router.

Unit V

Internet Terms: Web page, Home page, website, internet browsers, URL, Hypertext, ISP, Web server, download and upload, online and offline. Internet Applications: www, telnet, ftp, e-mail, social networks, search engines, Video Conferencing, e-Commerce, m-Commerce, VOIP, blogs.

Unit VI

Introduction to Web Design: Introduction to hypertext markup language (html) Document type definition, creating web pages, lists, hyperlinks, tables, web forms, inserting images, frames, hosting options and domain name registration. Customized Features: Cascading style sheet (css) for text formatting and other manipulations.

References

1. A.S. Tanenbaum David J. Wethrall, Computer Networks, Pearson publication, 2012

2. Behnouz A. Forouzan, Data Communication and Networking, McGraw-Hill Education, 2017.

3. T.A. Powell, HTML & CSS: The Complete Reference, 5th Edition, Tata McGraw-Hill, 2010.

Additional Resources

1. W. Stallings, Data and Computer Communications, 10th Edition, Pearson Education India, 2017.

2. Jessica Minnick, Web Design with HTML5 and CSS3, 8th Edition, Cengage Learning, 2015.

Practical

Practicals based on concepts mentioned in theory.

Teaching Learning Process

- Use of ICT tools in conjunction with traditional class room teaching methods
- Interactive sessions
- Class discussions

Assessment Methods

Written tests, assignments, quizzes, presentations.

Keywords

network topologies, data communication, OSI model, TCP/IP model, HTML, web design.

Data Science using Python
(CSGE603)
Generic Elective - (GE) Credit:6

Course Objective

Data Science also known as data driven science makes use of scientific methods, processes and systems to extract knowledge or insights from data in various forms (structured or unstructured). What are these methods and processes is the main concern of the Paper. This paper is designed with key learning goals of Data Science in mind, each of which represents a different level of learning for BA(P) students as an Generic Elective option. The learning goals help students to understand and solve the real world problems. After studying this paper student would be able to develop real world applications and to analyze the data.

Course Learning Outcomes

At the completion of the paper, students will be able to Create effective solutions to computing challenges in data science related real world projects. Effectively organize and manage data sets for data science projects. To analyze problems and identify solutions. Communicate data science problems, methods, and findings effectively, visually, and in writing. Critically evaluate various challenges in data Science.

Unit 1

Introduction: Introduction to Data Science, Data Science Basics, Need of Data Science, Life Cycle of Data Science, Challenges of Data Science Technology, Data Science Components,Applications of Data Science, Data Science Job Roles,Tools for Data Science, Structured Data, Unstructured Data.

Unit 2

Python Basics:

Overview of Python, data types, Operators, Precedence and associativity, Decision Making, Loops, Functions, Scoping, Strings, Vectors, Lists, Matrices, Arrays, Factors, File System, reading and writing data.

Unit 3

Data Structures in Python: Lists, Tuples, Dictionaries, Introduction to Numpy, Arrays Creating and arrays Indexing, Data Processing using Arrays, About Pandas library.

Unit 4

Statistical Analysis:Mean, Harmonic Mean, Median, Mode, Standard Deviation, Central tendency, measures of dispersion, data Distribution, Analysis of Variance & co-variance, Linear Regression analysis.

Unit 5

Data Visualization:Overview of Data Visualization, Introduction to Matplot library, Line Plot, Bar Chart, Histogram, Box Plot, Scatter Plot, Function plot, animating the objects.

Unit 6

Case Study:Different Case Studies. References: 1. Python Data Science Handbook, Jakes Vander Plas O' Reilly2. Think Python, Allen B. Downy,O'reilly3. Python Programming a modular approach by Sheetal Taneja and Navin Kumar.4. Introduction to Statistical Learning, Gareth James, Daniela Written andTrevir Hostie, Springer.5. Data Visualizations, Noab Iliinsky and Julie Steele, O' Reilly

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Data Science using R
(CSGE602)
Generic Elective - (GE) Credit:6

Course Objective

Data Science also known as data driven science makes use of scientific methods, processes and systems to extract knowledge or insights from data in various forms (structured or unstructured). What are these methods and processes is the main concern of the Paper. This paper is designed with key learning goals of Data Science in mind, each of which represents a different level of learning for BA(P) students as an Generic Elective option. The learning goals help students to understand and solve the real world problems. After studying this paper student would be able to develop real world applications and to analyze the data.

Course Learning Outcomes

At the completion of the Paper, students will be able toCreate effective solutions to computing challenges in data science related real world projects. Effectively organize and manage datasets for data science projects. To analyze problems and identify solutions. Communicate data science problems, methods, and findings effectively, visually, and in writing. Evaluation of various challenges in data Science.

Unit 1

Introduction: Introduction to Data Science, Data Science Basics, Need of Data Science, Life Cycle

of Data Science, Challenges of Data Science Technology, Data Science Components,Applications of Data Science, Data Science Job Roles,Tools for Data Science, Structured Data, Unstructured Data.

Unit 2

R Programming Basics: Overview of R, R data types and objects, Operators, Precedence and associativity, Decision Making, Loops, Functions, Scoping, File System, Reading and writing Data..

Unit 3

Data Structures In R programming: Strings, Vectors, Lists, Matrices, Arrays, Factors, Data Frames.

Unit 4

Statistical Analysis: Mean, Harmonic Mean, Median, Mode, Standard Deviation, Central tendency, measures of dispersion, Data Distribution, Analysis of Variance & covariance, Summary Function, Z score Function, Linear Regression analysis, Multiple Regression, Logistic regression.

Unit 5

Data Visualization:Overview of Data Visualization, Pie Chart, Line Graphs, Bar Chart, Histogram, Box plot, Scatter Plot, Function plot,

Animating objects using R.

Unit 6

Case Study: Different Case Studies.

References

1. R for Data Science, Garret Grolemund and Hadley Wickham, O'Reilly.

2. Introduction to Statistical Learning, Gareth James, Daniela written, Travir Hostie and Robert Tibshirani, Springer.
3. Data Visualization with R, Thomas Rahif, Springer.

Database Management System
(CSGE201)
Generic Elective - (GE) Credit:6

Course Objectives

The course introduces the concepts of database management systems to students, focusing on

basics such as the importance and significance of a database, data model, schema creation and normalization.

Course Learning Outcomes

On successful completion of the course, students will:

1. describe the features of database management systems.
2. differentiate between database systems and file systems.
3. model an application's data requirements using conceptual modelling tools like ER.diagrams and design database schemas based on the conceptual model.
4. write queries in relational algebra / SQL.
5. normalize a given database schema.

Unit 1

Introduction: Introduction to database, relational data model, DBMS architecture, data independence and data abstraction, DBA, database users, end users, front end tools

Unit 2

Data Modeling: Entity types, entity set, attribute and key, relationships, relation types, E-R diagrams, database design using ER diagrams

Unit 3

Relational Data Model: Relational model concepts, relational constraints, primary and foreign key, candidate key, alternate, composite, superkey.

Unit 4

Data redundancy, Normalization: 1NF, 2NF, 3NF.

Unit 5

Structured Query Language: Introduction to SQL, concepts of Data Definition Language (DDL) and Data Manipulation Language (DML), DDL queries like create a data base, drop a database, create table, drop table, alter table, DML queries like inserting data in a table, update in a table, delete data from a table, filter data.

Unit 6

Structured Query Language (continued..): Create relationships between database tables, auto increment, check, Null values, aggregate functions - min, max, count, average, sum, nested sub-queries, Join operations - inner, left join, right join, natural join, Cartesian product. group by, having, exists, case, order by, overview of forms and reports.

References

1. Avi Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, 6th edition, Tata McGraw-Hill Education, 2011.

2. R. Elmsasri,S. Navathe Fundamentals of Database Systems, Pearson Education, 7th edition, 2017,

3. I. Bayross, SQL, Pl/SQL the Programming Language of Oracle, 4th edition, BPB Publications, 2010.

Additional Resources

1. R. Ramakrishnan, J. Gehrke, Database Management Systems, 3rd edition, Tata McGraw Hill Education, 2014.

2. C.J. Date, A. Kanman and S. Swamynathan, An Introduction to Database Systems, 8th edition, Pearson, 2006.

3. MySQL : Reference Manual.

Teaching Learning Process

- Use of ICT tools in conjunction with traditional class room teaching methods
- Interactive sessions
- Class discussions

Assessment Methods

Written tests, assignments, quizzes, presentations.

Keywords

Databases, E-R diagrams, normalization, structured query language

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Information Security and Cyber Laws
(CSGE401)
Generic Elective - (GE) Credit:6

Course Objectives

This course introduces the students to the concepts of information security and different type of attacks in the cyber space. The course also introduces countermeasures to mitigate attacks and different existing cyber laws.

Course Learning Outcomes

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

1. Learn structure, mechanics and evolution of various crime threats

2. Learn to protect information systems from external attacks by developing skills in enterprise security, wireless security and computer forensics.

3. Analyse the risks involved while sharing their information in cyber space and numerous related solutions like sending protected and digitally signed documents

4. Insights of ethical hacking and usage of password cracking tools

5. get an overview of different ciphers used for encryption and decryption.

Unit 1

Definitions :Protection , Security, risk, threat, vulnerability, exploit, attack, confidentiality,integrity, availability, non-repudiation, authentication , authorization, codes,plain text,encryption, decryption,cipher text, key, ciphers, Symmetric and asymmetric cryptography, Public key , private key ,Crypt analysis,, Cyber forensics.

Substitution cipher (Caeser), Transposition cipher (Rail-Fence),

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Unit 2

Risk analysis, process, key principles of conventional computer security, security policies, data

protection, access control, internal vs external threat, security assurance, passwords, access control, computer forensics and incident response.

Unit 3

CYBER ATTACKS(definitions and examples):

- Denial-of-service attacks.
- Man-in-the-middle attack.
- Phishing , spoofing and spam attacks.
- Drive-by attack.
- Password attack.
- SQL injection attack.
- Cross-site scripting attack.
- Eavesdropping attack.
- Birthday attack
- Malware attacks
- Social Engineering attacks

Unit 4

Brief Introduction of handling the attacks described in UNIT 3.

Firewalls, logging and intrusion detection systems, e-mail security, security issues in operating systems, ethics of hacking and cracking.

Unit 5

Definitions: Digital Signature and Electronic Signature, Digital Certificate

- [Section 43] Penalty and compensation for damage to computer etc.
- [Section 65] Tampering with computer source documents
- [Section 66A] Punishment for sending offensive messages through communication service etc.
- [Section 66B] Punishments for dishonestly receiving stolen computer resource or communication device
- [Section 66C] Punishment for identity theft
- [Section 66D] Punishment for cheating by impersonation by using computer resource
- [Section 66E] Punishment for violation of privacy
- [Section 66F] Punishment for cyber terrorism
- [Section 67] Punishment for publishing or transmitting obscene material in electronic form
- [Section 67A] Punishment for publishing or transmitting of material containing sexually explicit act, etc. in electronic form
- [Section 67B] Punishment for publishing or transmitting of material depicting children in sexually explicit act, etc. in electronic form
- [Section 72] Breach of confidentiality and privacy

Unit 6

Brief introduction of IT infrastructure in India.National agencies handling IT.

Practical

Practicals are based on the theory covered in the various units of the paper.

References

1. M. Merkow, J. Breithaupt, Information Security Principles and Practices, 5th Edition, Pearson Education.

2. Michael E. Whitman and Herbert J. Mattod, Priciples of Information Security, 5th Edition, Cengage Learning.

3. G.R.F. Snyder, T. Pardoe, Network Security, Cengage Learning, 2010

4. https://blog.netwrix.com/2018/05/15/top-10-most-common-types-of-cyber-attacks/

5.https://www.ibef.org/industry/infrastructure-sector-india.aspx

Additional Resources:

1. A. Basta, W.Halton, Computer Security: Concepts, Issues and Implementation, Cengage Learning India, 2008.

2. Anderson, Ross. Security engineering. John Wiley & Sons,

Assessment Methods

Written tests, assignments, quizzes, presentations.

Keywords

Information security, cyber laws, risk analysis, attacks.

IT Fundamentals
(CSGE501)
Generic Elective - (GE) Credit:6

Course Learning Outcomes

This course
Course Learning Outcomes

Learning Outcomes

By the end of this course, students will be able to:

· Develop a vocabulary of key terms related to the computer and to software program menus.

· Understand the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming

· Identify the components of a personal computer system.

· Demonstrate mouse and keyboard functions.

· Demonstrate window and menu commands and how they are used.

· Demonstrate how to organize files and documents on a USB/hard drive.

· Compose, format and edit a word document.

· Send email messages (with or without attachments).

· Navigate and search through the internet.

Unit 1

UNIT –I

Introduction: Introduction to logical organization of computer, input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, monitor, Printer, Plotter.

Unit 2

UNIT – II

Storage Devices: Primary memory, secondary memory, auxiliary memory.

Unit 3

UNIT –III

User Interface: Operating system as user interface, system tools, control panel settings.

Unit 4

UNIT –IV

Database: Introduction to database, use of spreadsheet as database, use of functions and

database operations in spreadsheet.

Unit 5

UNIT –V

Networks: Definition of network, classification of network, LAN, MAN, WAN, distinction among networks.

Unit 6

UNIT -VI

Internet Applications: Internet as a global network, Internet utilities – email, online banking, reservations etc.

Practical

Practical exercises based on concepts mentioned in theory using relevant software.

References

1. A. Goel, Computer Fundamentals, Pearson Education, 2010.

Additional Resources:

1. P. Aksoy, L. DeNardis, Introduction to Information Technology, Cengage Learning, 2006.

2. P. K. Sinha, Fundamentals of Computers, BPB Publishers, 2007.

Assessment Methods

Written tests, assignments, quizzes, presentations.

Keywords

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Multimedia and Web Design
(CSGE601)
Generic Elective - (GE) Credit:6

Course Objective(2-3)

This paper provides a self-paced, comprehensive review of concepts and techniques for

designing and developing attractive websites with multimedia components.

Course Learning Outcomes

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

a) Understand fundamental Web design principles and technologies·

b) Understand the detailed design plan required to create a successful Web site that considers audience needs, accessibility features, and various technical issues.

c) Understand the coverage of ownership, permissions, and copyright issues·

d) Incorporate text, images, animation, sound, and video into Web pages.

e) Create a website with popular multimedia authoring tools, such as Macromedia Flash.

Unit 1

Introduction: Definition of multimedia, Components, uses, applications

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Unit 2

Multimedia Input/ Output Devices: Scanner, camera, microphone, speaker, monitors, printers

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Unit 3

Multimedia Storage Devices: CD ROMs, DVDs, Blue ray disk

Unit 4

Multimedia tools: Sound editor, video editor, animator, authoring tools

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Unit 5

Web Designing: Concept of website, website as a communication resource, Internet, intranet and extranet, basic concepts related to website designing.

Unit 6

HTML: Introduction to hypertext markup language, document type definition, creating web pages, graphical elements, lists, hyperlinks, tables, web forms, inserting images, inserting audio, video and animation; frames, use of CSS.

Practical

Practicals based on concepts covered in theory

References

i) Tay Vaughan, Multimedia: Making It Work, McGraw Hill Education(India), Ninth Edition.

ii) J. A. Ramalho, Learn Advanced HTML 4.0 with DHTML, BPB Publications, 2007.

Teaching Learning Process

Use of ICT tools in conjunction with traditional class room teaching methods.

Assessment Methods

Continuous evaluation of students' performance by:

i) Assignments
ii) Written Tests
iii) Quizzes

Keywords

Multimedia, Website, HTML, CSS

Programming using Python
(CSGE101)
Generic Elective - (GE) Credit:6

Course Objective

This course is designed as the first course that introduces computers and programming to non-Computer Science students. The course focuses on the use of computer and programming to solve problems of different domains. It also introduces the concept of object-oriented programming.

Course Learning Outcomes

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

1. describe the components of a computer and notion of an algorithm.
2. apply suitable programming constructs and built-in data structures to solve a problem.
3. develop, document, and debug modular python programs.
4. use classes and objects in application programs and visualize data.

Unit 1

Computer Fundamentals and Problem Solving: Basic Computer Organization: CPU, memory, I/O Units. Problem solving using computer, notion of an algorithm.

Unit 2

Introduction to Python Programming:: Python interpreter/shell, indentation; identifiers and keywords; literals, numbers, and strings; operators (arithmetic operator, relational operator, boolean operator, assignment, operator, ternary operator and bitwise operator) and expressions

Unit 3

Creating Python Programs: Input and output statements, defining functions, control statements (conditional statements, loop control statements, break, continue and pass, exit function.), default arguments, errors and exceptions.

Unit 4

Strings and Lists: String class, built-in functions for string, string traversal, string operators and operations; Lists creation, traversal, slicing and splitting operations, passing list to a function

Unit 5

Object Oriented Programming: Introduction to Classes, Objects and Methods, Standard Libraries, File handling through libraries.

Unit 6

Built-in data structures: Tuples, sets, dictionary, stacks, and queues; searching and sorting.

Practical

Programs based on concepts covered in theory.

References

1. Sheetal Taneja, Naveen Kumar. Python Programming- A modular Approach. Pearson, 2018.
2. John V. Guttag. Introduction to computation and programming using Python. MIT Press, 2013.

Additional Resources

1. Y. Daniel Liang. Introduction to Programming using Python. Pearson, 2013.
2. Ashok Namdev Kamthane, Amit Ashok Kamthane, Programming and Problem Solving with Python, McGraw Hill Education, 2018

Teaching Learning Process

- Use of ICT tools, Hands-on
- Assessment Methods
- Internal Assessment through assignments, class tests and practical evaluation, Semester Exam – Theory and Practical

Keywords

Computer Hardware Organization, Problem solving for computer programming, Object oriented programming, Python