# LOYOLA ACADEMY

**DEGREE & PG COLLEGE**
**OLD ALWAL, SECUNDERABAD - 500 010, TELANGANA, INDIA**
**(An Autonomous Institution Affiliated to Osmania University)**
**Re-accredited with 'A' Grade (III Cycle) by NAAC**
**A Catholic Christian Minority Institution (Co-Education)**
**A "College with Potential for Excellence" by UGC**
www.loyolaacademy.edu.in **email:** info@loyolaacademy.edu.in **Ph:** 040-27862363/27860077


# SYLLABUS

of

# B.Sc. Computer Science & Cyber Security

For the Academic Year 2026-2027

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SYLLABUS

of

# B.Sc. Computer Science & Cyber Security

**Principal** **Dean** **Chairman, Board of Studies**

**Academic Year :2026-2027 for the Batch**

**2026-29, 2025-28 & 2024-27**

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## PROGRAMME OUTCOMES

**PO1: Scientific Knowledge.** Apply the knowledge of Science, Mathematics, Engineering & Technology fundamentals to solve the complex problems**.**

**PO2**:**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO3: Problem analysis:** Identify, formulate, research literature, and analyse complex scientific problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO4: Modern tool usage:** Create, select and apply appropriate techniques, resources, and modern technology and IT tools to complex science and technological activities.

**PO5: Environment and sustainability:** Understand the impact of professional science and technological solutions in societal and environmental contexts and for sustainable Development.

**PO6: Individual and team work:** Function objectively as an individual and as a member in diverse teams.

**PO7: Communication:** Communicate effectively on complex science & technology activities with society at large and able to write effective reports and documentation.

**PO8. Life-long learning:** Recognize the need and ability to engage in independent and lifelong Learning in the context of technological change.

**DEPARTMENT OF B.Sc. Computer Science & Cyber Security**

**PROGRAMME SPECIFIC OUTCOMES**

**Students will be able to:**

**PSO1:** Apply computer science languages and algorithms, as well as mathematical and statistical models for developing solutions to real world problems.

**PSO2:** Understand the fundamentals of Computer Organisation, Operating Systems and networking related concepts and apply the knowledge of computer systems in designing and building software solutions.

**PSO3:** Demonstrate, identify, formulate and analyse diverse big data problems helping in business decision making. Apply supervised and unsupervised machine learning methodologies.

**PSO4:** Apply appropriate Data Mining and Text Mining techniques for cleaning, processing and transforming the data. Analyse and interpret the data using an ethically responsible approach and derive insights from it.

## Consolidated Scheme

**LOYOLA ACADEMY**
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**SCHEME- B.Sc. COMPUTER SCIENCE AND CYBER SECURITY-2025-26(NEW) of Batch 2024-27 and 2025-28**

| Year | Sem | Course-1 | Course-2 | Course-3 | Course-4 | Course-5 | Course-6 | Hours | Credits | |
|---|---|---|---|---|---|---|---|---|---|---|
| I | I | General English-I (3T) **(AECC-1)(3)** | Value Education & Personality Development (2T)(2) **(AECC-2)** | Computer Fundamentals (4T+2P)(5) **(SEC-1)** | Elementary Number Theory & Laplace Transforms(5T) **(DSC-1)(4)** | Computer Networks (4T+2P) **(DSC-2)(5)** | Problem Solving and Programming in C (5T+2P) **(DSC-3)**(5) | 29 | 24 | AECC=2 SEC=1 CORE=3 |
| | II | General English-II (3T) **(AECC-3)(3)** | Indian Heritage and Culture (2T) **(AECC-4)(2)** | Server Administration (4T+2P) **(SEC-2)(5)** | Matrices and vector calculus(5T) **(DSC-4)(4)** | Operating System(4T+2P) **(DSC-5)(5)** | Data Structures with C (5T+2P) **(DSC-6)(5)** | 29 | 24 | AECC=2 SEC=1 CORE=3 |
| II | III | Environmental Studies & Gender Sensitization (3) **(AECC-5)(3)** | (2+1) **(GE-1)*** | Ethical Hacking (4T+2P)**(DSC-7)(5)** | Cryptographic Algorithms(4T) **(DSC-8)(4)** | Database Management System(4T+2P) **(DSC-9)(5)** | Python Programming (4T+2P) **(SEC-3)(5)** | 29 | 25 | AECC=1 GE=1 CORE=3 SEC=1 |
| | IV | Discrete Mathematics(4)**(GE-2)(4)** | Computer Forensics(4T) **(DSC-10)(4)** | Cyber Ethics and IPR(4) **(DSC-11)(4)** | Principles of information security(3T+2P) (5)**(DSC-12)** | Network Security **(4T+2P)** **(DSC-13)(5)** | Python Scripting (4T+2P) **(DSC-14)**(5) / Mini Project (1)(1) | 30 | 28 | GE=1 CORE=5 |
| III | V | Computer Security & Audit Assurance/ Secure ECommerce(4T) **(DSE-1)**(4) | Internet of Things /Distributed Systems(4T) **(DSE-2)**(4) | Go Lang(4T+2P) **(DSC-15)(5)** | Machine Learning (4T+2P) **(DSC-16)(5)** | Database Security(4T+2P) (DSC-17)(5) | Disaster Recovery and Risk Management (4T) **(DSC-18)(4)** | 30 | 27 | DSE=2 CORE=4 |
| | VI | Cyber Threat Intelligence /Block chain and cryptocurrency(3T) **(DSE-3)**(3) | Web Application Testing (4T+2P) **(SEC-4)(5)** | Cloud Computing (3T+2P) **(DSC-19)(4)** | Project Work (6) **(DSE-4)** | | | 30 | 18 | DSE=2 SEC=1 CORE=1 |
| Legend: 1. Ability Enhancement Compulsory Course (AECC)<br>2. Generic Elective (GE)<br>3. Skill Enhancement Course (SEC)<br>4. Discipline Specific Course<br>5. Discipline-Specific Elective (DSE)<br>*Principles of Information security | | | | | : 05<br>: 02<br>: 04<br>: 19<br>: 03 | | **Total** | **177** | **146** | |

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**SCHEME- B.Sc. COMPUTER SCIENCE AND CYBER SECURITY-2026-27 of Batch 2026-29**

| Year | Sem | Course-1 | Course-2 | Course-3 | Course-4 | Course-5 | Course-6 | Course-7 | Hours | Credits | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| I | I | **General English-I (AEC-1)(5)** | **Value Education & Personality Development (2) (AEC-II)** | **Programming for problem Solving using C (DSC-1)(4+1)** | **Operating Systems (DSC-2)(4+1)** | **Matrix Algebra & Number Theory** (DSC-3)(4) | Computer Networks (3+1) (DSC-4) | | 30 | 25 | AEC-2 CORE=4 |
| | II | **General English-II (AEC-III)(5)** | **Indian Heritage and Culture (AEC-IV)(2)** | **Data Structures and Algorithms using C (DSC-5)(4+1)** | Server Administration (DSC-6)(4+1) | **Discrete Mathematics (DSC-7) (4)** | Cryptographic Algorithms (DSC-8)(4) | | 30 | 25 | AEC-2 CORE=4 |
| II | III | **General English-III (AEC-V)(5)** | **Environmental Studies & Gender Sensitization (3) (AEC-VI)** | **(2+1) (GE-1)* Principles of information security** | **Programming for Problem Solving using Python** (DSC-9)(4+1) | **Database Management System (DSC-10) (4+1)** | Ethical Hacking (DSC-11)( 4+1) | | 30 | 26 | AEC-2 GE=1 CORE=3 |
| | IV | **General English-IV(AEC-VII)(5)** | **Data Engineering with Python (4+1) (DSC-12)** | Artificial Intelligence (4+1) (DSC-13) | Network Security (DSC-14)(4+1) | Cyber Ethics & IPR (4)(DSC-15) | Web technologies Lab(1) (SEC-I) | | 30 | 25 | AEC-1 CORE=3 SEC-I |
| III | V | Computer Security & Audit Assurance/ Secure ECommerce (**DSE-1**)(4) | Internet of Things in Security / Quantum Computing (**DSE-2**)(4) | **Machine Learning (DSC-16)(4+1)** | Computer Forensics**(DSC-17)(4)** | Database Security (4+1) **(DSC-18)** | Disaster Recovery and Risk Management **(DSC-19) (4)** | Short Term Internship(I) (2) | 30 | 28 | DSE=4 CORE=4 Internship-1 |
| | VI | Cyber Threat Intelligence /Block chain and cryptocurrency (**DSE-3**)(4) | Deep Learning / Cloud Computing (DSE-4)(4) | Vulnerable Assessment & Penetration Testing **(DSC-20)(4+1)** | Project Work (6) ((P) | | | | 30 | 19 | DSE=4 CORE=1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Legend: 1. Ability Enhancement Compulsory Course (AEC)<br>2. Generic Elective (GE)<br>3. Skill Enhancement Course (SEC)<br>4. Discipline Specific Core<br>5. Discipline-Specific Elective (DSE)<br>6. Short Term internship(I)<br>7.Major Project(p)<br>*Principles of Information security | : 07<br>: 01<br>: 01<br>: 20<br>: 04<br>:01 | Total | | 180 | 148 | |

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YEAR AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
B.Sc. COMPUTER SCIENCE AND CYBER SECURITY
I SEMESTER
ACADEMIC YEAR 2026-27 FOR THE BATCH 2026-29

| SL. No. | Part No. | Subject Code | Title of the Subject | Hours /Week | Credits | Marks | | | Duration of Exam (hrs.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Internal | External | Total | |
| 1 | I | EN26101 | General English-I (**AEC-1**) | 5 | 5 | 40 | 60 | 100 | 3 |
| 2 | I | VE26101 | Value Education & Personality Development (AECC-1) | 2 | 2 | 40 | 60 | 100 | 2 |
| 3 | II | BS26102 | Programming for problem solving using C (DSC-1) | 4+1 (Tutorial) | 4 | 40 | 60 | 100 | 3 |
| 4 | II | BS26104 | Operating System (DSC-2) | 4 | 4 | 40 | 60 | 100 | 3 |
| 5 | II | CSCS26101 | Matrix Algebra & Number Theory (DSC-3) | 4+1 (Tutorial) | 4 | 40 | 60 | 100 | 3 |
| 6 | II | BS26109 | Computer Networks (DSC-**4**) | 3 | 3 | 40 | 60 | 100 | 3 |
| | PRACTICALS | | | | | | | | |
| 7 | II | CSCS26102 | Programming for problem solving using C lab (**DSC-1**) | 2 | 1 | 40 | 60 | 100 | 3 |
| 8 | II | CSCS26103 | UNIX Shell Programming lab (**DSC-2**) | 2 | 1 | 40 | 60 | 100 | 3 |
| 9 | II | CSCS26104 | Computer Networks(DSC-4) | 2 | 1 | 40 | 60 | 100 | 3 |
| | Total | | | 30 | 25 | 360 | 540 | 900 | - |

*** Compulsory course(CC)**
***Ability Enhancement Compulsory Course (AECC)**
*** Skill Enhancement Compulsory Course (SEC)**
*** Discipline Specific Course(DSC)**

## GENERAL ENGLISH - I

**Credits: 5**
**Course Code: EN26101**
**Semester: I**
**No of Lecture Hours: 75**

**Course Objective:**

- To develop advanced language skills through critical thinking and interpretation of literary texts like poems and short stories.
- To enhance language proficiency through the systematic study of grammar, vocabulary, and usage in both written and spoken English.

**Course Outcome:**

CO1: To comprehend and appreciate poetic expression; understand the concept and types of nouns as part of speech; identify word roots and their meaning to improve vocabulary; and to exhibit effective listening comprehension and coordinated listening and writing skills by following hints and instructions to write passages.

CO2: To comprehend and critique a moral story; understand the definition, usage and types of pronouns; use affixes for word formation; interpret visual information to clearly, meaningfully and accurately transfer visual information to words.

CO3: To appreciate the genre of detective fiction and its major aspects; identify verb and its types for accuracy in usage; expand vocabulary by learning synonyms; exhibit efficient note-taking and note-making skills; and to display social and professional courtesies.

CO4: To analyse a story; apply the understanding of tenses towards accurate usage in communication; expand vocabulary by learning antonyms; construct meaningful paragraphs with accuracy of expression; and narrate experiences with clarity, coherence and confidence.

CO5: To exhibit thematic understanding and appreciation of a poetic text; understand concord and its usage with accuracy; improve word-meanings and spellings using homonyms; write informal letters with clarity of expression and grammatical accuracy; and develop conversational skills for real-life situations.

| Course Content | Hours Allotted | Pedagogy |
|---|---|---|
| **Module I: (15 hours)**<br>• Poetry: "Sonnet 30" by William Shakespeare.<br>• Grammar: Noun: Definition and Types: Common Proper, Concrete, Abstract; Countable and Uncountable Nouns.<br>• Vocabulary: Word Roots.<br>• Writing: Guided Writing<br>• Practical Skills: Listening Comprehension | 3<br>4<br>2<br>3<br>3 | Power Point presentations/ Videos Assignments/ Lectures/ Exercises / Listening Activities |

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| | | |
|---|---|---|
| **Module II: (15 hours)**<br>• Prose : "The Old Tiger and the Traveller" — from the *Hitopadesa*.<br>• Grammar: Pronouns: Definition and Types: Personal, Possessive, Reflexive, Demonstrative, Interrogative, Relative and Indefinite Pronouns.<br>• Vocabulary: Affixes.<br>• Writing: Information Transfer<br>• Practical Skills: Interpreting Visual Information | 4<br>4<br>2<br>2<br>3 | Power Point presentations/ Role-Play/ Videos/ Assignments/ Lectures/ Exercises/ Visual Displays |
| **Module III: (15 hours)**<br>• Prose: "Mr Sherlock Holmes" by Arthur Conan Doyle.<br>• Grammar: Verbs - Action verbs, Linking verbs and Auxiliary verbs.<br>• Vocabulary: Synonyms.<br>• Writing: Note-Taking and Note-Making.<br>• Practical Skills: Making Requests, Greetings and Enquiries | 4<br>4<br>1<br>3<br>3 | Power Point presentations/ Group Discussions/ Videos/ Lectures/ Exercises/ Simulation of everyday interactions |
| **Module IV: (15 hours)**<br>• Prose: "To Build a Fire" by Jack London.<br>• Grammar: Tenses.<br>• Vocabulary: Antonyms.<br>• Writing: Paragraph Writing.<br>• Practical Skills: Narrating experiences | 4<br>6<br>1<br>2<br>2 | PowerPoint presentations/ Class Discussions/ Lectures/ Exercises / Narration Activities |
| **Module V: (15 hours)**<br>• Poetry: "Where the Mind Is Without Fear" by Rabindranath Tagore.<br>• Grammar: Concord.<br>• Vocabulary: Homonyms.<br>• Writing: Informal Letters<br>• Practical Skills: Dialogue | 4<br>5<br>1<br>2<br>3 | PowerPoint presentations/ Class Discussions/ Videos Assignments/ Lectures/ In-class Writing/ Role-play conversations in pairs |

| **Learning Resources** | |
|---|---|
| 1. | Kulkarni, Parimala et al. *English Edge*. Orient BlackSwan, 2025, Print. |
| 2 | Lester, Mark, and Larry Beason. *Handbook of English Grammar and Usage*. McGraw-Hill, 2012 |
| 3 | Murphy, Raymond. *English Grammar in Use*, 5th ed., UK Cambridge University Press, 1985. |
| 4 | Swan, Michael. *Practical English Usage*, 4thEd, Oxford University Press, UK, !980. |

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# VALUE EDUCATION & PERSONALITY DEVELOPMENT

**Credits: 2** **Semester: I**
**Subject Code: VE26101** **No. of Lecture Hours: 30**

**Objective:** To form intellectually competent, morally upright, socially committed, spiritually inspired citizens in the service of the nation and the world.

**Outcome:**
**CO1:** Students will be able to **differentiate** between Accepted norms and Counter values and be able to understand the various Dimensions of Human Development.
**CO2:** Students will be able to **demonstrate** Love and Experience of God and identify the Basic Issues of Life and Happiness as a life goal.
**CO3:** The students will be able to **recognize** the traits of a good personality and practice Self-exploration.
**CO4:** Students will be able to **interpret** the Purpose of Life and Goal Setting and **inculcate** the skills required for Self-management.
**CO5:** Students will **understand** constitutional values, rights, and civic duties. They will develop a sense of global citizenship, environmental responsibility, and respect for diversity.

## UNIT-I — 6 Hrs
## INTRODUCTION TO VALUES AND ETHICS

- Importance of Value Education
- Reasons to have Ethics
- Accepted Norms and Counter Values
- Dimensions of Human Development: Physical, Intellectual, Emotional, Moral, Spiritual and Social

## UNIT-II — 6 Hrs
## APPROACH TO LIFE

- Conscience and Pseudo-Conscience
- Happiness as Life-goal
- Self and another
- Values revealed and lived in Religions
- Experience of God
- Moral problems of society / True Society: Social Desire, Social Fear, Social Science, Social Indifference

## UNIT-III — 6 Hrs
## TRANSFORMATION OF SELF

- Definitions of personality
- Characteristics of good personality
- Self-Identity, Self-Concept
- Self-Discovery, Self-Acceptance
- Self-Esteem

WORK SHEET (1): Self Evaluation

**UNIT-IV** **6 Hrs**

**LIFE ENRICHMENT SKILLS**

- Characteristics of Goals-Purpose of life-Goal setting
- Building Relationships
- Time Management
- Stress Management
- Emotional Management
- Conflict Management
- Team Management (Group Dynamics)

WORK SHEETS (1) & (2):

1. Anger Management
2. Team Management

**UNIT-V** **6 Hrs**

**CONSTITUTIONAL VALUES AND GLOBAL CITIZENSHIP**

- Values embedded in the Preamble of the Indian-Constitution
- Individual Human Rights and duties
- Directive Principles and Responsibilities as citizens of India
- Sensibility and responsibilities towards global environment, Loksangraha and Vasudhaiva Kutumbakam.
- Practical: Debates and Theatre on diversity and plurality, research on similarities and differences in the ethos of different countries

**ESSENTIAL READING**

1. In Harmony by G.M James, B.J. Jayaraj, K. Candassamy, Bernard D'Sami, S.J.A Packiaraj 2011, Prakash Printers, Chennai.
2. Human Values - Development Programme – 2015, An AIACHE Publication, New Delhi.
3. Blanchard, Kenneth and Peale, Norman Vincent. 1988. The Power of Ethical Management. New York: William Morrow and Company, Inc.
4. Gandhi, Mohandas Karamchand. 1971. Pathway to God compiled by MS Deshpande. Ahmedabad: Navajivan Mudranalaya, Navjivan Trust.
5. Goleman, D. 2008. What Makes a Leader. Boston: Harvard Business School Press.
6. Kashyap, Subhash C. 2019. Constitution of India. A handbook for students. New Delhi: National Book Trust.
7. Lama, D. 2012. Beyond Religion: Ethics for a Whole World. India: Harper Collins.
8. Sharma, M. 2017. Radical Transformational Leadership: Strategic Action for Change Agents. Berkely, US: North Atlantic Books.

# PROGRAMMING FOR PROBLEM SOLVING USING C

**Common Syllabus for B.Sc.(CSE/CSIT/CSCS/CSCC/MSCS)**

**Credits: 4** **Semester: I**

Course Code: BS26102 No of Lecture Hours: 60 Hrs.

**Course Objective:**

- Introduce the fundamentals of **C programming language** and its program structure.
- Enable students to understand **data types, operators, expressions, and control statements** used in C.
- Develop logical thinking through the use of **loops, arrays, and strings** for problem solving.
- Provide knowledge of **functions, pointers, storage classes, and dynamic memory allocation**.
- Familiarize students with **structures, unions, and file handling** concepts for real-world applications.

**Course Outcome:**

**CO1:**Understand the basic structure of a C program, compilation process, tokens, identifiers, and keywords.

**CO2:**Apply appropriate data types, operators, expressions, and conditional statements to solve simple programming problems.

**CO3:**Use iterative statements, arrays, and string functions to develop programs for repetitive and data-based tasks.

**CO4:**Design and implement user-defined functions, recursion, pointers, and dynamic memory allocation techniques.

**CO5:**Develop programs using structures, unions, and file handling concepts for structured data storage and retrieval.

| Course Content | Hours Allotted | Pedagogy |
|---|---|---|
| **Module I: Title:**<br>• Introduction to C programming<br>• Structure of C program<br>• Files used in a C program<br>• Compiling and executing C program<br>• C tokens, Constants, Character set in C, Keywords<br>• Identifiers | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures |
| **Module II: Title:**<br>• Data Types in C, Enumerated data types, typedef<br>• Variables and scope of a variables,Data input and output statements in C<br>• Operators and expressions<br>• Type conversion and Type Casting<br>• Conditional Branching Statement – if, if-else, if-else-if, switch case | **(12)**<br>3<br>2<br>2<br>3<br>2 | Case Studies / Review of research articles |
| **Module III: Title:**<br>• Iterative Statements – while loop, do-while loop, for loop.<br>• Nested loops, break and continue statements, goto statement<br>• Arrays - Single and double dimensional arrays<br>• Strings- string input output functions,String manipulation functions | **(12)**<br>2<br>3<br>2<br>2<br>3 | Assignments |
| **Module IV: Title:**<br>• Function- Declaring, defining and invoking functions<br>• Categories of functions-Built-in functions<br>Passing parameters to functions – call by value & Call byreference<br>• Storage classes<br>• Recursion.<br>• Pointers - Declaration, Passing pointer to functions, Pointers and one-dimensional arrays<br>• Dynamic memory allocations. | **(12)**<br>2<br>2<br>1<br>1<br>2<br>2<br>1<br>1 | Lectures |

| | | |
|---|---|---|
| **Module V: Title:**<br>• Structures - Simple structures, nested structure, Arrayof Structures.<br>• Unions-Differences between Structures and Unions.<br>• File handling - Various modes, File operations – fopen(),fclose().<br>• File input output functions – fputc(),fgetc(),fputs(), fgets(),getw(), putw(), getc(), putc(),printf(),fscanf(), getchar(), putchar().<br>• Random accessing file – fseek(), ftell(), rewind() | **(12)**<br>**2**<br>3<br>3<br>2<br>2 | Assignments / Lectures |

| | |
|---|---|
| **ESSENTIAL READING** | |
| 1. | TharejaReema.,**Programming in C**-2016,2nd Edition |
| **SUGGESTED READING** | |
| 3. | Kanetkar Yashwant. 2018. Let **us C.** 16th Edition**.** New Delhi: BPB. |
| 4. | Gottfried Byron. 2010. Programming **with C (**Schaum's Outline Series**).** 3rd Edition. New Delhi: McGraw Hill Education |
| **WEB LINKS** | |
| 5. | : https://www.learn-c.org/<br>https://www.learnconline.com/ |

# C PROGRAMING LAB

**Credits: 1** **Semester: I**
Course Code: CSCS26102 No of Lecture Hours: 30 Hrs

**Course Objective:**
To develop applications using structured programming.

Course Outcome:

Students will be able to write, compile and debug programs in C language.

**S.No Topic**

1. Programs to implement various arithmetic operators
2. Programs to find area of circle, area of rectangle, area of square
3. Programs to find gross salary of employee
4. Programs using if, if-else, if-else if –condition statements
5. Program to stimulate calculator using switch case
6. Programs using break and continue
7. Program to print sum of "N" natural numbers
8. Program to print factorial of given numbers using loops
9. Program to print multiplication table of a given number
10. Program to LOYOLA five times
11. Program to find sum of digits and reverse of a given number
12. Program to check if the given number is palindrome or not
13. Program to find the Fibonacci series
14. Program to check the year is leap year or not
15. Program to find swap of two numbers
16. Program to print a pattern
17. Program to solve quadratic equation
18. Programs to display array elements, sum of array elements, smallest, greatest array elements
19. Program to check if the given number is Armstrong number
20. Programs using 2-D array
21. Program to find the element in an array
22. Program to perform operations on matrices (addition, subtraction, multiplication, transpose)
23. Programs using strings and functions
24. Program to find call by value and call by reference
25. Program to find factorial using recursion
26. Program to find the sum of array elements using pointers
27. Program to accept and display book details using structures
28. Program to maintain employee details using structures
29. Program to Read a file and display its content using files
30. Program to count number of space, tabs and newlines in a file

# OPERATING SYSTEMS

**(Common Syllabus for B.Sc (CSE,CSIT,CDS,CSCS,CSAI,CSML,CSCC,MSCS)**

**Credits: 4** **Semester: I**
**Course Code: BS26104** **No of Lecture Hours: 60**

**Course Objective:**

- To learn the core ideas in operating systems, process management, memory protection, CPU scheduling, concurrent programming, deadlocks and File systems.
- To learn file organization, directory structures, allocation methods, and free space management.
- To learn contiguous allocation, paging, segmentation, virtual memory, page replacement algorithms, and thrashing control.
- To learn functions, types, services, system calls, structures, and role in managing computer resources.

Course Outcome:

**CO1: Explain** functions, types and structures of operating system
**CO2:Analyze** various process management concepts including scheduling and synchronization
**CO3: Illustrate** the concepts of memory management and I/O system.
**CO4: Solve** issues related to file system interface.
**CO5: Choose** an appropriate Page replacement algorithm

| Course Content | Hours Allotted | Pedagogy |
|---|---|---|
| **Module I:**<br>• Introduction -Define Operating System and its Types<br>• Operating System Operations-Process Management<br>• Memory Management, Storage Management, Protection & Security<br>• Operating system structures-system components<br>• Operating system services, system calls<br>• system programs, system structures, virtual machines | **(12)**<br>2<br><br>3<br><br>2<br>2<br>3 | Power point presentations / Lectures |
| **Module II:**<br>• Process concept-process concept, process scheduling<br>• Operation on processes, cooperating processes<br>• Inter process communication<br>• Process scheduling-basic concepts,<br>• Scheduling criteria, scheduling algorithms. | **(12)**<br>2<br>2<br>2<br>3<br>3 | Case Studies / Review of research articles |
| **Module III:**<br>• Process synchronization-critical section problem | **(12)** | Assignments |

| | | |
|---|---|---|
| • Semaphores, monitors<br>• Deadlocks-deadlock characterization, methods for handling deadlocks<br>• Deadlock prevention, Deadlock avoidance, Deadlock detection | 3<br>3<br>3<br>3 | |
| **Module IV:**<br>• File system-file concept, access methods<br>• Directory structure, file system mounting, file system sharing.<br>• File system implementation-file system structure, file system implementation.<br>• Directory implementation, allocation methods, free space management | **(12)**<br>3<br>3<br>3<br>3 | Lectures |
| **Module V:**<br>• Memory management-swapping, contiguous memory allocation<br>• Fragmentation-internal and external fragmentation<br>• Paging, segmentation, segmentation with paging.<br>• Virtual memory management-demand paging<br>• Page replacement algorithms:Least Recently Used, First in First Out, Optimal Page Replacement<br>• Thrashing and working set model. | **(12)**<br>2<br>2<br>3<br>2<br>3 | Assignments / Lectures |

| **Learning Resources** | |
|---|---|
| **ESSENTIAL READING** | |
| 1. | Silber Schatz Abraham, Operating System Concepts,2021,10th Edition |
| 2. | Silber Schatz Abraham, Galvin Peter, B. and Gagne Greg. 2006. Operating System Concepts. 6th Edition. India: Wiley. |
| **SUGGESTED READING** | |
| 1. | Tanenbaum Andrew, S. 2001. Modern Operating Systems. New Delhi: Pearson Education. |

# UNIX SHELL PROGRAMMING

**Credits: 1** **Semester: I**

**Subject Code: CSCS26103** **No. of Practical Hours: 30**

**Objectives:**

- To understand the commands and programming constructs of Shell Programming.
- To understand various algorithms related to CPU scheduling and memory management.

**Outcome:** Students will be able to identify UNIX/Linux utilities and implement shell scripts to perform more complex tasks.

**List of Programs:**

1. Introduction to Vi Editor, File and Directory related Commands.

2. Miscellaneous Commands

3. Arithmetic in ShellScripts

3.1: Write a shell script to evaluate arithmetic operations.

3.2: Write a shell script to calculate simple interest.

4. Sample programs using Shell Script
   4.1: Write a script to find area of a circle

   4.2: Write a shell script to swap two numbers

5. Decision making in Shell Script
   5.1: Write a shell script to determine if a given year is a leap year or not
   5.2: Write a shell script to find if a given number is even or odd.
   5.3: Write a shell script to find the greatest of three numbers
   5.4: Write a shell script to compare two strings.
   5.5: Write a shell script to create a simple calculator

6. Loop control structures in Shell Script.
   6.1: Write a shell script to find the sum of all digits from a given number.
   6.2: Write a shell script to find reverse of a number.

   6.3: Write a shell script to find n Fibonacci numbers.

   6.4: An employee Basic salary is in put through a Keyboard where DA is 40% of

basic salary and HRA is 20% of basic salary. Write a program to calculate gross salary

6.5: Write a shell script to find an Armstrong number

6.6: Write a shell script find the Factorial of a given number

7. Implementation of UNIX System calls

8. Implementation of CPU Scheduling algorithms

8(a) Case Study on First Come First Serve (FCFS) Scheduling Algorithm

Aim

To study the First Come First Serve (FCFS) CPU scheduling algorithm and calculate Waiting Time and Turnaround Time for the given set of processes.

Problem Statement

Consider the following set of processes that arrive for execution at the same time. Schedule the processes using the First Come First Serve (FCFS) scheduling algorithm and compute the Waiting Time and Turnaround Time.

| Process | Arrival Time | Burst Time |
|---|---|---|
| P1 | 0 | 24 |
| P2 | 0 | 3 |
| P3 | 0 | 3 |

8(b) Case Study on Shortest Job First (SJF) – Non-Preemptive

Aim

To study the Shortest Job First (SJF) non-preemptive CPU scheduling algorithm.

Problem Statement

Consider the following set of processes. Schedule them using the SJF (Non-Preemptive) scheduling algorithm and calculate Waiting Time and Turnaround Time.

| Process | Arrival Time | Burst Time |
|---|---|---|
| P1 | 0 | 24 |
| P2 | 0 | 3 |
| P3 | 0 | 3 |

8(c) Case Study on Priority Scheduling Algorithm

Aim

To study Priority based CPU scheduling.

Problem Statement

Schedule the following processes using Priority Scheduling (lower number indicates higher priority).

| Process | AT | BT | Priority |
|---|---|---|---|
| P1 | 0 | 10 | 2 |
| P2 | 0 | 1 | 1 |
| P3 | 0 | 2 | 3 |

8(d) Case Study on Round Robin Scheduling Algorithm

Aim

To study Round Robin CPU scheduling.

Problem Statement

Schedule the following processes using Round Robin algorithm with Time Quantum = 4 ms.

| Process | AT | BT |
|---|---|---|
| P1 | 0 | 10 |
| P2 | 0 | 5 |
| P3 | 0 | 8 |

9. Implementations of memory management algorithms

**REFERENCE LINKS:**

- https://www.cse.iitb.ac.in/~mythili/os/
- https://ieeexplore.ieee.org/document/7951997
- https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/6_CPU_Scheduling.html
- https://www.shellscript.sh/

# MATRIX ALGEBRA AND NUMBER THEORY

**Credits: 4** **Semester: I**
**Subject Code: CSCS26101** **No of Lecture Hours: 75**

**Objectives:**

- The objective of this course is to present a user friendly introduction to Matrix Algebra and Number Theory and its many applications.

## Outcome:

- Students will be able to develop specific skills, competencies and thought processessufficient to support further study or work in this or related fields.

**Course Outcomes:**

**CO1: Understand** to find the rank of a matrix and to solve systems of linear equations applying matrix techniques.
**CO2: Determine** Eigenvalues and Eigenvectors of a given matrix.
**CO3: Demonstrate** knowledge and understanding of topics including divisibility, prime numbers, congruences, Diophantine equations.
**CO4: Apply** the concept of congruences and their fundamental properties in solving numerical and theoretical problems.
**CO5: Apply** concepts of Euler's Totient function and **understand** basic cryptographic applications.

| **UNIT I** | **15 Hrs** |
|---|---|
| **Matrices:** | |
| Types of Matrices | 1 |
| Rank Of a Matrix | 1 |
| Rank - Echelon Form | 1 |
| Rank – Normal Form | 5 |
| Solution of Linear Systems | 2 |
| Homogeneous Equations, Non-Homogeneous Equations. | 5 |

| **UNIT II** | **15 Hrs** |
|---|---|
| **Eigenvalues-Eigenvectors** | |
| Eigenvalues-Eigenvectors–Properties | 5 |
| Cayley-Hamilton Theorem (Without Proof) -Problems only | 5 |
| Inverse and powers of a matrix by using Cayley-Hamilton theorem | 5 |

**UNIT III** **15 Hrs**

**Early Number Theory**

| | |
|---|---|
| Divisibility- The Division algorithm (Without Proof) | |
| Euclid' algorithm- The Diophantine equation axe + by = c (Problems there on) | 5 |
| Greatest Common Divisor - Properties of G.C. D (Problems there on) | 5 |
| Primes – Fundamental theorem of Arithmetic. | 5 |

**UNIT-IV** **15 Hrs**

| | |
|---|---|
| Congruences – Properties- Applications of Congruences. | 5 |
| Linear Congruences - Solutions of Congruences. (Simple Problems) | 5 |
| Fermat's theorem, Wilson's theorem. (Simple applications) | 5 |

**UNIT V** **15 Hrs**

| | |
|---|---|
| The functions $\tau$ and $\sigma$ | 5 |
| Euler Totient function $\varphi(n)$ (Simple Problems) | 5 |
| An application to cryptography (Caesar Cipher Test) | 5 |

**ESSENTIAL READING**

1. Matrices By AR. Vasishtha Krishna Prakashan mandir, Meerut.
2. David M. Burton 2004 Elementary **Number Theory** Universal Book Stall New Delhi.

**COMPUTER NETWORKS**
**(Common Syllabus for B.Sc CSAI, CSCS, CSCC)**

**Credits: 3** **Semester: I**
**Course Code: BS26109** **No of Lecture Hours: 45**

**Course Objective:**

- To familiarize with fundamental concepts of computer network.
- To gain expertise in various layers of the TCP/IP model.

**Course Outcome:**

**CO1: Understand** and identify basic computer network topologies and protocols and explain Data Communication System components.
**CO2: Describe** the functions of each layer in OSI model and its protocols.
**CO3: Classify** different error detecting techniques.
**CO4: Build** skills of sub-netting and routing mechanisms.
**CO5: Classify** the routing protocols and analyze how to assign the IP addresses for the given network.

| Course Content | Hours Allotted | Pedagogy |
|---|---|---|
| **Module I:**<br>• Data communication concepts<br>• Components of data communication<br>• Network goals and applications<br>• Types of networks: LAN, MAN, WAN<br>• Network topologies: Bus, Star, Ring, Mesh, Hybrid<br>• Transmission media:<br>  o Guided (twisted pair, coaxial, optical fiber)<br>  o Unguided (radio, microwave, satellite)<br>• Network models:<br>  o OSI reference model<br>  o TCP/IP model<br>• Comparison of OSI and TCP/IP models | **(9)**<br>1<br>1<br>1<br>1<br>1<br>2<br>2 | Power point presentations / Lectures |
| **Module II: Data Link Layer**<br>• Functions of Data Link Layer<br>• Error detection and correction:<br>  o Parity check<br>  o CRC<br>  o Hamming code<br>• Flow control mechanisms<br>• Data link protocols:<br>  o Stop and Wait<br>  o Go-Back-N<br>  o Selective Repeat | **(9)**<br>1<br>2<br>1<br>3 | Case Studies / Review of research articles |

| | | |
|---|---|---|
| • Multiple access protocols:<br>  o ALOHA<br>  o CSMA/CD<br>  o CSMA/CA | 2 | |
| **Module III: Network Layer**<br>• Functions of Network Layer<br>• Logical addressing: IPv4 and IPv6<br>• Subnetting and supernetting<br>• Routing concepts<br>• Routing algorithms:<br>  o Distance Vector<br>  o Link State<br>• Routing protocols overview:<br>  o RIP<br>  o OSPF<br>  o BGP | **(9)**<br>1<br>2<br>1<br>1<br>2<br><br><br><br>2 | Assignments |
| **Module IV: Transport Layer**<br>• Services provided by Transport Layer<br>• Process-to-process delivery<br>• Multiplexing and demultiplexing<br>• UDP: features, advantages, limitations<br>• TCP:<br>  o Segment structure<br>  o Connection establishment and termination<br>  o Flow control<br>  o Error control<br>  o Congestion control | **(9)**<br>1<br>1<br>1<br>1<br>5 | Lectures |
| **Module V: Application Layer**<br>• Application layer services<br>• Protocols:<br>  o HTTP<br>  o FTP<br>  o SMTP<br>  o POP3<br>  o DNS<br>• Client–Server model<br>• Peer-to-Peer model | **(9)**<br>1<br>6<br><br><br><br><br><br>1<br>1 | Assignments / Lectures |

| **Learning Resources** | |
|---|---|
| **ESSENTIAL READING** | |
| 1. | Forouzan, Beharouz A. 2017. **Data Communications and Networking**. 4th Edition. New Delhi:Tata Mc Graw Hill. (UNIT- I and II) |
| 2. | Forouzan, Beharouz A. 2018. **TCP/IP Protocol Suite**. 4th Edition. New Delhi: Tata McGraw Hill. (UNIT-III,IV,V) |
| **SUGGESTED READING** | |

| | |
|---|---|
| 1. | Tanenbaum, Andrew S. 2008. **Computer Networks**. 4th Edition. New Delhi: PearsonEducation. |
| 2 | Forouzan, Beharouz A. 2022 **Data Communications and Networking with TCP/IP Protocol Suite** 6th Edition New Delhi: Tata McGraw Hill. |

# COMPUTER NETWORKS LAB

**Credits: 1** **Semester: I**

**Subject Code:CSCS26104** **No. of Practical Hours: 30**

**Objective:**

Hands-On training regarding the design ,troubleshooting and evaluation of computer networks

**Outcome**:

Demonstrate basic switching concepts, VLAN, routing, dynamic and static routing protocols using Cisco packet tracer software (Freeware)

| No.of Hrs | Topic |
|---|---|
| 1 | Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using crimping tool |
| 2 | study the Network Devices in Detail |
| 3 | Study of Network IP |
| 4 | Connect the Computers in LAN |
| 5 | Study of Basic Networking Commands |
| 6 | Configure a Network Topology using Packet Tracer |
| 7 | Performing an Initial Switch Configuration |
| 8 | Performing an Initial Router Configuration |
| 9 | Interpreting Ping and Traceroute Output |
| 10 | Observing Static and Dynamic Routing |
| 11 | Configure a Network Using Distance Vector Routing Protocol |
| 12 | Configure a Network Using Link State Vector Routing Protocol |

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YEAR AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
B.Sc.COMPUTER SCIENCE AND CYBER SECURITY
II SEMESTER
ACADEMIC YEAR 2026-27 FOR THE BATCH 2026-29

| Sl. No. | Part | Subject Code | Title of the Subject | Hours /Week | Credits | Marks | | | Duration of Exam (hrs.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Internal | External | Total | |
| | **THEORY** | | | | | | | | |
| 1 | I | EN26201 | General English-II (**AEC-III**) | 5 | 5 | 40 | 60 | 100 | 3 |
| 2 | I | IC26201 | Indian Heritage & Culture (**AECC-2**) | 2 | 2 | 40 | 60 | 100 | 2 |
| 3 | II | BS26202 | Data Structures and Algorithms using C (**DSC-4**) | 4+1 (Tutorial) | 4 | 40 | 60 | 100 | 3 |
| 4 | II | CSCS26201 | Server Administration (**DSC-5**) | 4 | 4 | 40 | 60 | 100 | 3 |
| 5 | II | BS26203 | Discrete Mathematics (DSC-6) | 4 | 4 | 40 | 60 | 100 | 3 |
| 6 | II | CSCS26202 | Cryptographic Algorithms(DSC-8) | 4 | 4 | 40 | 60 | 100 | 3 |
| | **Practical** | | | | | | | | |
| 7 | II | CSCS26203 | Data Structures and Algorithms using C Lab(DSC-4) | 2 | 1 | 40 | 60 | 100 | 3 |
| 8 | II | CSCS26204 | Server Administration Lab(SEC-II) | 2 | 1 | 40 | 60 | 100 | 3 |
| 9 | III | | PLANET* (Outreach) | | 1* | - | - | - | - |
| | **Total** | | | **30** | **25** | 360 | 540 | 900 | - |

***Ability Enhancement Compulsory Course (AECC)**
***Skill Enhancement Course (SEC)**
***Programme of Loyola Academy for Neighbourhood Empowerment and Transformation (PLANET)**

## GENERAL ENGLISH - II

**Credits: 5**
**Course Code: EN26201**

**Semester: II**
**No of Lecture Hours: 75**

**Course Objective:**

- To develop comprehension and critical thinking by engaging with a wide range of literary genres such as poems and short stories from Indian and global authors.
- To strengthen language proficiency through the systematic study of grammar, vocabulary, and usage in English.
- To enhance competency in using spoken and written language with accuracy, clarity and effectiveness.

**Course Outcome:**

CO1: To comprehend literary language and appreciate literary themes and expression; understand and apply the concept and types of adjectives as a part of speech; distinguish between homophones and their meaning to improve vocabulary; attempt free writing for clear self-expression; and use body language for effective interpersonal communication.
CO2: To comprehend and critique the ideas expressed in poetic language; understand the application of determiners; identify homographs and understand their different meanings for enhanced vocabulary; write narrative and descriptive essays.
CO3: To understand and appreciate short fiction; identify adverb and its types for accuracy in usage; identify and use heteronyms; construct argumentative and discursive essays; and pronounce common words correctly.
CO4: To analyse and appreciate a poem; apply the understanding of prepositions in constructing sentences without ambiguity; identify and expand abbreviations accurately; draft formal letters efficiently; and introduce self and others with confidence and courtesy.
CO5: To exhibit understanding of wit and humour in a literary text; understand the structure of a sentence in English language; identify and expand acronyms accurately; write academic passages with grammatical accuracy and clarity of expression; and show confidence, clarity and cohesion in brief, spontaneous speech.

| Course Content | Hours Allotted | Pedagogy |
|---|---|---|
| **Module I: (15 hours)**<br>• Prose: "The Blue Light" by Vaikom Muhammad Basheer.<br>• Grammar: Adjectives: Definition and Types: Descriptive, Quantitative, Demonstrative, Possessive, | 4<br>4 | Power Point presentations/ Class Discussions/ Videos Assignments/ Lectures/ In-class writing/ Simulation and peer-assessment activities |

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| | | |
|---|---|---|
| Interrogative and Distributive adjectives; Degrees of Comparison of Adjectives<br>• Vocabulary: Homophones.<br>• Writing: Diary and Journal Writing.<br>• Practical Skills: Body Language | 1<br>2<br>4 | |
| **Module II: (15 hours)**<br>• Poetry: "Mending Wall" by Robert Frost.<br>• Grammar: Determiners: Specific and General<br>• Vocabulary: Homographs.<br>• Writing: Essay Writing: Descriptive and Narrative<br>• Practical Skills: Describing People, places, things and experiences | 3<br>3<br>1<br>4<br>4 | Power Point presentations/ Discussions/ Videos Assignments/ Lectures/ Observation and experience-based writing |
| **Module III: (15 hours)**<br>• Prose: "Swan Song" by Anton Chekhov.<br>• Grammar: Adverbs: Definition and Types: Adverbs of Manner, Adverbs of Time, Adverbs of Place, Adverbs of Frequency and Adverbs of Degree.<br>• Vocabulary: Heteronyms.<br>• Writing: Essay Writing: Discursive and Argumentative<br>• Practical Skills: Commonly Mispronounced Words | 3<br>3<br>1<br>4<br>4 | Power Point presentations/ Discussions/ Videos Assignments/ Lectures/ In-class writing/ Listening and Mirroring Exercises |
| **Module IV: (15 hours)**<br>• Poetry: "You Are Old, Father William" by Lewis Carroll.<br>• Grammar: Prepositions - Preposition of Place, Position, Direction and Time.<br>• Vocabulary: Abbreviations.<br>• Writing: Formal Letters.<br>• Practical Skills: Introducing Oneself and Others | 3<br>4<br>1<br>4<br>3 | Power Point presentations/ Discussions/ Videos Assignments/ Lectures/ Exercises/ Social and Professional Situation Simulation |
| **Module V: (15 hours)**<br>• Prose: "Letter to Lord Chesterfield" by Samuel Johnson.<br>• Grammar: English Sentence Structures- Subject, Verb, Object, Predicate, Phrase, Conjunction, Clause, Complement and Adjunct.<br>• Vocabulary: Acronyms.<br>• Writing: Academic Writing.<br>• Practical Skills: Just-a-minute | 4<br>4<br>1<br>3<br>3 | Power Point presentations/ Discussions/ Videos Assignments/ Lectures/ Exercises/ JAM |

| **Learning Resources** | |
|---|---|
| 1. | Kulkarni, Parimala et al. *English Edge*. Orient BlackSwan, 2025, Print. |
| 2 | Lester, Mark, and Larry Beason. *Handbook of English Grammar and Usage*. McGraw-Hill, 2012 |
| 3 | Murphy, Raymond. *English Grammar in Use*, 5th ed., UK Cambridge University Press, 1985. |
| 4 | Swan, Michael. *Practical English Usage*, 4thEd, Oxford University Press, UK, !980. |

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## INDIAN HERITAGE AND CULTURE (THEORY) (new syllabus)

**First year**

**Credits: 2**

**Course Code: IC26101/201**

**Semester: I**

**No of Lecture Hours: 30**

**Overall Course Objectives:**

- Understand the evolution of Indian culture from ancient to modern times
- Appreciate India's cultural diversity and unity
- Analyze the contributions of different civilizations, rulers, movements, and communities
- Develop critical awareness of social reform, subaltern struggles, and democratic values
- Recognize the importance of preserving cultural heritage and constitutional ideals

**Course Outcome:**

**COI**: Students will understand the foundations and characteristics of Indian culture, learn the contributions of ancient civilizations, rulers, and South Indian kingdoms, and recognize the impact of Buddhism and Jainism on Indian art and heritage.

**CO2:** Students will understand how Islamic culture influenced Indian society and shaped its social and cultural life. They will study cultural developments under the Delhi Sultanate, the Mughals, and regional kingdoms like the Kakatiyas and Qutubshahis. They will also appreciate the contributions of Sufi and Bhakti movements and the evolution of medieval art and architecture.

**CO3**: Students will understand the influence of Western culture on Indian society and the impact of 19th-century socio-religious reform movements. They will learn about the contributions of reformers and the struggles of marginalized communities through subaltern movements. They will also analyze the Moderate, Extremist, and Gandhian phases of the Indian National Movement to understand social change and nationalism.

**CO4:** Students will learn about Indian dance forms and their cultural and historical significance, explore important Indian monuments to understand their artistic and cultural value, and study key archaeological sites to learn how they reveal India's past.

**CO5:** Students will understand the beliefs and impact of India's major religions, learn about tribal cultures and the challenges they face, and explore the Indian Constitution to see how it ensures democracy and citizens' rights.

| Course Content | | Hours Allotted | Pedagogy |
|---|---|---|---|
| **Module -I** | **Module-I: Indian Culture, Civilization and Early kingdoms.**<br>**1.Culture:** -Meaning and definition of culture-characteristics of Indian Culture.<br>**2. Indus Valley Civilization & Aryan Culture:** Salient Features of the Indus Valley Civilization-Meaning and origin of Aryan Cuture-Vedic Culture-Ashram Dharmas-Social life and Varna system.<br>**3.Mauryas and Guptas:** Sources of Mauryan History-Important kings-Mauryan Administration-Sources of Gupta's History-Important Rulers-Golden Age of the Guptas.<br>**4.Ashoka the great and Harshavardhana:** - Sources of Ashoka's history-Kalinga war-Ashoka's Administration-Sources of Harshavardhana's history-Harsha's Administration.<br>**5. Development of Art and Architecture-Contributions of Buddhism and Jainism-** Art and Architecture-Buddhist art and Architecture (Stupes, Viharas and Chaityas)-Jainism Art and Architecture (Cave Temples). | 6 | Lecture Method using Board, and also using PPT method. |

| | | | |
|---|---|---|---|
| | **6.South Indian Kingdoms-**Sathavahanas, Pallavas, Cholas | | |
| **Module II** | **Module-II: Islamic Influence and Cultural Development in Medieval India**<br>**1. Influence of Islamic Culture on Indian Society: -** Introduction to Islamic Culture in India-arrival and spread of Islam in India.<br>**2. Cultural Development under the Delhi Sultanate and the Mughal Empire: -** Brief Account of the Five Dynasties of the Delhi Sultanate-Cultural Development of the Delhi Sultanate Period-The Great Mughals-Cultural Development under the Mughal Empire.<br>**3. The Sufi and Bhakti Movements during the Medieval Period: -** Origin and Meaning of Sufism-Main Principles of Sufism-Important Sufi Saints-Role of Sufis in Indian Society-Bhakti Movement-Origin and Meaning of the Bhakti Movement-Main Teachings of the Bhakti Movement-Important Bhakti Saints-Role of Bhakti Saints in Social Reform.<br>**4. Cultural Achievements of the Kakatiyas and the Qutb Shahis:** -Historical Background of the Kakatiyas-Important Kings-Literature-Language-Art & Architecture. Historical Background of the Qutb Shahis-Important Kings-Literature & Language-Art & Architecture.<br>**5. Development of Art and Architecture during Medieval India:** -Delhi Sultanate Art and Architecture-Mughals Art & Architecture-Kakatiya's Art & Architecture-Qutb Shahis art and architecture. | 6 | Lecture Method using Board, and using PPT method |
| **Module III** | **Module-III: Social and Political Movements in Modern India** | | Lecture Method using board and using PPT method |

| | | | |
|---|---|---|---|
| | **1.Influence of Western culture on Indian Society: -** Entry of western culture into India-reasons for the influence of the western culture on Indian Society.<br>2.**19th century Socio Religious Reform Movements: -** Raja Ram Mohan Roy, Ishwara Chandra Vidyasagar and Veerasalingam Panthulu.<br>**3.Subaltern Movements in India-** Jyothirao Phule, Savitribai Phule, E. V Ramaswamy (Periyar) Naikar, Narayana Guru and Dr.B.R. Ambedkar.<br>**4. Indian National Movement:** Moderate, Extremist and Gandhian phases. | 6 | |
| **Module IV** | **Module-IV: Indian Cultural Heritage: Dance, Art and Architecture.**<br>**1.Indian dance: -** Classification of Indian dance- Classical dance forms (Bharatanatyam, Kathak, Kathakali, Kuchipudi, Odissi, Manipuri, Mohiniyattam, Sattriya-folk-dance forms (Bhangra, Garba, Yakshagana, Kolattam, Bihu, Perini Shivatandavam, Bonalu folk dance.<br>**2.Indian Art and Architecture:** - Temple Architecture in India (Nagara Style, Dravida Style, Vesara Style), Indian Sculpture (Ashokan Pillars, Nataraja Sculpture), Indian Paintings (Cave paintings, Mughal paintings, Rajput paintings)<br>**3. Archaeological Sites of India:** Importance of archaeological sites-Indus valley civilization Sites-Buddhist and Jain sites-Mauryan and Gupta period sites. | 6 | Lecture Method using Board and using PPT method |

| | | | |
|---|---|---|---|
| **Module V** | **Module-V: Religion, Tribal Life, and Governance in India**<br>1. **Major Religions of India-An Overview:** - Hinduism, Buddhism, Jainism, Sikhism, Islam, Christianity.<br>**2.Tribal Culture and the Challenges faced by indigenous communities:** Salient Features of Tribal Culture, Major Challenges Faced by Tribal Communities.<br>**3. Indian Constitution:** - Importance of the Indian Constitution-Fundamental Rights. | 6 | Lecture Method using board and using PPT method |

| **Learning Resources** | |
|---|---|
| 1. | Jha, Dr K.N. 2006. Studies in ancient & Medieval India. COSMOS Book hives Ltd: Gurgaon. |
| 2. | Mahajan, V.D. 2008. Ancient India. S.Chand, New Delhi. |
| 3. | Manasseh, Dr P. 2010. An Overview of Indian Culture. Gamaleil Publishers, Hyderabad. |
| 4 | Malpani, Madanlal & Malpani, Shamsunder. 2014. Indian Heritage and Culture. Kalyani Publishers, Ludhiana. |
| 5. | A.L. Basham, The Wonder That Was India, Rupa Publications, 2013 (Reprint) |
| 6 | Kapila Vatsyayan, Indian Classical Dance, Publications Divisions, Govt of India, 2001. |
| 7 | R.S. Sharma, India's Ancient Past, Oxford University Press, 2017. |
| 8 | Romila Thapar, Ashoka and the Decline of the Mauryas, Oxford University Press, 2012. |
| 9 | Satish Chandra, History of Medieval India, Orient Black swan, 2018. |
| 10 | Irfan Habib, the Mughal Empire, Cambridge University press, 1997. |
| 11 | K.A. Nilakanta Sastri, A History of South India, Oxford University press, 2011. |
| 12 | Bipan Chandra, India's Struggle for Independence, Penguin India, 2016. |
| 13 | Sumit Sarkar, Modern India, Macmillan, 2014. |
| 14 | R.C. Majumdar, History of the Freedom Movement in India, Firma KLM, 2001. |
| 15 | Gail Omvedt, Sage Publications, 2011. |
| 16 | Dhananjay Keer, Dr. Ambedkar: Life and Mission, popular Prakashan, 2016. |
| 17 | Verrier Elwin, the Tribal World of India, Oxford University press, 2014. |
| 18 | D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2023. |
| 19 | B.R. Ambedkar, Constituent Assembly Debates, Govt of India publications, 1946-1949. |

# DATA STRUCTURES AND ALGORITHMS USING 'C'

(Common for B.Sc CSE/CSIT/CSCS/CSCC/MSCS)

**Credits: 4** **Semester: II**
Course Code: **BS26202** No of Lecture Hours: 60

**Course Objective:**

- To focus on different methods of sorting, searching, storing data and understandingtime and storage efficiency.

**Course Outcome**:

**CO1:** Choose appropriate data structures to represent data items in real world problems
**CO2:** Illustrate linear data structures like linked list and hashing
**CO3:** Organize the data using sorting in various non-linear data structures and determine time complexity
**CO4:** Construct data with non-linear data structure using trees.
**CO5:** Explain the concept of graphs and b trees

| Course Content | Hours Allotted | Pedagogy |
|---|---|---|
| **Module I:**<br>1. Introduction to Data Structures<br>2. Stacks- Definition and various operations performed on stacks<br>3. Queue and types- Definition and various operations performed on queues<br>4. Stack applications<br>a. Notations - Prefix, Postfix , Infix<br>b. Conversions – Infix to Postfix , Infix to Prefix | **(12)**<br>1<br>3<br>4<br>1<br>3 | Power point presentations / Lectures |
| **Module II:**<br>1.Data Representation, Concept of linked list Advantages of Linked List, Types of linked list<br>2.Linear Linked list- Various operations performed on singly linked list<br>3.Doubly linked list, Circular linked list, Applications of Linked Lists | **(12)**<br>4<br>4<br>4 | Case Studies / Review of research articles |
| **Module III:**<br>1.Trees<br>a. Definition and properties<br>2.Binary Trees<br>a. Definition and Representation of Binary trees<br>b. Operations: insertion, deletion, search | **(12)**<br>1<br>2<br>3 | |

| | | |
|---|---|---|
| c. Tree traversal techniques- in order, pre order, post order (Recursively)<br>3.AVL trees<br>a. Definition and representation of AVL Trees<br>b. Operations on AVL trees- insertion, deletion | 2<br>2<br>2 | Assignments |
| **Module IV:**<br>**1.**Sorting methods<br>a. Bubble sort<br>b. Insertion sort<br>c. Selection sort<br>d. Merge sort<br>e. Quick sort<br>2.Searching methods<br>a. Linear search<br>b. Binary search<br>3. Comparison and analysis | **(12)**<br>2<br>2<br>2<br>2<br>2<br>2<br>2 | Lectures |
| **Module V:**<br>1 Graphs<br>a. Terminology & Representations<br>b. Definition and representation of graph<br>c. Graph Traversal -BFS, DFS<br>d. Minimum Cost Spanning Trees- Prim's and Kruskal's Algorithms.<br>2.B-Trees<br>a. Definition and representation of B-Trees<br>b. Operations on B- Tree-insertion, deletion, search | **(12)**<br>1<br>1<br>2<br>3<br>1<br>2<br>2 | Assignments / Lectures |

| **Learning Resources** | |
|---|---|
| 1. | Textbook:<br>1. Kanetkar Yashvanth ,5th edition,Data Structures through C.India: BPB Publications.<br>2.Tanenbaum, A.M.Langsam,Y.Augenstein, M.J.Data Structures Using C.<br>New Delhi: Pearson Education.2nd Edition |
| 2. | Reference books:<br>1.Balagurusamy, E. C Programming& Data Structures. Tata McGrawHill.<br>Krishna Moorthy, R.Indirani Kumaravel, G. 2008.<br>2.Data Structures Using C.Tata McGrawHill Publishing Company Ltd |
| | Web Links:<br>https://nptel.ac.in/courses/106102064<br>https://onlinecourses.swayam2.ac.in/nou23_cs13/preview |

# DATA STRUCTURES WITH C LAB

Credits : 1 Semester : II

**Subject Code : CSCS26203** **No. of Lecture hours:30**

**Objectives:**To implement data structures for problem solving To implement and analyze the searching algorithms in the context of specific engineering problems

## Outcomes:

1. Choose the appropriate data structure for problem solving.
2. Code, debug and demonstrate the working nature of different types of data structures and their applications.
3. Analyze and Compare various linear and non-linear data structure.
4. Document the results and operations of various Data Structure.

1 Program to find transpose of a sparse matrix

2 Program to find the sum of two 2-D arrays of order 2X2

3 Program to find the transpose of a matrix

4 Program to find the upper triangle of an array

5 Program to find the trace of a 2-D array

6 Program to find the lower triangle of an aray

7 Program to find the addition of two sparse matrix

8 Program to perform linear search

9 Program to implement binary search

10Program to implement bubble sort
11 Program to implement insertion sort
12Program to implement selection sort
13. Program to implement quick sort
14. Program to implement merge sot on 2 sorted lists
15. Program to implement stack operations using aray
16. Program to implement queue operations using array

17.Program to implement stack operations using linked list

18.Program to implement queue operations using linked list

19.Program to convert infix expression to postfix

20.Program to evaluate a postfix expression

21.Program to create a linked list

22.Program to concatenate two lists

23.Programs to perform insertion and deletion operations on the linked list

24.Program to copy a list into another list

25.Program to split a list into two linked lists

26.Program to search for a node in the list.

27.Program to find the number of elements in the list

28.Program to illustrate tree traversal techniques.

29.Program to implement graph traversals

# SERVER ADMINISTRATION

Credits: 4 Semester: II

Course Code: **:** CSCS26201 No of Lecture Hours: 60

## Course Objective:

- To study the concepts of Windows Server OS
- To learn the installation procedure of servers and different server services

## Course Outcome:

**CO1**: **Choose** different editions of operating system
**CO2**: **Organize** topologies in active directory

**CO3**: **Compare** different services in active directory

**CO4**: **Compare** networking services

**CO5**: **Plan** installation of required services in organization

| **Course Content** | **Hours Allotted** | **Pedagogy** |
|---|---|---|
| **Module I:**<br>• Introduction to Windows server 2012, windows server 2012 Editions & Features<br>• . Installation of Windows server 2012 OS , creating local user accounts<br>• Networking : IP Addressing, Active Directory , Structure of Active Directory<br>• Client and Member Server and User management<br>• Permissions and types of permissions and User Profiles and home folders | **(12)**<br>3<br>3<br>3<br>3 | Power point presentations / Lectures/Assignments |
| **Module II:**<br>• Logical Structure of Active directory :Trees, Forest, Organizational Unit<br>• Logical topologies (Work Group & Domain), ADC and Child Domain<br>• Roles of Active directory and transfer and seizing of FSMO Roles<br>• Group policy, Scope of Group Policy and Hierarchy of | **(12)**<br>3<br>3<br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| Group Policy<br>• Delegating of Control, Software Deployment Policy and Folder Redirection | 3 | |
| **Module III:**<br>• Trust Relationships, Types of Trusts ,Domain and forest level Functions<br>• Physical structure of Active directory , Global Catalog and RODC<br>• Active directory domain services<br>• Introduction to Rights Management Services, Federation Services<br>• Overview of Light weight directory services | **(12)**<br>2<br>2<br>3<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module IV:**<br>• Introduction to Dynamic Host Configuration Protocol (DHCP)<br>• Introduction to Domain Naming System (DNS)<br>• Internet Information Services (IIS) – Web Server , HTTP,FTP Server<br>• Routing, Working of Network Address Translation<br>• Remote Access Services (RAS), Working Principle of VPN | **(12)**<br>2<br>2<br>3<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module V:**<br>• Network Access Protection, ICS and WSUS<br>• Windows deployment services, Boot Images and Install Images<br>• Disk Management: FAT, FAT 32, NTFS and Fault Tolerance<br>• Backup and Recovery using Windows server backup<br>• Distributed File System and Groups | **(12)**<br>2<br>3<br>2<br>3<br>2 | Power point presentations / Lectures/Assignments |

**Learning Resources**

**ESSENTIAL READING**

1. William Panek **MCSA Windows Server 2012 R2 Complete Study Guide: Exams 70-410, 70-411, 70-412** 2nd Edition
2. Rand Morimoto,Michael Noel, Guy Yardeni, Omar Droubi, Andrew Abbate, ChrisAmaris **Windows Server 2012 Unleashed** 1st Edition

**SUGGESTED READING**

1. William Stanek. **Windows Server 2012 Pocket Consultant.** 1st Edition

# SERVER ADMINISTRATION LAB

Credits:1 Semester:II

**Subject Code: CSCS26204** **No. of Lecture hours:30**

**Objective:** To get hands on experience on installations, configurations of server serviceroles and troubleshooting procedures.

**Outcome:** Students will be able to implement, troubleshoot different server service roles in Windows server operating system

1. Installation of Windows server 2012 Operating system and Assigning IPAddress.
2. Installation of Active Directory in Windows server 2012, Installing ClientOS Windows 7/8.
3. Configuring Member server, Creating Domain User Accounts andChanging Default Password Policy
4. Creating Profiles and Configuring Home Folder
5. Configuring Additional Domain controller and child domain
.
6. Creating an Organizational Unit and Applying group policy on OU Level
7. Raising Functional Levels and creating Forest Trust
8. Configuring Terminal Server in Remote Administration Mode
9. Installing DHCP Service and Creating Scope and DHCP Reservations
10. Installation of DNS Service and Creating Forward Lookup zones and Reverse Lookup zones
11. Installation of IIS Web server and Hosting a Website
12. Installation and Configuration of IIS FTP Server

13-14. Establishing Virtual Private Network IN windows server

15. Installation and Configuration

## DISCRETE MATHEMATICS

**Credits : 4** **Semester: II**

**Subject Code : BS26203** **No. of Lecture hours: 60**

**Objective:** The objective of the course is to introduce students with an introduction to lattices, Boolean algebras and fundamental concepts in graph Theory, with some of their modern applications.

**Course Outcome:**

**CO1: Develop** understanding of Logic Sets and Functions.
**CO2: Develop** an understanding of how Lattice concepts are used to solve problems arising in the computer science.
**CO3**: **Understand** Boolean algebra and basic properties of Boolean algebra; able to simplify simple Boolean functions by using the basic Boolean properties.
**CO4**: **Evaluate** and apply the fundamental concepts in graph theory.
**CO5: Apply** graph theory-based tools in solving practical problems.

**UNIT I** **12Hrs**

Relations and ordering- Types of relations- Equivalence relation 4

Partial order relations - Partially ordered sets. 4

Maximal and Minimal Elements of Posets - Hasse diagrams 4

**UNIT II** **12Hrs**

**Lattices:**

Lattices - Properties of lattices 6

Types of Lattices – Bounded Lattice, Distributive lattice – Complemented

Lattice and their Properties 6

**UNIT III** **12Hrs**

**Boolean algebra:** Boolean algebra and its Applications 4

Boolean polynomials, Disjunctive normal form, Conjunctive normal form 4

| | |
|---|---|
| Minimization of Boolean functions using K-Map technique | 4 |

**UNIT IV** **12Hrs**

**Graph theory – I**:

| | |
|---|---|
| Definition of a graph, Degree of vertex | 4 |
| First theorem of graph theory Paths and connection | 2 |
| Isomorphism of graphs | 2 |
| some special simple graphs | 2 |
| Trees and their properties | 2 |

**UNIT V** **12Hrs**

**Graph theory-II**:

| | |
|---|---|
| Planar graphs, Euler's formula | 3 |
| Euler graphs | 3 |
| Hamiltonian graphs | 3 |
| Chromatic numbers (Only Problems) | 3 |

**ESSENTIAL READING:**

1. Trembly J.P. and Manohar. R 2005 **Discrete Mathematical Structures with Applications to Computer Science** Tata Mc Graw Hill Publishing Company Ltd, New Delhi.

(For Unit I – III)

2. Joe. L.Mott & Abrham Kandel, Theodore P. Baker 2007 **Discrete Mathematics for Computer scientists** and **Mathematicians** 2nd Edition, PHI New Delhi (For Units IV & V)

# CRYPTOGRAPHIC ALGORITHMS

Credits: 4 Semester: II

Course Code: **CSCS26202** No of Lecture Hours: 60

Course Objective:

- To provide issues related to security in modern Networked Computer Systems.

## Course Outcome:

**CO1**: **Identify** information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory.
**CO2**: **Apply** Public Key Cryptographic Technique for securing messages
**CO3**: **Use** an appropriate message authentication code.
**CO4**: **Compare** the performance of different message digest algorithms for verifying the integrity of varying message sizes
**CO5**: **Compare** different IEEE standards and electronic mail security

| Course Content | Hours Allotted | Pedagogy |
|---|---|---|
| **Module I: Title: INTRODUCTION TO CLASSICAL ENCRYPTION TECHNIQUES**<br>• Symmetric cipher model<br>• Substitution Techniques-Caesar Cipher, Mono alphabetic cipher<br>• Play fair cipher, Hill cipher, Polyalphabetic cipher, Transposition Techniques<br>• The DES encryption, Details of Single Round, Key Generation<br>• DES Decryption, The Avalanche Effect, The Strengths of DES | **(12)**<br>2<br>2<br>3<br>2<br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module II: Title: MORE ON SYMMETRIC CIPHERS**<br>• Multiple Encryption and Triple DES<br>• Key Distribution, Random Number Generation<br>**PUBLIC-KEY CRYPTOGRAPHY AND RSA**<br>• The principles of public-key cryptosystems and essential steps of Public key Cryptosystems, Public key encryption to provide Authentication, Applications of Public key cryptosystems, Requirements for public-key cryptography, Public-key cryptanalysis<br>• The RSA algorithm-Description of algorithm, computational Aspects, Key generation and Security of RSA | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module III: Title KEY MANAGEMENT**<br>• Distribution of public keys, public announcement of Public keys, publicly available directory, public-key Authority, public-key Certificates, Distribution of secret keys using public-key cryptography<br>• Diffie-Hellman key exchange<br>**MESSAGE AUTHENTICATION**<br>• Authentication Requirements, Authentication Functions-Message Encryption, Message Authentication code, Hash Functions-Requirements for a hash function, Simple Hash Functions, Birthday Attacks, Block Chaining Techniques<br>• Security of Hash functions and MACS-Brute-force attacks, Message Authentication codes | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module IV:**<br>• Secure Hash Algorithm (SHA), MD5 Algorithm<br>• Kerberos, X.509 Authentication Services<br>• Digital Signatures<br>• Whirlpool | **(12)**<br>3<br>3<br>3<br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module V: Title: EMAIL SECURITY**<br>• E –Mail System<br>• Pretty Good Privacy, S/MIME<br>**IP SECURITY**<br>• Overview, Architecture, Authentication Header, Encapsulating security payload, combining security associations, key management<br>• Modes of IPSEC<br>**WEB SECURITY**<br>• Web Security Considerations , Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction | **(9)**<br>2<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |

| **Learning Resources** |
|---|
| **ESSENTIAL READING**<br>1. Cryptography & network security – Forouzan, McGraw Hill Education , 2010 .<br>(**Unit I :** Chapter 1-Chapter 3,**Unit2:** Chapter 6- Chapter 10,**Unit 3:** Chapter 11,**Unit4 :** Chapter12-Chapter 13,**Unit5:** Chapter 116-Chapter 18)<br>**SUGGESTED READING**<br>1.Forouzan, Behrouz A. 2008. **Cryptography and Network Security.** Special Indian Edition**.** New Delhi**:** Tata McGraw-Hill. |

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**SCHEME OF INSTRUCTION FOR B.Sc. COMPUTER SCIENCE & CYBER SECURITY**

| SECOND YEAR SUBJECTS FOR BATCH (2025-28) CBCS | | | | | |
|---|---|---|---|---|---|
| III SEMESTER | | | IV SEMESTER | | |
| S. NO | Subject Code | Theory | SNO | Subject Code | Theory |
| 1. | ES23301 | Environmental Studies and Gender Sensitization(AECC-5) | 1. | CSCS22401 | Discrete Mathematics (GE-2) |
| 2. | G22CSCS1T | Principles of Information Security (GE-1) (ID) | 2. | CSCS22402 | Computer Forensics (Core-10) |
| 3. | CSCS22301 | Ethical Hacking (Core-7) | 3. | CSCS22403 | Cyber Ethics and IPR (Core-11) |
| 4. | CSCS22302 | Cryptographic Algorithms (Core 8) | 4. | CSCS25404 | Principles of information Security (Core-12) |
| 5. | CSCS25303 | Database management systems (Core -9) | 5. | CSCS22405 | Network Security (Core-13) |
| 6. | CSCS22304 | Python Programming (Core-9) | 6. | CSCS22406 | Python Scripting (Core-14) |
| S. NO | Subject Code | Practical's | S.NO | Subject Code | Practical's |
| 7 | G22CSCS1P | Principles of Information Security Lab (GE-1)(ID) | 7. | CSCS25407 | Principles of information Security (core-12) |
| 8 | CSCS22305 | Ethical Hacking Lab (Core-7) | 8. | CSCS22408 | Network Security lab(Core-13) |
| 9 | CSCS25306 | Database Management Systems Lab(Core -9) | 9. | CSCS22409 | Python Scripting(Core-14) |
| 10 | CSCS22307 | Python Programming-Lab (Core-9) | | | |

**Year-wise and Semester-Wise Distribution of Courses**
**Department of B.Sc. Computer Science & Cyber Security**
**II Year I Semester**
**Academic Year 2026-27 of 2025-28 Batch (CBCS)**

| Sl. No. | Part | Course Code | Title of the Course | Hours /Week | Duration of Exam (hrs.) | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Internal | External | Total | |
| 1 | I | ES23301 | Environmental Studies and Gender Sensitization(AECC-5) | 3 | 3 | 40 | 60 | 100 | 3 |
| 2 | I | G22CSCS1T | Principles of Information Security (GE-1) | 2 | 3 | 40 | 60 | 100 | 2 |
| 3 | II | CSCS22301 | Ethical Hacking (DSC-7) | 4 | 3 | 40 | 60 | 100 | 4 |
| 4 | II | CSCS22302 | Cryptographic Algorithms (DSC -8) | 4 | 3 | 40 | 60 | 100 | 4 |
| 5 | II | CSCS25303 | Database Management System (DSC-9) | 4 | 3 | 40 | 60 | 100 | 4 |
| 6 | II | CSCS22304 | Python Programming (SEC-3) | 4 | 3 | 40 | 60 | 100 | 4 |
| **PRACTICALS** | | | | | | | | | |
| 7 | II | G22CSCS1P | Principles of Information Security Lab (GE-1)(ID) | 2 | 3 | 40 | 60 | 100 | 1 |
| 8 | II | CSCS22305 | Ethical Hacking Lab (DSC-7) | 2 | 3 | 40 | 60 | 100 | 1 |
| 9 | II | CSCS25306 | Database Management System Lab (DSC-9) | 2 | 3 | 40 | 60 | 100 | 1 |
| 10 | II | CSCS22307 | Python Programming-Lab (SEC-3) | 2 | 3 | 40 | 60 | 100 | 1 |
| **Total** | | | | **29** | **-** | 400 | 600 | 1000 | **25** |

***Ability Enhancement Compulsory Course (AECC)**
*** Skill Enhancement Compulsory Course (SEC)**
***Value added Course(VAC)**
*** Discipline Specific Course(DSC)**

**GENERIC ELECTIVE (2026-27)**
**(INTER-DEPARTMENTAL/INTER-DISCIPLINARY)**
**GE courses for AY 2026-27**

| S. No | **Name of the Department** | **GE Course** |
|---|---|---|
| 1 | B.Sc. Chemical Technology | Solar Processing Technologies |
| 2 | B.Sc. Agricultural Science and Rural Development | Principles of Organic farming |
| 3 | B.Sc. Computer Science and Engineering | PC Operating Systems |
| 4 | B.Com Honors | Taxation |
| 5 | B.Sc. Computer Science and Information Technology | PC Hardware and Software Installation |
| 6 | B. Com Marketing | Principles of Marketing |
| 7 | B.Sc. Biotechnology, Genetics and Chemistry | Medical Lab Technology |
| 8 | B. Com Business Studies | Banking |
| 9 | B.A Mass Communication | Photography |
| | | Film Appreciation |
| 10 | B.Sc. Food Technology and Management | Food Processing and Quality Control |
| 11 | B A Psychology, English Literature & Journalism | Communication Skills |
| | | Career Skills |
| | | Psychology for Living |
| 12 | B.Sc. Mathematics, Statistics & Computer Science | Quantitative Aptitude |
| | | Statistics-Data Analysis |
| 13 | B.Sc. Multimedia and Animation | Creative Arts |
| 14 | B. Com Computer Applications | Accounting |
| 15 | BBA | Principles of Management |
| 16 | B. Com International Finance | Project Management |
| 17 | B.Sc. Computer Data Science & Data Analytics Engg. | Python programming |
| 18 | B. Com Honors Strategic Finance | Goods and Services Tax |
| 19 | B. Com Business Process Management | Financial Markets |
| 20 | B.Sc. Food Science, Nutrition and Dietetics | Nutrition and Dietetics |
| 21 | B.Sc. Computer Science & Cognitive Systems | Introduction to Worksheets |
| 22 | B. Com Business Analytics | Principles of Insurance |
| 23 | B.Sc. Computer Science and Artificial Intelligence | LISP Programming |
| 24 | B.Sc. Computer Science and Cyber Security | Principles of Information Security |
| 25 | B.A Economics, Public Administration and Computer Applications | Human Rights |
| 26 | B.Sc. Computer Science and Cloud Computing | Web Programming |
| 27 | B.Sc. Computer Science and Internet of Things | Introduction to IoT using Arudino |
| 28 | B.Com Information Systems | Human Resource Management |
| 29 | B.B.A Entrepreneurship Development | Start-up Management |
| 30 | B.B.A Retail Operations Management | Consumer Behavior |

# ENVIRONMENTAL STUDIES & GENDER SENSITIZATION

**Credits: 3** **Semester: III**
Course Code: **ES23301** No of Lecture Hours: 45

**Course Objective:**

- To understand the importance of ecological balance for Sustainable Development
- To understand the impacts of developmental activities and mitigation measures
- To understand the environmental policies and regulations.
- To develop students' sensibility with regard to issues of gender in contemporary
- India
- To provide a perspective on the socialization of men and women
- To expose the students to debate on the politics and economic works and on gender violence.

Course Outcome:

**COl**: Understand the importance of Environmental education, conservation of natural resources & understand the importance of ecosystems and biodiversity.

**CO2:** Understand the pollution problems and apply the environmental science knowledge on solid waste management, disaster management.

**CO3:**Apply the environmental science knowledge to improve the resources Evaluate and understand the sustainable environmental conditions and control methods.

**CO4:** Identify the interactions and inter sections of identities ( e.g., gender, race, ethnicity class, sexuality, and so on) and assess the ways in which they contribute to instances of privilege and power dynamics across cultures, space, and time. And their problems

**CO5:** Understand the gender problems and ways of addressing them, including interactions across local to global scales in communities and overcome inequalities with legislation

| Course Content | Hours Allotted | Pedagogy |
|---|---|---|
| **Module I: Title: NATURAL RESOURCES, ECOSYSTEMS & BIODIVERSITY**<br>• Definition, Scope and importance of environmental studies. Need for public awareness<br>• Renewable & Non-Renewable resources, Brief account on Forests, Water, Minerals and Energy (Solar, Wind, and Geo-thermal & Bio-energy).<br>• Definition of Ecosystem, Structure and functions-food chains, food webs, ecological pyramids, producers, consumers and decomposers. Energy flow and example | **(9)**<br>2<br>3<br>2 | Power point presentations / Lectures/Assignments |
| ecosystems--F orest, Desert, Aquatic ecosystem<br>• Definition of Biodiversity, types (Genetic, Species, Ecosystem), India-mega diversity Nation<br>• Hotspots, Threats to biodiversity, Conservation of biodiversity (In-Situ and Ex-Situ). | 1<br>1 | |
| **Module II: Title: ENVIRONMENTALPOLLUTION**<br>• Definition of Environmental pollution<br>• Brief account on causes, effects, prevention and control measures of Air pollution<br>• Water Pollution, (c) Soil pollution<br>• ((d)e) Noise pollution Manne Pollution .<br>• Solid Waste Management: Causes, Effects & Control measures of urban and irrigation<br>• Disater Management:Floods,Earth Quakes and cyclones | **(9)**<br>2<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module III: Title: Social Issues & Environment**<br>• Rain Water Harvesting,Water shed Management,and Form Unsustainable to sustainable development.<br>• Global warming,Ozone Depletion, and ACID rains<br>• Environmental Legislation: Air Act,Water Act,Environmental protection Act,Forest act,WildLife Act.<br>• Environmental & Human Health-HIV/AIDS<br>• Welfare Programs-Family,Women & Child Welfare,Population Explosion<br>• Role of Information Technologyin Environmental Studies. | **(9)**<br>2<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |
| **Module IV: Title: Gender Studies**<br>• Why should we study Gender Issues?<br>• Socialization-Making women and making Men<br>• Being Together as Equals-Through the lens of Gender | **(9)**<br>2<br>3<br>2 | Power point presentations / Lectures/Assignments |
| • Missing women: Gender Selection and its consequences<br>• Health issue of women | 2 | |
| **Module V: Title: Gender & Labour Gender Violence & Law**<br>• Housework: The invisible Labour-My mother doesn't work"share the load"<br>• Women's work: Role in politics and economics Fact and Fiction.Unrecognized and Unaccounted work.Wages and conditions of work.<br>• Sexual Harassment-say no eve teasing-the caste-based violence-NirbhayaAct.<br>• Domestic Violence-is home a safe place? Blaming the victim.-Domestic violence Act<br>• Forums of justice-Hindu Inheritance(2005) | **(9)**<br>2<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |

**Learning Resources**

SUGGESTED READING:

1. A. Suneetha, Uma Bhrugubanda, Duggirala Vasantha, Rama Melkote, Vasudha Nagaraj,Asma Rasheed,Gogu Shyamala, Deepa Sreenivas and Susie Tharu.201.Towards a world of Equals:A Billingual text on gender.Hyderabad:Telugu academy

2. Rajgopalan R.2015. Environmental studies-from crisis to Cure.Third Edition.Chennai:Oxford University press.

3. dr.D.K Asthana and Dr. Meera Asthana.2014.A text Book of Environmental studies Revised Edition.New Delhi: S.Chand & Company.

4. Anubha Kaushik and C.P. Kaushik published.2016. Perspectives in Environmental Studies, fifth Edition.New Delhi:New Age International.

(for Gender Sensitization)

1. Sen Amartya More than one Million Women Are Missing.New York of Books37.20(20 December 1990).Print. We were making History…Life Stories of women in the Telangana Peoples Struggle.New Delhi: Kali for Women.1998.
2. Tripti Lahiri.By the Numbers:Where Indian women Work. Women's Studies Journal.(14 November 2012). Available online at:<http://blogs.wsj.com/Indiarealtime/2012/11/14/by- the numbers-where-Indian-women-work
3. K satyanaryana and Susie Tharu.Ed. Steel Nibs are Sprouting: new Dalit Writing From South India, Dossier2: Telugu and Kanada code=3732
4. Vimala.Vantillu(The Kitchen)". Women writing in india:600 Bc to the Present.Volume II
5. The 20th Century.Ed.susie Tharu and K.Lalitha.delhi: oxford University Press,1995.599-601.
6. Shatrughna,Veena.Women's Work and its impact on Child Health and nutrition.Hyderabad: National Institute of Nutition, Indian Council of Medical Research.1993.

# PRINCIPLES OF INFORMATION SECURITY

**Credits: 2** **Semester: III**
Course Code: **G22CSCS1T** No of Lecture Hours: 30

**Course Objective:**

- To compile, analyze, and assess the applicability of best practices in addressing information.

Course Outcome:

**CO1**: **Explain** concepts of confidentiality, availability and integrity (CIA) in context of Information security
**CO2**: **Identify** the risk, assess and risk control strategies.
**CO3**: **Demonstrate** expertise in configuring host and network level technical security controls to include host firewalls
**CO4**: **Analyse** systems, tools, methods, and techniques for securing digital information within an organisation
**CO5**: **Develop** encryption and decryption techniques.

| Course Content | Hours Allotted | Pedagogy |
|---|---|---|
| **Module I: Title: INTRODUCTION OF INFORMATION SECURITY**<br>• Introduction to Security, Critical Characteristics of Information<br>• NSTISSC Security Model, Components of Information Security, Balancing Information Security and Access<br>• Security System Development Life Cycle | **(6)**<br>2<br>1<br>1<br>1 | Power point presentations / Lectures/Assignments |
| **Module II: Title THE NEED FOR SECURITY**<br>• Important functions of Information Security<br>• Threats and category of Threats<br>• Attacks and Types of Attacks | **(6)**<br>2<br>2<br>2 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module III:**<br>• Firewalls: Processing modes, categorizations<br>• Firewall Architecture, Choosing a Firewall<br>• Firewall Rules | **(6)**<br><br>2<br>2 | Power point presentations / Lectures/Assignments |
| • VPN: Transport and Tunnel Mode | 2 | |
| **Module IV:**<br>• IDPS :terminology, types of IDPS<br>• IDPS Detection Methods, IDPS Response Behaviour<br>• Strengths and Limitations of IDPS<br>• Honeypots, Honeynets and Padded Cell Systems<br>• Port Scanners | **(6)**<br><br>2<br><br>2<br>2 | Power point presentations / Lectures/Assignments |
| **Module V:**<br>• Terminology<br>• Steganography<br>• Protocol for Secure Communication: Securing Internet with SSL<br>• Securing web Transactions SET<br>• Securing wireless Network with WEP and WPA | **(6)**<br><br>2<br>2<br><br>2 | Power point presentations / Lectures/Assignments |

| **Learning Resources** |
|---|
| 1. Principles of Information Security, **Michel e. Whitman, Herbert, J. Mattord** – Fourth Edition (Unit -1 : Chapter 1,<br>Unit 2: Chapter 2,Unit 3: chapter 6, Unit 4: Chapter 7, Unit 5: Chapter 8) |

# ETHICAL HACKING

**Credits: 4** **Semester: III**
Course Code: **CSCS22301** No of Lecture Hours: 60

**Course Objective:**

- To get familiarize with the essential terms in Hacking and Various phases of attacks
- To provide the details on Law and Punishment for Hacking.
- To explain the maintenance of access gained through hacking and the techniques used to avoid the traces of attacks in order to escape from the legal Punishment by a malicious hacker

Course Outcome:

**CO1**: **Explain** essential terminology and phases of hacking
**CO2**: **Identify** different types of scanning methods
**CO3**: **Analyze** how to perform IP Spoofing
**CO4**: **Understand** Sniffing and Social Engineering
**CO5**: **Understanding** Session Hijacking and DDoS concepts

| **Course Content** | **Hours Allotted** | **Pedagogy** |
|---|---|---|
| **Module I:**<br>• Information Security Overview<br>• Information Security Threats and Attack Vectors<br>• Hacking Concepts, Types , Scope and Phases<br>• Information Security Laws and Standards<br>• Footprinting Concepts, Methodology, Tools<br>• Footprinting Countermeasures | **(12)**<br><br>3<br>3<br>2<br>2<br>2 | Power point presentations / Lectures/Assignments |
| **Module II:**<br>• Overview of Network Scanning<br>• Understanding different techniques to check for Live Systems and open ports<br>• Understanding Various Scanning Techniques<br>• Understanding various IDS Evasion Techniques<br>• Understanding Banner Grabbing | **(12)**<br><br>2<br>3<br>2<br>2<br>2<br><br>1 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module III:**<br>• Overview of Vulnerability Scanning<br>• Using Proxies and Anonymizers for Attacks<br>• Understanding IP Spoofing and Various Detection Techniques<br>• Overview of Scanning Pen Testing<br>• Overview of Sniffing Concepts<br>• Understanding MAC Attacks , ARP Poisoning, MAC Spoofing Attacks | **(12)**<br>2<br>2<br>2<br>2<br>2<br>2 | Power point presentations / Lectures/Assignments |
| **Module IV:**<br>• Sniffing Tools<br>• Sniffing Countermeasures<br>• Understanding various Techniques to Detect Sniffing<br>• Overview of Social Engineering Concepts<br>• Understanding various Social Engineering Techniques<br>• Understanding Insider Threats | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module V:**<br>• Overview of of DOS and DDOS and its techniques<br>• DoS and DDoS attack tools<br>• Understanding the Botnet Network<br>• Understanding Session Hijacking Concepts<br>• Application level Session Hijacking<br>• Network Level Session Hijacking | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |

**Learning Resources**

**ESSENTIAL READING**

1. Ethical Hacking and countermeasures **V9, by EC- Council**. (**Unit1 :** Chapter 1, Chapter2 , **Unit 3:** Chapter 3 , Chapter 4, **Unit 4:** Chapter-7 , **Unit 5:** Chapter 8, Chapter 9)
2. **Mc Clure, Stuart, Scambray, Joel and Kurtz, George, 2009** .Hacking exposed. 7TH Edition. New Delhi. McGraw Hill (**Unit2** : Chapter 2, Chapter 3)

**SUGGESTED READING**

1. Engerbrestson, Patrick. 2011.**Basics of Hacking and Penetration**.Syngress
2. Walker, Matt.2012. C**ertified Ethical Hacker All-in-One**.McGraw Hill.

# CRYPTOGRAPHIC ALGORITHMS

**Credits: 4** **Semester: III**
Course Code: **CSCS22302** No of Lecture Hours: 60

**Course Objective:**

- To provide issues related to security in modern Networked Computer Systems.

Course Outcome:

**CO1**: **Identify** information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory.
**CO2**: **Apply** Public Key Cryptographic Technique for securing messages
**CO3**: **Use** an appropriate message authentication code.
**CO4**: **Compare** the performance of different message digest algorithms for verifying the integrity of varying message sizes
**CO5**: **Compare** different IEEE standards and electronic mail security

| Course Content | Hours Allotted | Pedagogy |
|---|---|---|
| **Module I: Title: INTRODUCTION TO CLASSICAL ENCRYPTION TECHNIQUES**<br>• Symmetric cipher model<br>• Substitution Techniques-Caesar Cipher, Mono alphabetic cipher<br>• Play fair cipher, Hill cipher, Polyalphabetic cipher, Transposition Techniques<br>• The DES encryption, Details of Single Round, Key Generation<br>• DES Decryption, The Avalanche Effect, The Strengths of DES | **(12)**<br>2<br>2<br>3<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module II: Title: MORE ON SYMMETRIC CIPHERS**<br>• Multiple Encryption and Triple DES<br>• Key Distribution, Random Number Generation<br>**PUBLIC-KEY CRYPTOGRAPHY AND RSA**<br>• The principles of public-key cryptosystems | **(12)**<br>2<br>3<br>2 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| and essential steps of Public key Cryptosystems, Public key encryption to provide Authentication, Applications of Public key cryptosystems, Requirements for public-key cryptography, Public-key cryptanalysis<br>• The RSA algorithm-Description of algorithm, computational Aspects, Key generation and Security of RSA | 2<br>3 | |
| **Module III: Title KEY MANAGEMENT**<br>• Distribution of public keys, public announcement of Public keys, publicly available directory, public-key Authority, public-key Certificates, Distribution of secret keys using public-key cryptography<br>• Diffie-Hellman key exchange<br>**MESSAGE AUTHENTICATION**<br>• Authentication Requirements, Authentication Functions-Message Encryption, Message Authentication code, Hash Functions-Requirements for a hash function, Simple Hash Functions, Birthday Attacks, Block Chaining Techniques<br>• Security of Hash functions and MACS-Brute-force attacks, Message Authentication codes | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module IV:**<br>• Secure Hash Algorithm (SHA), MD5 Algorithm<br>• Kerberos, X.509 Authentication Services<br>• Digital Signatures<br>• Whirlpool | **(12)**<br>3<br>3<br>3<br>3 | Power point presentations / Lectures/Assignments |
| **Module V: Title: EMAIL SECURITY**<br>• E –Mail System<br>• Pretty Good Privacy, S/MIME<br>**IP SECURITY**<br>• Overview, Architecture, Authentication Header, Encapsulating security payload, combining security associations, key management<br>• Modes of IPSEC<br>**WEB SECURITY**<br>• Web Security Considerations , Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction | **(9)**<br>2<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |

**Learning Resources**

**ESSENTIAL READING**

1. Cryptography & network security – Forouzan, McGraw Hill Education , 2010 .
(**Unit I :** Chapter 1-Chapter 3,**Unit2:** Chapter 6- Chapter 10,**Unit 3:** Chapter 11,**Unit4 :** Chapter12-Chapter 13,**Unit5:** Chapter 116-Chapter 18)

**SUGGESTED READING**

1.Forouzan, Behrouz A. 2008. **Cryptography and Network Security.** Special Indian Edition**.** New Delhi**:** Tata McGraw-Hill.

# DATABASE MANAGEMENT SYSTEM

**Credits: 4** **Semester: III**
Course Code: **CSCS25303** No of Lecture Hours: 60

**Course Objective:**

- To design a database and enforce Integrity Constraints to keep database consistent.
- To normalize tables to eliminate redundancies.
- To query relational data using Structured Query Language.
- To understand storage strategies for easy retrieval of data through index.
- To understand PL/SQL and transaction management.

Course Outcome:

**CO1**: **Represent** logical database using Entity Relationship and Enhanced ER model.
**CO2**: **Formulate** database using relational algebra and organize using normalization.
**CO3**: **Develop** programs using PL/SQL and the need for Transactions
**CO4**: **Explain** the need for NOSQL and its characteristics
**CO5**: **Implement** document databases such as MongoDB

| Course Content | Hours Allotted | Pedagogy |
|---|---|---|
| **Module I:**<br>• Introduction, data base applications and purpose<br>• View of data, data base languages- DDL,DML<br>• Data base architecture, users and administrators<br>• Design process overview, Entity relational ship model, Constraints<br>• ER diagrams, design issues, weak entity sets<br>• Extended ER features | **(12)**<br>2<br>3<br>2<br>2<br>2<br>1 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module II:**<br>• Structure of Relational model, Reduction to schema<br>• Relational algebra- union, project, select and other operations<br>• SQL- data definition, structure, set operations, Aggregate functions<br>• Modification of data base, Nested sub queries, views, Joins and Null values<br>• Introduction to Normalization, 1NF, 2NF and 3NF, BCNF | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module III:**<br>• Introduction, Programming, Functions and Procedures<br>• Introduction, Programming, Functions and Procedures<br>• Error handling in PL/SQL<br>• Transactions- concepts, states<br>• Concurrent executions, Serializability<br>• Recoverability, Testing for Serializability<br>• Concurrency control, lock based protocols, locks and granting locks<br>• Two Phase locking and deadlock handling | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module IV: Title: Distributed Databases**<br>• Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Commit Protocols<br>**Getting Started with NoSQL**<br>• History, Introduction and need of NoSQL<br>• NoSQL Databases<br>• SQL versus NoSQL, ACID vs HBASE<br>• CAP theorem<br>• Key value pair, Document, Column family and Graph databases<br>• New Features of Oracle23ai | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module V:**<br>• Schema less databases, Materialized views, Distribution Models: Single Server, Sharding, Master-Slave Replication, Peer- | **(9)**<br>2<br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| to-Peer Replication, Combining Sharding and Replication<br>**MongoDB**<br>• Introduction, Terms used in MongoDB and RDBMS<br>• CRUD operations- create, drop database, data types, Arrays<br>• Arrays, aggregate function, map reduce framework, cursors<br>• Indexes, MongoImport, MongoExport, Automatic generation of unique<br>• Numbers for the _id field | 2<br><br>2 | |

| **Learning Resources** |
|---|
| **ESSENTIAL READING**<br>1. Korth Henry, F. SilberSchatz Avi. And Sudarshan, S. 2021. **Database System Concepts.** 7th Edition. Noida: McGraw-Hill. UNIT I,II and III<br>2. Acharya, Seema. 2020. **Demystifying NoSQL**. 1st Edition. Wiley Emerging Technology Series. India: New Delhi. UNIT-IV,V<br>3. Sadalage, Pramod J and Fowler, Martin. 2013. **NoSQL Distilled**. Addison Wesley. Pearson Education. (UNIT -V-S.no 1,2)<br>4. Release Update 23.5 Features oracle |

# PYTHON PROGRAMMING

**Credits: 4** **Semester: III**
Course Code: **CSCS22304** No of Lecture Hours: 60

**Course Objective:**

- To help the students understand the fundamentals of object-oriented programming.
- To emphasize on learning important principles of software development and provide practice in developing small-scale programs.

Course Outcome:

**CO1**: **Explain** the basics of Python Programming constructs.
**CO2**: **Sub divides** larger problems into smaller ones using functions
**CO3: Apply** various data structures for problem solving
**CO4**: **Apply** object-oriented programming features for solving a given problem
**CO5**: **Select** an appropriate exception handling depending on application and design file operations using Python standard library

| **Course Content** | **Hours Allotted** | **Pedagogy** |
|---|---|---|
| **Module I:**<br>• Basics of Python Programming: Features of Python, History of Python,Future of Python, writing and executing first python program, Literal constants-Numbers, strings<br>• Variables and Identifiers, Data types, Input Operation, comments, Reserved words<br>• Operators and Expressions in Python, Other Data types-Tuples, dictionary, list. Type conversion<br>• Decision control statements- if statement, if-else statements, Nested if ,if-elif-else<br>• Basic Loop structure- while loop, for loop, selecting an appropriate loop, Nested loops, Break statement, continue statement, pass statement, else statement used with loops | **(12)**<br>2<br>3<br>2<br>3<br>2 | Power point presentations / Lectures/Assignments |
| **Module II:**<br>• **Functions and modules**-Need for functions, function definition, function call, variable scope and lifetime, Return statement, function definition using required argument, keyword argument, Default argument | **(12)**<br>2<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| • Lambda functions, Recursive functions- Greatest common Divisor, finding exponents Fibonacci series<br>• Modules—The from…import statement, Name of module, making your own module<br>• The dir( ), the Python module, modules and Namespaces<br>• Packages in Python, Standard Library modules, Function redefinition | 3 | |
| **Module III:**<br>• **Python String: Introduction—**concatenating, Appending, multiplying strings,Strings are Immutable, string formatting operator<br>• Built-in String methods and functions, slice operation<br>• Ord( ) and chr( ) functions, in and not in operators, comparing and iterating strings<br>• The String module, Regular Expressions—match( ),search( ),sub( ), findall( ),Finditer( ) functions, flag options. Metacharacters in Regular expressions<br>• **Data Structures**-Sequence, Lists, Functional programming: filter(),map() and reduce()function, Tuple, sets<br>• Dictionaries—creating dictionary, adding, modifying ,sorting and deleting item in dictionary, looping and nested dictionary, built-in dictionary functions,difference between list and dictionaries | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module IV:**<br>• **Classes and objects-**Introduction, defining classes, creating objects, data abstraction<br>• Class method and self argument, The __init__() method, class variables and object variables, The __del__() method, other special methods, public and private data members, private methods<br>• Calling a class method from another class method, built-in functions to check, Get, Set and Delete Class Attribute, Built-in class attribute<br>• **Inheritance :** Introduction, inheriting classes in Python, Types of Inheritance<br>• Composition or container ship or complex objects, abstract classes and interfaces Meta class<br>• **Operator overloading**—Introduction, Implementing operator overloading, reverse Adding | **(12)**<br>2<br>3<br>2<br>3<br>2 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module V:**<br>• **Error and Exception Handling-** Introduction to errors and exceptions, handling exceptions<br>• Multiple except blocks, multiple exception in a single block, except block without exception<br>• Raising Exceptions, Instantiating exceptions, handling exceptions in invoked functions, Built-in and user defined exceptions, the finally block<br>• **File Handling-**Introduction, File path, Types of Files-ASCII text file ,Binary file, opening and closing files<br>• **Reading and writing files-**write(), writelines(),append(),readline()<br>• File positions, renaming and deleting files, Directory methods | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |

**Learning Resources**

**ESSENTIAL READING**

1. Thareja, Reema. 2017. **Python Programming**. 3rd Edition. New Delhi: Oxford HED(UNIT-I,II,III,IV,V)

**SUGGESTED READING**

1. BalaGuruSwamy, E. 2017. **Problem Solving and Python Programming**. 1st Edition. McGraw Hill Education
2. Dr. R. Nageshwara Rao. 2018. **Core Python Programming**. 2nd Edition. DreamTech Press

# PRINCIPLES OF INFORMATION SECURITY LAB

**Credits:1**

**Semester:III**

**SubjectCode: G22CSCS1P** **No. of Lecture hours:30**

**Objective:** To get hands on experience with popular hacking tools and understand various hacking techniques in brief.

**Outcome:** Students will be able to learn some of the skills that you would require to become an expert in Ethical Hacking.

**Topics to be covered**

1. Installation of Operating System Using VMware.
2. Exploring Internet Options for a Browser, Examination and configuring the
   Contents of Security and Privacy Tabs.
3. Setting up a Simple network using Simulation Tools(Packet tracer)
4. Perform an experiment to Grab a Banner with Telnet
5. Using Nmap
   - Find open ports on a System
   - Find the machines which are active
   - Find the version of Remote OS on other systems
   - Find the version of Software installed on another system.
6. Program to implement Virus.
7. Demonstrate Intrusion Detection System
8. Implementation of Stenography–Hiding a Text File within a Image File using WinRar
9. Digital Signing a word document, PDF document and Email

# ETHICAL HACKING LAB

**Credits:1**

**Semester:III**

**SubjectCode: CSCS22305** **No. of Lecture hours:30**

**Objective:** To get hands on experience with popular hacking tools and understand various hacking techniques in brief.

**Outcome:** Students will be able to learn some of the skills that you would require to become an expert in Ethical Hacking.

1. Using the Open-Source Reconnaissance tool Recon-ng to gather personal information
2. Enumeration resources in a Local Machine Using Hyena
3. Enumerating services on a target Machine
4. Open Source Information gathering Using Windows Command Line utilities
5. Collecting Information about Target Website Using Firebug
6. Network Scanning Using Nmap
7. Detecting Phishing using Netcraft
8. Sniffing Facebook Credentials using Social Engineering Toolkit
9. Basic Disk Encryption using VeraCrypt

# DATABASE MANAGEMENT SYSTEM-LAB

**Credits: 1** **Semester:III**
**Course Code: CSCS25306** **No. of Practical Hrs: 30**

**Objective**: To develop relational and non-relational databases using SQL and NoSQL

1. **Create a Supplier table as shown below :**

| Sup_No (Primary Key) | Sup_Name | Item_Supplied | Item_Price | City |
|---|---|---|---|---|
| S1 | Suresh | Keyboard | 400 | Hyderabad |
| S2 | Kiran | Processor | 8000 | Delhi |
| S3 | Mohan | Mouse | 350 | Delhi |
| S4 | Ramesh | Processor | 9000 | Bangalore |
| S5 | Manish | Printer | 6000 | Mumbai |
| S6 | Srikanth | Processor | 8500 | Chennai |

a. Write sql query to display Supplier numbers and Supplier names whose name starts with 'R'
b. Write sql query to display the name of suppliers who supply Processors and whose city is Delhi.
c. Write sql query to display the names of suppliers who supply the same items as supplied by Ramesh.
d. Write sql query to increase the price of Keyboard by 200.
e. Write sql query to display supplier numbers, Supplier names and item price for suppliers in delhi in the ascending order of item price.
f. Write sql query to add a new column called CONTACTNO.
g. Write sql query to delete the record whose item price is the lowest of all the items supplied.
h. Create a view on the table which displays only supplier numbers and supplier names.
i. Write sql query to display the records in the descending order of item price for each item supplied.
j. Write sql query to display the records of suppliers who supply items other than Processor or Keyboard.

2. **Below are the details of Employees working for a software Company. Create the table called EmpDetails with the below mentioned details.**

| Eid (Primary Key) | Ename | DOB | Designation | Salary | DOJ |
|---|---|---|---|---|---|
| E101 | Suma | 29-Dec-89 | Designer | 20000 | 01-Apr-10 |
| E102 | Amit | 10-Jan-95 | Programmer | 25000 | 18-Feb-18 |
| E103 | Payal | 15-Aug-85 | Tester | 35000 | 13-Jun-11 |
| E104 | Kiran | 20-Apr-90 | Programmer | 40000 | 7-Mar-14 |
| E105 | Meenal | 29-May-83 | DBA | 50000 | 9-Dec-11 |
| E106 | Sheila | 1-May-70 | Analyst | 60000 | 25-Sep-18 |
| E107 | Swamy | 13-Jan-85 | Programmer | 45000 | 14-Feb-16 |
| E108 | Sushma | 22-Dec-76 | DBA | 45000 | 31-Jan-12 |

a. Write sql query to display all the employees whose designation is Programmer.
b. Write sql query to display employees who have joined after 2014.
c. Write sql query to display all the employees whose name ends with ‘a’.
d. Write sql query to display the total salary of all the employees whose designation is programmer.
e. Write sql query to display all the employee names in upper case.
f. Write sql query to display the details of the employee with highest experience.
g. Write sql query to display the details of the employees whose name contains‘ee’.
h. Write sql query to increase the salaries of employees by 5000 whose designation is DBA.
i. Write sql query to display the employees whose salary is more than the average salary of all the employees.
j. Write sql query to display the record in the following format:
xxxxxxxxx is working as xxxxxxxxxxxxxx with a Salary of Rs.xxxxxxxx
eg: Suma is working as Designer with a Salary of Rs. 20000

3. **Create the two tables as shown below with the given constraints:**

Table name: **Employee**

Constraints: Eid is Primary key and DeptId is foreign key

Salary should not be less than 10000

| Eid (Primary Key) | Ename | DeptId (Foreign Key) | Designation | Salary ( > 10000) | DOJ |
|---|---|---|---|---|---|
| 101 | Sudha | D2 | Clerk | 20000 | 01-Apr-10 |
| 102 | David | D1 | Manager | 50000 | 18-Feb-18 |
| 103 | Preethi | D3 | Clerk | 35000 | 13-Jun-11 |
| 104 | Kiran | D1 | Salesman | 20000 | 7-Mar-14 |
| 105 | Meenal | D2 | Clerk | 50000 | 9-Dec-11 |
| 106 | Sunitha | D3 | Manager | 60000 | 25-Sep-18 |
| 107 | Akhil | D3 | Clerk | 25000 | 14-Feb-16 |
| 108 | Sushma | D2 | Manager | 45000 | 31-Jan-12 |

Tablename: **Department**

Constraints:DeptId Primary key and Dname is NOT NULL

| DeptId (Primary Key) | Dname |
|---|---|
| D1 | Sales |
| D2 | Marketing |
| D3 | Finance |

a. Write sql query to display all the employees who earn more than average salary of all the employees in the company.
b. Write sql query to display the fields Eid, Ename and Dname.
c. Write sql query to sort the employee table in the descending order of salaries.
d. Write sql query to list all the job designations in the employee table without repetitions.
e. Write sql query to display all the employee details Department wise and in the ascending order of their salaries.
f. Write sql query to display all the clerks in DeptId D2.
g. Write sql query to display all the employees who joined in the year 2011.
h. Write sql query to display all the employees who joined in the month of February.
i. Write sql query to display all the employees whose salary is between 30000 and 45000.
j. Write sql query to display all the employee details along with their work experience in the company till current date.

4. **Below are the details of Students enrolled in various course of B.Com. Create the table called Student with the below mentioned details.**

| Sid (Primary Key) | Sname | DOB | State | Gender | Category | Course |
|---|---|---|---|---|---|---|
| 1001 | Neha | 29-Dec-02 | Telangana | F | Gen | Comp |
| 1002 | Arun | 10-Jan-02 | Telangana | M | OBC | Honors |
| 1003 | Payal | 15-Aug-01 | Maharashtra | F | Gen | Appl |
| 1004 | Amrita | 20-Apr-02 | Karnataka | F | OBC | Honors |
| 1005 | Pavan | 29-May-03 | AndhraPradesh | M | ExServicemen | Comp |
| 1006 | Anchal | 1-May-03 | Gujarat | F | OBC | Comp |
| 1007 | Ramya | 13-Jan-02 | Telangana | F | Gen | Appl |
| 1008 | Rakesh | 22-Dec-01 | AndhraPradesh | M | Sports | Comp |

a. Write sql query to display the students who are not from Telangana or Andhra Pradesh.
b. Create a view to display the columns Sid, Sname for students belonging to Telangana.
c. Write sql query to create an index on column Sname.
d. Write sql query to display all the female students enrolled under Comp course and who belong to OBC.
e. Write sql query to display the student ids, names, and their present age.
f. Write sql query to display the students in the ascending order of their names for each course.
g. Write sql query to delete all the students records who have enrolled for Comp course and who are born after 2002.
h. Write sql query to add two new columns Contact no and Email to the existing fields.
i. Write sql query to display all the Student names prefixed with Mr./Ms. Based on Gender column.
j. Write sql query to display all the Student names where the length of the name is 5 characters.

5. **Create a Table for Library Information**

**Table name: Library**

**Constraints: BookId is primary key and BookName is NOT NULL**

| BookId (Primary Key) | BookName | Author | DatePurchased | Publisher | Price |
|---|---|---|---|---|---|
| B101 | Cost Accounting | Jain Narang | 11-Feb-13 | Kalyani | 800 |
| B102 | Business Statistics | OP Aggarwal | 22-Dec-11 | Himalaya | 750 |
| B103 | Rdbms | C J Date | 2-Mar-15 | TMH | 900 |
| B104 | Mgmt Accounting | RK Sharma | 19-Apr-16 | Kalyani | 450 |
| B105 | Operating Systems | Galvin | 25-Nov-13 | PHI | 750 |
| B106 | Advanced Accounting | SC Gupta | 16-Apr-18 | Himalaya | 600 |

a. Write sql query to display the list of authors from Himalaya publications.
b. Write sql query to display the total cost of books purchased Publisher wise.
c. Write sql query to count the total number of books under Kalyani publications.
d. Write sql query to rename the column Publisher as Publications.
e. Write a sql query to display the books in the ascending order of DatePurchased.
f. Write sql query to create an index on the fields BookName and Author.
g. Write sql query to display the books whose price is between 500 and 700
h. Write sql query to increase the price of all the books by 200 for publishers other than Himalaya or Kalyani.
i. Write sql query to display the book details where author name contains the name Sharma.
j. Create a view to display the fields BookId and BookName where the Publisher is Himalaya

6. Queries on EMP and DEPT tables
a. Simple query
b. Aggregate, numeric and string functions
c. Group by, order by clause
d. Joins
e. Set operators

7. **PL/SQL PROGRAMS**

1. PL/SQL to add two numbers
2. PL/SQL to find factorial of a number
3. PL/SQL for demo on for loop
4. PL/SQL for case structure
5. PL/SQL/ for simple loop
6. PL/SQL to increase the value by 10
7. PL/SQL for performing arithmetic operations
8. PL/SQL to find square, cube, double of a number
9. PL/SQL program to swap two numbers
10. PL/SQL program to find multiplication table
11. PL/SQL to determine whether a year is leap year or not
12. PL/SQL to insert item numbers from 1 to 5 using a loop
13. PL/SQL to delete an item whose itemnum=4
14. PL/SQL program to display name, salary, commission and emp no
15. of an employee based on the ID
16. PL/SQL program for inverting a number
17. PL/SQL program to calculate the area for circle for radius ranging from 3 to 7
18. Program to print empno, ename, job and salary of an employee given empno
19. PL/SQL block that will increase the salary by 100 if salary is greater than 1000 for a empno
20. PL/SQL program to implement %found
21. PL/SQL program to implement %found using dept table

22. Write a PL/SQL block using the cursor to display details of all employee's from emp table whose sum of sal and commission is>2000
23. Write a PL/SQL block that display's employee name and the salary of the first 5 employee's having the highest salary
24. Write a PL/SQL program to find the sum of the salaries in a particular department
25. PL/SQL to print all employees begin with s.
26. Write a PL/SQL to print names of all managers
27. PL/SQL to update salary of an employee whose empno and increment mentioned.
28. Write a PL/SQL block which accepts the empno from the user and display the details of the employee. When the user enters an empno that is not in the emp table then PL/SQL block must display an appropriate
29. PL/SQL block that retrieves course table into cursor. Input course ID to search. If course exists, print the information. If the course ID does not exist, print user defined message by throwing user defined
30. Write a program to handle ZERO_DIVIDE exception
31. Write a PL/SQL function which checks for an employee number in the table and returns 1 if present otherwise returns 0
32. PL/SQL that creates a trigger that inserts or update values of ename, job as lower case strings.
33. Practice CRUD (Create, Read, Update, and Delete) operations on the MongoDB

a. Usage of Where Clause equivalent in MongoDB
b. Usage of operations in MongoDB – AND in MongoDB, OR in MongoDB, Limit Records and Sort Records.
c. Usage of operations in MongoDB – Indexing, Advanced Indexing, Aggregation and Map Reduce.

34. Download a zip code dataset at http://media.mongodb.org/zips.json Use mongo import to import the zip code data set into MongoDB. After importing the data, answer the following questions by using aggregation pipelines:

a. Find all the states that have a city called "BOSTON".
b. Find all the states and cities whose names include the string "BOST".
c. Each city has several zip codes. Find the city in each state with the most number of zip codes and rank those cities along with the states using the city populations.

# PYTHON PROGRAMMING LAB

**Credits:1**

**Semester:III**

**SubjectCode: CSCS22307** **No. of Lecture hours:30**

**Outcome:** Students will be able to develop applications using object-oriented concepts of varying complexities.

- To strengthen problem solving ability by applying the characteristics of an object oriented approach in Python.
- To build software for real world applications.
- To implement frontend of an application

**Outcome:** Students will be able to develop applications using object-oriented concepts of varying complexities.

1. Write a program that takes two integers as command line arguments and prints the sum of two integers.
2. Program to display the information: Your name, Full Address, Mobile Number, College Name, Course Subjects
3. Program to find the largest number among ‘n’ given numbers.
4. Program to find the sum of all prime numbers between 1 and 1000.
5. Program that reads a set of integers and displays the first and second largest numbers.
6. program to check whether the character is digit or alphabet or space.
7. Program to sum of series 1+1/2+1/3+……+1/n
8. Program to print the sum of first ‘n’ natural numbers.
9. Program to perform operations on two matrices such as add, product and transpose
10. Program to find the roots of a quadratic equation
11. Write both recursive and non-recursive functions for the following:
    a. To find GCD of two integers
    b. To find the factorial of positive integer
    c. To print Fibonacci Sequence up to given number ‘n’
    d. To convert decimal number to Binary equivalent
12. Program to print calendar of a month given start date and number of Days.
13. Program with a function that accepts two arguments: a list and a number ‘n’. It should display all the numbers in the list that are greater than the given number ‘n’.
14. Program with a function to find how many numbers are divisible by 2, 3,4,5,6 and 7 between 1 to 1000
15. Program that accepts a string as an argument and returns the number of vowels and consonants the string contains.
16. Program that accepts two strings S1, S2, and finds whether they are equal are not.
17. Program to count the number of occurrences of characters in a given string.
18. Program to find whether a given string is palindrome or not

19. Program with a function that takes two lists L1 and L2 containing integer numbers as parameters. The return value is a single list containing the pairwise sums of the numbers in L1 and L2.
20. Program to read the lists of numbers as L1, print the lists in reverse order without using reverse function.
21. Program for functional programming – map, reduce, filter.
22. Write a program that combines lists L1 and L2 into a dictionary.
23. Program to find mean, median, mode for the given set of numbers in a list.
24. Program to find all duplicates in the list.
25. Program to find all the unique elements of a list.
26. Program to find max and min of a given tuple of integers.
27. Program to find union, intersection, difference, symmetric difference of given two sets.
28. Program to display a list of all unique words in a text file
29. Program to copy contents of a file.
30. Program to count the number of times a character appears in a file.
31. Program to read the content of a text file and display it on the screen line wise with a line number followed by a colon
32. Program to analyse the two text files using set operations
33. Write a program to print each line of a file in reverse order.
34. Program to create a class rectangle to print the area of the rectangle.
35. Program to implement the inheritance
36. Program to create class polygon and derive rectangle and triangle class to find areas
37. Program to implement built-in exceptions.
38. Program to demonstrate user defined exception

**Year-wise and Semester-Wise Distribution of Courses**
**Department of B.Sc. Computer Science & Cyber Security**
**Second Year Second Semester**
**Academic Year 2026-27 of 2025-28Batch (CBCS)**

| Sl. No. | Part | Course Code | Title of the Course | Hours /Week | Duration of Exam (hrs.) | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Internal | External | Total | |
| 1 | I | CSCS22401 | Discrete Mathematics (**GE-2)** | 4 | 3 | 40 | 60 | 100 | 4 |
| 2 | I | CSCS22402 | Computer Forensics **(DSC-10)** | 4 | 3 | 40 | 60 | 100 | 4 |
| 3 | II | CSCS22403 | Cyber Ethics and IPR **(DSC-11)** | 4 | 3 | 40 | 60 | 100 | 4 |
| 4 | II | CSCS25404 | Principles of Information Security **(DSC-12)** | 4 | 3 | 40 | 60 | 100 | 4 |
| 5 | II | CSCS22405 | Network Security **(DSC-13)** | 4 | 3 | 40 | 60 | 100 | 4 |
| 6 | II | CSCS25406 | Python Scripting(DSC-**14**) | 4 | 3 | 40 | 60 | 100 | 4 |
| **PRACTICALS** | | | | | | | | | |
| 7 | II | CSCS25407 | Principles of Information Security **(DSC-12)** | 2 | 3 | 40 | 60 | 100 | 1 |
| 8 | II | CSCS22408 | Network Security lab(DSC-13) | 2 | 3 | 40 | 60 | 100 | 1 |
| 9 | II | CSCS25409 | Python Scripting(DSC-14) | 2 | 3 | 40 | 60 | 100 | 1 |
| 10 | II | CSCS25410 | Mini Project (SEC-4) | 1 | 3 | 40 | 60 | 100 | 1 |
| **Total** | | | | **31** | **-** | 400 | 600 | 1000 | **28** |

# DISCRETE MATHEMATICS

**Credits: 4** **Semester: IV**
Course Code: **CSCS22401** No of Lecture Hours: 60

**Course Objective:**

- To introduce lattices, Graph theory and to familiarise with the basic concepts of Number theory

Course Outcome:

**CO1: Develop** an understanding of Logic Sets and Functions
**CO2**: **Evaluate** and apply the fundamental concepts in graph theory
**CO3**: **Develop** an understanding of how graph and tree concepts are used to solve problems arising in computer science.
**CO4: Express** the concepts and results of Euler and Hamiltonian graphs.
**CO5**: **Identify** methods and techniques used to represent flow through a network.

| **Course Content** | **Hours Allotted** | **Pedagogy** |
|---|---|---|
| **Module I: Title: LATTICES**<br>• Relations and ordering<br>• Partial order relations - Partially ordered sets<br>• Hasse diagrams<br>• Lattices - Properties of lattices<br>• Types of Lattices | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module II: Title: GRAPH THEORY – I**<br>• Definition of a graph, Degree of vertex<br>• First theorem of graph theory Paths and connection<br>• Isomorphism of graphs<br>• Some special simple graphs | **(12)**<br>3<br>2<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |
| **Module III: Title: GRAPH THEORY – II**<br>• Trees and their properties<br>• Binary trees, Binary search trees, Spanning trees, Kruskal's Algorithm,<br>• Prim's Algorithm, Planar graphs, Euler's formula | **(12)**<br>**5**<br>3<br>4 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module IV: Title: GRAPH THEORY-III**<br>• Euler graphs<br>• Hamiltonian graphs- Grinberg theorem<br>• Chromatic numbers | **(12)**<br>4<br>4<br>4 | Power point presentations / Lectures/Assignments |
| | | |
| **Module V: Title: NETWORK FLOW**<br>• Graphs as Models of Flow of Commodities<br>• Flows<br>• Maximal Flows and Minimal Cuts<br>• The Max Flow Min Cut Theorem | **(12)**<br>3<br>3<br>3<br>3 | Power point presentations / Lectures/Assignments |

**Learning Resources**

**ESSENTIAL READING**

1. Tremblay Jean, P. and Manohar, R. 2007. **Discrete Mathematical Structures with Applications to Computer Science.** New Delhi: McGraw-Hill. (For Unit I)
2. Mott Joe, L. Kandel Abraham. And Baker Theodore, P. 1999. **Discrete Mathematics for Computer Scientists and Mathematicians.** 2nd Edition. New Delhi: PHI (For Units II,III, IV and V)

# COMPUTER FORENSICS

**Credits: 4** **Semester: IV**
Course Code: **CSCS22402** No of Lecture Hours: 60

**Course Objective:**

- Understand the role of Computer Forensics in digital evidence plays in criminal and civil investigations and incident response

Course Outcome:

**CO1**: **To Understand** Computer Forensics in detail.
**CO2**: **Identify** the types of Evidence and Methods of collecting evidence.
**CO3**: **To Explain** Computer Forensics analysis and validation
**CO4**: To **Analyse** Current Computer Forensic tools
**CO5**: To **Understand** acquisition procedures for cell phones and mobile devices

| **Course Content** | **Hours Allotted** | **Pedagogy** |
|---|---|---|
| **Module I: Title: Computer Forensics Fundamentals:**<br>• What is Computer Forensics?, Use of Computer Forensics in Law Enforcement<br>• Computer Forensics Services<br>• Forensics Methodology<br>• Types of Military Computer Forensic Technology<br>• Types of Computer Forensics Technology<br>• Computer Forensics Evidence and Capture | **(12)**<br>2<br>3<br>2<br>3<br>2 | Power point presentations / Lectures/Assignments |
| **Module II: Title: Evidence Collection and Data Seizure**<br>• Why Collect Evidence, Types of Evidence, The Rules of Evidence<br>• Methods of Collection, Controlling Contamination<br>• Computer Evidence Processing Steps | **(12)**<br>4<br>4<br>4 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module III: Title: Computer Forensics analysis and Validation**<br>• Determining what data to collect and analyse, validating forensic data<br>• Addressing data-hiding techniques, | **(12)**<br>2<br>3 | Power point presentations / Lectures/Assignments |
| performing remote acquisitions<br>• Processing Crime and Incident Scenes:<br>• Identifying digital evidence, collecting evidence in private-sector incident scenes,<br>• Processing law enforcement crime scenes, preparing for a search,<br>• Securing a computer incident or crime scene,<br>• Seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case | 2<br>2<br>3 | |
| **Module IV: Title: Current Computer Forensic tools**<br>• Evaluating computer forensic tool needs, computer forensics software tools,<br>• computer forensics hardware tools, validating and testing forensics software<br>• E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in email, investigating email crimes and violations<br>• Understanding email servers, using specialised email forensic tools | **(12)**<br>2<br>3<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |
| **Module V:**<br>• Cell phone and mobile device forensics: Understanding mobile device forensics<br>• Understanding acquisition procedures for cell phones and mobile devices<br>• Working with Windows and DOS Systems: understanding file systems, exploring Microsoft File Structures, Examining NTFS disks<br>• Understanding whole disk encryption, windows registry | **(12)**<br>2<br>3<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |

**Learning Resources**

1. John R. Vacca ,Computer Forensics, Computer Crime Investigation , Firewall Media, New Delhi.
2. Nelson, Phillips Enfinger, Steuart ,Computer Forensics and Investigations CENGAGE Learning

**REFERENCE READING**

1. Real Digital Forensics by Keith J. Jones, Richard Bejtiich, Curtis W. Rose, AddisonWesley Pearson Education
2. Forensic Compiling, A Practitioner's Guide by Tony Sammes and Brian Jenkinson, Springer International edition

# CYBER ETHICS AND IPR

**Credits: 4** **Semester: IV**
Course Code: **CSCS22403** No of Lecture Hours: 60

**Course Objective:**

- To understand the origin and development of cyber laws
- To understand the various rules and procedures for the applicability of the cyber laws with reference and domestic and international laws
- To understand the contemporary issues and challenges in cyber laws

Course Outcome:

**CO1:Learn** the conceptual and theoretical perspective of cyber laws Presentation
**CO2: Understand** the legalities through analysis of IT Act, 2000 Presentation
**CO3: Understand** the concepts of Trademark
**CO4: Understand** the relation between IPR laws Presentation
**CO5: Understand** the importance of E-commerce

| **Course Content** | **Hours Allotted** | **Pedagogy** |
|---|---|---|
| **Module I:**<br>• Information Security And Cyber Law – Introduction, Cybersecurity Policy, Cyber Crime,, Nature of Threat, Enabling People, Information Technology Act, Mission and Vision of Cybersecurity Program<br>• Emerging Trends of Cyber Law, Areas of Development, International Network on Cybersecurity,<br>• Types of Intellectual Property Rights, Advantages of Intellectual Property Rights, Intellectual Property Rights in India, Intellectual Property in Cyber Space<br>• Cyber Security Strategies(strategies 1 to 8) | **(12)**<br>2<br>3<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module II:**<br>• I.T. ACT, Salient Features, Scheme, Application, Highlights of I.T.Act<br>• Offences, Offences Under The It Act 2000<br>• Offence and penalties against all the mentioned sections of the I.T. Act<br>• Compounding of Offences<br>• Digital Signature, Electronic Signature,Digital Signature to Electronic Signature<br>• Web Content Accessibility Guidelines (WCAG). | **(12)**<br>2<br>3<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |
| **Module III:**<br>• Trade Marks: Purpose and function of trademarks, Acquisition, transfer of rights<br>• Protectable matter, selecting and evaluating trademark<br>• Registration of trademarks, claims. Trade Secrets: Trade secret law<br>• determination of trade secret status, liability for misappropriation of trade secrets, protection for submission, trade secret litigation<br>• Unfair Competition: Misappropriation right of publicity, false advertising<br>• Social Networking Sites Vs Human Rights | **(12)**<br>2<br>3<br>3<br>3<br>1 | Power point presentations / Lectures/Assignments |
| **Module IV:**<br>• Copyrights: Fundamentals of copyright law, originality of material<br>• Right of reproduction, right to perform the work publicly<br>• Copyright ownership issues, notice o copyright<br>• Patents: Foundation of patent law<br>• Patent searching process, ownership right and transfer | **(12)**<br>3<br>3<br>3<br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module V:**<br>• E-Commerce -United Nations , Commission On International Trade Law Top of Form UNCITRAL Model<br>• Legal aspects of E-Commerce, Technical and Legal issues<br>• Trends and Prospects<br>• online publishing and online credit card payment<br>• Employment Contracts – Non-Disclosure Agreements | **(12)**<br>3<br>3<br>3<br>3 | Power point presentations / Lectures/Assignments |

**Learning Resources**

**ESSENTIAL READING**

1. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing, UP, 2016.
2. Indian Law Institute, Legal dimensions of Cyberspace, New Delhi.
3. Farouq Ahmed, Cyber Law in India, Allahabad Law Agency, 2015 .
4. https://www.tutorialspoint.com/information_security_cyber_law/digital_and_electronic_signatures.htm

**REFERENCE READING**

4. Karnika Seth, Computers, Internet and New Technology Laws-A Comprehensive Reference Work With Special Focus On Developments In India, LexisNexis, Nagpur, 2016.
5. Kamath Nandan: Law relating to Computer, Internet and E-Commerce, Universal Law Publishing, UP, 2007.

# PRINCIPLES OF INFORMATION SECURITY

**Credits: 4** **Semester: IV**
Course Code: **CSCS25404** No of Lecture Hours: 60

**Course Objective:**

- To compile, analyze, and assess the applicability of best practices in addressing information.
- To address the issues relevant to the cyber security community

Course Outcome:

**CO1**: **Explain** concepts of confidentiality, availability and integrity (CIA) in context of Information security
**CO2**: **Identify** the risk, assess and risk control strategies.
**CO3**: **Demonstrate** expertise in configuring host and network level technical security controls to include host firewalls, user access controls, host logging, network filtering, intrusion detection and prevention
**CO4**: **Analyze** systems, tools, methods, and techniques for securing digital information within an organization
**CO5**: **Develop** encryption and decryption techniques.

| Course Content | Hours Allotted | Pedagogy |
|---|---|---|
| **Module I: Title: INTRODUCTION OF INFORMATION SECURITY**<br>• Introduction to Security, Critical Characteristics of Information<br>• NSTISSC Security Model, Critical Characteristics of Information<br>• Approaches to information Security implementation,<br>• System Development Life Cycle<br>• Security System Development Life Cycle,<br>• Information Security : Art of Science | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module II:**<br>**THE NEED FOR SECURITY**<br>• Important functions of Information Security<br>• Threats and category of Threats:Physical threats ,Non-Physical threats,Causes of Threats<br>• Attacks and Types of Attacks | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |
| • Prevention and Protection against Cyber Attacks<br>• Secure Software development | | |
| **Module III: Title: SECURITY TECHNOLOGY: FIREWALLS AND VPNS**<br>• Firewall : Processing modes, Categorization<br>• Firewall Architecture, Choosing a Firewall<br>• Configuring and Managing a Firewall<br>• Firewall Rules<br>• Protecting Remote Connections: Securing Authentication with Kerberos<br>• VPN : Transport and Tunnel Mode | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module IV: Title: SECURITY TECHNOLOGIES: INTRUSION DETECTION AND OTHER SECURITY TOOLS**<br>• IDPS : Terminology,Types of IDPS<br>• IDPS Detection Methods, IDPS Response Behaviour<br>• Strengths and Limitations of IDPS<br>• Honeypots, Honeynets and Padded Cell Systems<br>• Port Scanners, Firewall Analysis Tools<br>• Operating System Detection Tools, Vulnerability Scanners<br>• Packet Sniffers, Wireless Security Tools | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module V: Title: CRYPTOGRAPHY**<br>• Terminology, Cryptographic Tools, PKI<br>• Digital SIgnature Digital Certificate and Steganography<br>• Protocol for Secure Communication : Securing Internet with SSL<br>• Securing Email with S/MIME, PGP<br>• Securing Web Transactions SET<br>• Securing Wireless Network with WEP and WPA<br>• Securing TCP;IP with IPSEC | **(9)**<br>2<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |

**Learning Resources**

**ESSENTIAL READING**

1.Whitman Michael, E. and Mattord Herbert, J. 2011. **Principles of Information Security**. 4th Edition USA: Course Technology.
(Unit I: Chapter 1, Unit II: Chapter 2, UNIT III: Chapter 6, Unit 4: Chapter 7, Unit 5: Chapter 8)

# NETWORK SECURITY

**Credits: 4** **Semester: IV**
Course Code: **CSCS22405** No of Lecture Hours: 60

**Course Objective:**

- Describe the security threats facing modern network infrastructures

Course Outcome:

CO1:**Understand** Basics of Network Security, Classes of Attacks
CO2:**Explain** about Secure Network Life Cycle Management
CO3:**Demonstrate** Cisco Router Configuration.
CO4:**Learn** Securing the Cisco ISO image and ACS
CO5:Explore about ACL and Firewall.

| **Course Content** | **Hours Allotted** | **Pedagogy** |
|---|---|---|
| **Module I:**<br>• Introduction to Network Security Principles-Need of Security<br>• Data, Vulnerabilities, and Countermeasures<br>• Data Classification, Adversaries, Methodologies, and Classes of Attack<br>• Security Policies<br>• Principles of Secure Network Design<br>• Secure Network LifeCycle Management | **(12)**<br>2<br>3<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |
| **Module II:**<br>• The Need for IPv6, IPv6 Features and Enhancements<br>• IPv6 Addressing, Representation, Testing<br>• Assigning IPv6 Global Unicast Addresses<br>• IPv6 and Cisco Routers<br>• Revisiting Threats: Considerations for IPv6, Examples of Possible IPv6 Attacks | **(12)**<br>3<br>3<br>3<br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module III:**<br>• Threats Against the Network Infrastructure<br>• Cisco NFP Framework<br>• Configuring Secure Administration Access<br>• Configuring the Console password, Securing the Cisco ISO image and Configuration files<br>• Setting Timeouts for Router Lines, Enhanced Username and Password Security<br>• Securing ROM Monitor, Configuring Role based Command-Line Interface Access | **(12)**<br><br>3<br>3<br><br>3<br><br>3 | Power point presentations / Lectures/Assignments |
| **Module IV:**<br>• Network Time Protocol<br>• Using Syslog Logging for Network Security<br>• Configuring AAA on a cisco router using the local database<br>• Cisco Secure ACS Overview<br>• TACACS+ and RADIUS protocols , comparison, AAA Configuration for TACACS+ Example | **(12)**<br><br>3<br>3<br>3<br>3 | Power point presentations / Lectures/Assignments |
| **Module V:**<br>• Network Security using Cisco IOS Firewalls, Firewall Technologies and fundamentals<br>• Firewalls in a Layered defence strategy<br>• Static Packet filtering firewalls<br>• Application Layer Gateways<br>• Dynamic Packet Filtering Firewalls<br>• ACL Fundamentals | **(12)**<br><br>3<br>3<br><br>3<br><br>3 | Power point presentations / Lectures/Assignments |

**Learning Resources**

**ESSENTIAL READING:**

1. Catherine Paquet, **Implementing Cisco IOS Network Security (IINS),Cisco Press.**

**REFERENCE READING**

1. CCNA Security 210-260 Official Cert Guide | Cisco Press

# PYTHON SCRIPTING

**Credits: 4** **Semester: IV**
Course Code: **CSCS22406** No of Lecture Hours: 60

**Course Objective:**

- To understand various advanced programming concepts of Python

Course Outcome:

**CO1**: Understand the paradigm of scripting
**CO2**: Usage of Python to work with numbers
**CO3**: Build Interactive applications with GUI concepts
**CO4**: Apply network programming and e-mail
**CO5**: Use XML with Python

| Course Content | Hours Allotted | Pedagogy |
|---|---|---|
| **Module I: Title: Introduction to Regular Expressions**<br>• Regular Expressions<br>• Values and types<br>• Variables, storage and control<br>• Bindings and scope<br>• Procedural Abstraction and Data Abstraction<br>• Separate compilation and Module library | **(12)**<br><br>2<br>3<br>2<br>3<br>2 | Power point presentations / Lectures/Assignments |
| **Module II: Title: Numerical Programming**<br>• Numbers in Python-Integers, Long Integers, Floating point numbers<br>• Formatting Numbers and Characters as Numbers<br>• Mathematics- Arithmetic and Built-in Math functions<br>• Complex Numbers<br>• Arrays-The Array Module | **(12)**<br><br>2<br>3<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |
| **Module III: Title GUI Programming**<br>• Writing a GUI with Python-GUI Programming Toolkits for Python<br>• Tkinter Introduction<br>• Creating GUI Widgets with Tkinter<br>• Resizing the Widget, Configuring Widget Options<br>• Putting the Widgets to work | **(12)**<br><br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| • Radio Buttons, Checkboxes and Dialog Boxes | | |
| **Module IV: Title: Network Programming**<br>• Understanding Protocols-Comparing Protocols and Programming Languages<br>• The Internet Protocol Stack and about the Internet Protocol<br>• Sending Internet E-mail – The E-mail Format<br>• MIME Messages<br>• Retrieving Internet e-mail-Parsing a Local Mail Spool with mailbox, Fetching Mail from a POP3 Server with poplib | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module V: Title: Using Python for XML**<br>• What is XML? - A Hierarchical Markup Language, AFamily of Standards. What is a Schema/DTD-What AreDocument Models For? Do You Need One?<br>• Document Type Definitions-An Example DTD, DTDsAren't Exactly XML, Limitations of DTDs<br>• Schemas-An Example Schema, Schemas Are Pure XML,Schemas Are Hierarchical, Other Advantages of Schemas<br>• X Path and HTML as a subset of XML-The HTML DTDs, HTML Parser, XML Libraries Available forPython<br>• . What Is SAX? - Stream-based, Event-driven, What Is DOM? In-memory Access Why Use SAX or DOM - Capability Trade-Offs, Memory Considerations, Why Use SAX or DOM -Capability Trade-Offs, Memory Considerations, Speed Considerations. SAX and DOM Parsers Available for Python- xml. sax, xml. dom.minidom | **(12)**<br>3<br>3<br>3<br>3 | Power point presentations / Lectures/Assignments |

**Learning Resources**

**ESSENTIAL READING**

1. Beginning Python®: Using Python 2.6 and Python 3.1- James Payne (Unit-2, Unit-3,Unit-4, Unit-5)
2. PROGRAMMING LANGUAGE DESIGN CONCEPTS- David A. Watt with

contributions by William Findlay (Unit-1)

# NETWORK SECURITY LAB

**Credits:1**

**Semester:IV**

**Subject Code: CSCS22408** **No. of Lecture hours:30**

**Objectives:** Explain network threats, mitigation techniques, and the basics of securing a network

| No. of Hrs | Topic |
|---|---|
| 1 | Configure OSPF MD5 Authentication |
| 2 | Configure Routers to Log Messages to the Syslog Server |
| 3 | Configure Router to Support SSH Connections |
| 4 | Configure SSH timeouts and authentication parameters |
| 5-6 | Configure server-based AAA authentication using TACACS+ |
| 6-7 | Configure server-based AAA authentication using RADIUS |
| 7-8 | Configuring ACLs |

# PYTHON SCRIPTING LAB

**Credits: 1** **Semester: IV**
**Course Code: CSCS22409** **No. of Lecture hrs: 30**

## Course Objectives

To understand various concepts of advanced programming and implement them

1. Programs on Regular Expressions
2. Programs using Numbers in Python
3. Programs on Arithmetic and Math Built-in functions
4. Program to implement Array Module
5. Programs on GUI Widgets with T-kinter
6. Programs on checkboxes, radio- buttons and dialog boxes
7. Programs to implement XML using SAX and HTML Parser

# PRINCIPLES OF INFORMATION SECURITY LAB

**Credits : 1** **Semester : IV**
**Subject Code: CSCS25407** **No. of Practical Hours: 30**

**Objective:** To analyze the security tools for protecting the information.
**Outcome:** Students will be able to work with computer security tools and simulate network architecture

1. Installation of Operating System Using VMware.
2. Exploring Internet Options for a Browser, Examination and configuring the Contents of Security and Privacy Tabs.
3. Using Nmap
   - Find open ports on a System
   - Find the machines which are active
   - Find the version of Remote OS on other systems
   - Find the version of Software installed on other system.
4. Program to implement Virus.
5. Demonstrate Intrusion Detection System
6. Exploring Wireless Security Tools (Air snare)
7. Implementation of Stenography –Hiding a Text File within a Image File using Win Rar
8. Digital Signing a word document, PDF document and Email
9. Creating Public Key, Private Key and Digital Certificate
10. Create SSL Certificate Using XCA Software
11. Demonstration of Hash Function using Cry tool
12. Study of Hardware and Software Firewalls and Case Study on Man-In-Middle

Phishing and harming Attacks

# MINI PROJECT EVALUATION
## CRITERIA

**Credits : 1** **Semester: IV**

**Subject Code : CSCS25410** **No. of Practical Hours: 15**

Second year students in the fourth Semester are required to take up a mini project work which carries a total of 100 marks i.e. internal 40 marks and external 60 marks.

Students can choose any programming language and it should be the one relevant to the course of study.

| S.No. | Criteria | Marks |
|---|---|---|
| 1 | Attendance | 5 Marks |
| 2 | Review of Literature | 5 Marks |
| 3 | Internal Project Presentation<br>(Presentation , Communication Skills, Objectives, Work Submission, Methodology, results and Practical relevance ) | 10 Marks |
| 4 | Final Internal Presentations<br>(50% marks Evaluation done by the internal guide, and 50% marks evaluated by other internal lecturers guiding the projects). | 10 Marks |
| 5 | Project Report | 10 Marks |

**External Evaluation of the Project (60 marks)**: The Controller of Examination appoints an external examiner who evaluates Project Reports. The viva-voce examination is conducted on the Project work done by the student. The Project Report is evaluated for 40 marks and Viva for 20 marks

# YEAR AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
## DEPARTMENT OF COMPUTER SCIENCE AND CYBER SECURITY
## B.Sc. (COMPUTER SCIENCE AND CYBER SECURITY)
## FIFTH SEMESTER
## ACADEMIC YEAR 2026-27 Of Batch 2024-27

| Sl. No. | Part | Subject Code | Title of the Subject | Hours /Week | Credits | Marks | | | Duration of Exam (hrs.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Internal | External | Total | |
| **THEORY** | | | | | | | | | |
| 1 | II | CSCS26501A | **Electives-1**(DSE-1)<br>Computer Security & Audit Assurance | 4 | 4 | 40 | 60 | 100 | 3 |
| | II | CSCS23501B | Secure Ecommerce | | | | | | |
| 2 | II | CSCS26502A | **Elective-2**(DSE-2)<br>Internet of Things | 4 | 4 | 40 | 60 | 100 | 3 |
| | II | CSCS26502B | Distributed Systems | | | | | | |
| 3 | II | CSCS23503 | Go Lang Programming (Core-15) | 4 | 4 | 40 | 60 | 100 | 3 |
| 4 | II | CSCS26504 | Machine Learning (Core-16) | 4 | 4 | 40 | 60 | 100 | 3 |
| 5 | II | CSCS26505 | Database Security(Core-17) | 4 | 4 | 40 | 60 | 100 | 3 |
| 6 | II | CSCS23506 | Disaster Recovery and Risk Management (Core-18) | 4 | 4 | 40 | 60 | 100 | 3 |
| **PRACTICALS** | | | | | | | | | |
| 7 | II | CSCS23507 | Go Lang Programming lab(Core) | 2 | 1 | 40 | 60 | 100 | 3 |
| 8 | II | CSCS26508 | Machine learning lab(Core) | 2 | 1 | 40 | 60 | 100 | 3 |
| 9 | II | CSCS26509 | Database Security(Core) | 2 | 1 | 40 | 60 | 100 | 3 |
| | | **Total** | | **30** | **27** | 360 | 540 | 900 | - |

*** Skill Enhancement course(SEC)**
***Discipline -Specific Elective(DSE)**
***Core**

# COMPUTER SECURITY & AUDIT ASSURANCE

**Credits:4** **Semester:V**

**Course code:CSCS26501A** **No.of Lecture Hrs:60**

**Objectives :**

1. To state the basic concepts in information systems security, including security technology and principles.
2. To acquire knowledge about software security and trusted systems and IT security management.
3. To understand audit, standard practices and policies.
4. To explain concepts related to various cryptographic tools.
5. To understand and implement disaster recovery planning control.

**Outcomes:**

1. State the requirements and mechanisms for identification and authentication.
2. Explain and compare the various access control policies and models as well as the assurance of these models.
3. Understand various standard practices and policies in conducting audits.
4. Understand and analyse the significance of Network Security and Control, Internet Banking Risks and Control.
5. Developing appropriate disaster recovery strategy.

| **Course Content** | **Hours Allotted** | **Pedagogy** |
|---|---|---|
| **Module I:**<br>● System Audit and Assurance – Characteristics of Assurance services,<br>● Types of Assurances services<br>● Certified Information system auditor<br>● Benefits of Audits for Organization,<br>● Control Objectives for Information Related Technology | **(12)**<br>2<br>3<br>2<br>3<br>3 | Power point presentations / Lectures/assignments |

| | | |
|---|---|---|
| **Module II:**<br>● Internal Control<br>● Information system Audit - Internal Control<br>● Detective control, Corrective Control<br>● Computer Assisted Audit Tools and Techniques-Fraud Detection, Analytical Test,<br>● Data Analysis Report, continuous Monitoring | **(12)**<br><br><br>3<br>3<br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module III:**<br>● Conducting Audit – Standard practices<br>● Policies, Audit planning, Risk Assessment,<br>● Information gathering techniques,<br>● Vulnerabilities, System security testing<br>● Conducting Audits for Banks | **(12)**<br><br>3<br>3<br>3<br>3 | Power point presentations / Lectures/Assignments |
| **Module IV:**<br>● Network Security and Control<br>● Internet Banking Risks and Control- Identity Theft and Fraud, Data Breaches Inadequate Customer Support, Cybersecurity Risks, Insufficient Customer Education<br>• Operating System Risks and Control<br>• Operational Control Overview | **(12)**<br><br>2<br>3<br><br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module V:**<br>● Business Continuity, Types & its Benefits<br>● Disaster Recovery Planning Control – Data backup/storage<br>● Developing appropriate Disaster recovering strategy<br>● Business Impact analysis Tools- Risk Management Software<br>● **Business Continuity Planning Software,** Data Visualization Tools,Communication Tool | **(12)**<br><br>4<br>3<br><br>3<br>2 | Power point presentations / Lectures/Assignments |

| | |
|---|---|
| **TEXT BOOKS:** | |
| 1 | Martin Weiss, Michael G. Solomon; (2023)Auditing IT Infrastructures for Compliance; (3rd edition)Jones & Bartlett Publishers. |
| 2 | Martin Weiss, Michael G. Solomon; (2015)Auditing IT Infrastructures for Compliance; Jones & Bartlett Publishers. |
| 3 | D. P. Dube, Ved Prakash Gulati; (2005)Information System Audit and Assurance; Tata McGraw Hill Education. |
| **REFERENCE BOOKS:** | |
| 1 | Martin Weiss and Michael G. Solomon, Auditing IT Infrastructures for Compliance (Information Systems Security & Assurance), Jones and Bartlett Publishers, Inc. |
| 2 | Cyber Security Auditing, Assurance, and Awareness Through CSAM and CATRAM by Regner Sabillon |
| **WEB LINKS:** | |
| 1 | https://www.ukcybersecuritycouncil.org.uk/specialisms/cyber-security-audit-and-assurance |
| 2 | https://www.aaatechnologies.co.in/cyber-security-audit.php |

# SECURE E-COMMERCE

Credits:4 Semester:V

CourseCode:**CSCS23501B** No of Lecture Hours: 60

Course Objective: Mechanism of business transactions through electronic media Payment transactions in a secured network.

## Course Outcome:

**CO1:Understand** the framework and anatomy of ecommerce applications and analyze ecommerce consumer, organizational applications

**CO2: Understand** Web Security framework

**CO3:Infer** Digital payments system

**CO4: Understand** the implementation of Electronic Data Interchange (EDI)

**CO5: Analise** Strategies, Techniques of E payments

| **Course Content** | **Hours Allotted** | **Pedagogy** |
|---|---|---|
| **Module I:**<br>• Introduction to E-Commerce: Defining Commerce, Electronic Commerce<br>• Main Components of E-Commerce, Functions of ECommerce<br>• Types of E-Commerce; Role of Internet and Web in E Commerce<br>• Technologies used; Pre-Requisites of E-Commerce<br>• Process Management, Service Management<br>• Process of E-Commerce | **(12)**<br>3<br>3<br>2<br>2<br>2 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module II:**<br><br>• E-Security: Security on the Internet; Network and Website Security Risks<br>• Network and Website Security, Transaction Security and Data Protection<br>• Security Audits and Penetration Testing, E-Business Risk Management Issues<br>• Defining Enterprise Wide Security Framework. | **(12)**<br><br>3<br>3<br><br>3<br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module III:**<br><br>• E-Payment Systems: Electronic Funds Transfer<br>• Digital Token Based E-payment System<br>• Steps for Electronic Payment; Payment Security, Net Banking, Online Commercial Environments;<br>• Digital Currencies and Payment Systems, Private Data Networks, Security Protocols.<br>• Digital Payment Systems- First Virtual Internet Payment System, Cyber Cash Model.<br>• On-Line Commerce Environments ,E-Commerce Servers | **(12)**<br><br>2<br>2<br>2<br>2<br>2<br>1<br><br>1 | Power point presentations / Lectures/Assignments |
| **Module IV:**<br><br>• Electronic Data Interchange: Benefits of EDI, Technology and Standards<br>• EDI Communications, Agreements, Implementations and EDI Security<br>• Need of Electronic payment System, Study and Examine the use of Electronic payment system and the protocols used<br>• Study Electronic Fund Transfer and Secure Electronic Transaction Protocol for Credit Card Payment<br>• Digital Economy: Identify the methods of payments on net<br>• Electronic Cash ,cheques and Credit card system | **(12)**<br><br>2<br>3<br>2<br>2<br><br>2<br><br>1 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module V:**<br><br>• Operational process of DigiCash, eCash Trail<br>• Using eCash-; Smart cards<br>• Electronic Data Interchange: basics, EDI versus Internet and EDI over Internet<br>• Strategies, Techniques and Tools-, Shopping Techniques and Online Selling Techniques<br>• Implementation of E-Commerce: WWW.EBAY.COM - B2C Website - Registration.<br>• Time Factor, Bidding Process. Growth of eBay, PayPal - New Trend in Making Payments Online; National Electronic Funds Transfer | **(9)**<br><br>2<br>3<br><br>2<br><br>2<br><br><br>3 | Power point presentations / Lectures/Assignments |

**LearningResources**

Textbook: 1. Elias. M. Awad,2001. **Electronic Commerce**, Prentice-Hall of India Pvt Ltd.
2. 2. Ravi Kalakota, Andrew B. Whinston, 1997. **Electronic Commerce-A Manager's guide**, Addison-Wesley.
3. Efraim Turban, Jae Lee, David King, H.Michael Chung, 2002.**Electronic Commerce-A Managerial Perspective,** Addison-Wesley.

# INTERNET OF THINGS

**Credits:4** **Semester:V**

**Course code:CSCS26502A** **No.of Lecture Hrs:60**

**Course Objectives:**

- Understand the various attacks and importance of Security aspects in IoT
- Understand the techniques, protocols and security towards Gaming models
- Understand security and privacy challenges of IoT
- Understand the application of block chain technology for IoT Security

**Course Outcomes:**

- Incorporate the best practices learnt to identify the attacks and mitigate the same
- Adopt the right security techniques and protocols during the design of IoT products
- Assimilate and apply the skills learnt on ciphers and block chains when appropriate
- Describe the essential components of IoT
- Find appropriate security/privacy solutions for IoT

| Course Content | Hours Allotted | Pedagogy |
|---|---|---|
| **Module I:**<br>• Introduction to Internet of Things – Definition and Characteristics of IoT<br>• Physical Design of IoT , Logical Design of IoT<br>• IoT Enabling Technologies<br>• IoT Levels and Deployment Templates, Domain Specific IoTs – Home Automation Cities, Environment, Agriculture, Industry, health and Lifestyle | **(12)**<br>2<br>2<br>2<br>2<br>4 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module II:**<br>• IoT and cyber-physical systems RFID Security,<br>• Authenticated encryption Byzantine Generals problem sensors and actuators in IoT, | **(12)**<br><br>2<br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| • IoT security (vulnerabilities, attacks, and countermeasures),<br>• Cyber Physical Object Security,<br>• Hash functions Consensus algorithms and their scalability problems Accelerometer, photoresistor, buttons | 2<br><br>2<br>3<br><br>1 | |
| **Module III:**<br>• Security engineering for IoT development Hardware Security,<br>• Merkle trees and Elliptic curves digital signatures,<br>• verifiable random functions,<br>• Zero-knowledge systems motor, LED, vibrator,<br>• IoT security lifecycle, Front-end System Privacy Protection,<br>• Management, Secure IoT Databases, Public-key crypto (PKI), | **(12)**<br><br>3<br><br>3<br><br>3<br><br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module IV:**<br>• Data Privacy Networking Function Security<br>• Trees signature algorithms proof of work,<br>• Proof of stake, Networking in IoT Device/User Authentication in IoT<br>• IoT Networking Protocols, Crypto-currencies, alternatives to Bitcoin consensus, | **(12)**<br><br>2<br>3<br><br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module V:**<br>• Prevention & Security for Unauthorized access to sensor Data<br>• Case Studies Illustrating IoT Design<br>  • Home Automation- Smart Lighting, Home Intrusion Detection<br>  • Cities- Smart Parking<br>• Roles of Data Analytics in IoT | **(12)**<br><br>4<br><br><br><br>4<br><br><br>4 | Power point presentations / Lectures/Assignments |

| **TEXT BOOKS:** |
|---|
| **1. Arshdeep Bahga,VijayMadisetti,2015 Internet of Things,University Press** |
| 2. B. Russell and D. Van Duren, (2024)"Practical Internet of Things Security," Packt Publishing. |
| 3.B. Russell and D. Van Duren, (2016)"Practical Internet of Things Security," Packt Publishing. |
| 4.Narayanan et al., (2016)"Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction," Princeton University Press. |
| 5.FeiHU,(2016)"Security and Privacy Internet ofThings (IoTs):Models, Alg orithms and Implementations", CRC Press. |
| **REFERENCE BOOKS:** |
| 1. O'Reilly, 2014.A. Antonopoulos, "Mastering Bitcoin: Unlocking Digital Crypto currencies," |

2.Security and the IoT ecosystem, KPMG International, 2015

**WEB LINKS:**

https://www.geeksforgeeks.org/computer-networks/introduction-to-internet-of-things-iot-set-1/

# DISTRIBUTED SYSTEMS

**Credits: 4** **Semester: V**
**Course Code: CSCS26502B** **No. of Lecture Hours: 60 Hrs.**

**Course Objectives:**

To introduce the fundamental concepts, architectures, communication mechanisms, coordination issues, file systems, and fault tolerance techniques in distributed computing using simple concepts and real-world examples.

**Course Outcomes:**

**CO1:** Understand the fundamentals of distributed systems.
**CO2:** Describe architectural styles of distributed systems.
**CO3:** Understand synchronization and coordination issues .
**CO4:** Analyze replication techniques and evaluate consistency, availability & trade-offs. **CO5:** Analyze trust and access control mechanisms..

| Course Content | Hours Allotted | Pedagogy |
|---|---|---|
| **Module I:Introduction to Distributed Systems**<br>• Networked Systems vs Distributed Systems<br>• Distributed vs Decentralized Systems<br>• Design Goals of Distributed Systems<br>• Classification of Distributed Systems<br>• Pitfalls in Distributed Systems | **(12)**<br>2<br>2<br>2<br>2<br>1 | Power point presentations/ Lectures |
| **Module II: Architectures and Processes**<br>• Architectural Styles<br>• Middleware and its Role<br>• Client–Server and Multi-Tier Architectures<br>• Peer-to-Peer Systems<br>• Cloud Computing and Edge Computing<br>• Processes in Distributed Systems | **(12)**<br>2<br>2<br>2<br>2<br>2<br>2 | Case Studies / Review of research articles |
| **Module III: Communication and Coordination**<br>• Foundations of Communication | **(12)**<br>2 | Assignments |

| | | |
|---|---|---|
| • Remote Procedure Call (RPC)<br>• Message-Oriented Communication<br>• Multicast Communication<br>• Clock Synchronization<br>• Mutual Exclusion Algorithms<br>• Election Algorithms | 2<br>2<br>2<br>2<br>2 | |

| | | |
|---|---|---|
| **Module IV: Naming, Consistency, and Replication**<br>• Naming Concepts<br>• Consistency Models<br>• Replication Techniques<br>• Replica Placement and Management<br>• Consistency Protocols<br>• Web Caching and Replication | **(12)**<br>2<br>2<br>2<br>2<br>2<br>2 | Lectures |
| **Module V:Fault Tolerance and Security**<br>• Introduction to Fault Tolerance<br>• Failure Models<br>• Process Resilience<br>• Consensus Algorithms<br>• Reliable Client–Server Communication<br>• Distributed Commit Protocols<br>• Basics of Security<br>• Intrusion Detection and Monitoring | **(12)**<br>2<br>2<br>2<br>1<br>1<br>1<br>2<br>1 | Assignments |

**Learning Resources**

**ESSENTIAL READING**

1. M. van Steen and A.S. Tanenbaum, (2025)*Distributed Systems, 4th edition*
2. Andrew S. Tanenbaum and Maarten van Steen,2007, *Distributed Systems: Principles and Paradigms* 2nd Edition

# GOLANG PROGRAMMING

Credits: 4 Semester: V

CourseCode: **CSCS23503** No of Lecture Hours: 60

## Course Objective:

- To implement new style of programming.
- To Understand the hashing and cryptography techniques.

## Course Outcome:

**CO1**: **Identify** the importance and implementation of GO Lang.
**CO2**: **Differentiate**between types of Operators and types Functions .
**CO3**: **Understand** Arrays, Structure and its types

**CO4**: **Explain** Error Handling techniques and File operations
**CO5**: **Understand** Hashing and Cryptography

| **Course Content** | **Hours Allotted** | **Pedagogy** |
|---|---|---|
| **ModuleI: Title:Introduction To Go Language**<br>• Introducing Go<br>• Installing Go & Setting Up Your Environment<br>• Writing Your First Go Program: Hello World<br>• Data Type - Static and Dynamic Typing<br>• Checking and converting Between Types | **(12)**<br>3<br>3<br>2<br>2<br>2 | Power point presentations / Lectures/Assignments |
| **Module II: Title: Operators and Functions**<br>• Operators- Types<br>• Reading input from user<br>• Comments<br>• Control Flow<br>• Functions - User defined and Built In<br>. | **(12)**<br>3<br>2<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module III: Title: ARRAYS AND STRUCTURES**<br>• Arrays, Slices and Maps<br>• Strings<br>• Structs and Methods | **(12)**<br>3<br>2<br>3 | Power point presentations / Lectures/Assignments |
| • Methods and Interfaces<br>• Package | 2<br>2 | |
| **Module IV: Title: Error Handling & File Operations**<br>• Error Handling<br>• defer, panic(), and recover()<br>• Logging<br>• File Operations | **(12)**<br>3<br>3<br>3<br>3 | Power point presentations / Lectures/Assignments |
| **Module V: Title : Understanding Concurrency**<br>• Understanding Concurrency<br>• Concurrency Versus Parallelism<br>• Understanding Concurrency Through a Web Browser<br>• Handling Concurrent Operations with Goroutines<br>• Hashing & Cryptography | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |

**LearningResources**

Textbook: 1.George Ornbo, 2017. **Teach Yourself in Hours 24 Go Next Generation Systems Programming with Golang,** Sams**.**

2. Agus Kurniawan, 2015,**Go Programming by Example** 1st Edition,Copyright © 2015

# MACHINE LEARNING

**Credits: 4** **Semester: V**

**Course Code: CSCS26504** **No. of Lecture Hours: 60**

**Objectives:**

- To understand the concepts of machine learning.
- To understand supervised and unsupervised learning and their applications.
- To learn aspects of computational learning theory

**Course Outcomes:**

**CO1**: Have a good understanding of the fundamental issues and challenges of machine learning and basics of Python for Machine Learning.

**CO2**: Classify the supervised learning algorithms and apply to the given data set.

**CO3**: Identify the underlying relationships within and across unsupervised Machine Learning algorithms

**CO4**: Evaluate and interpret the results of Neural Networks

**CO5**: Design and implement advanced machine learning algorithms

| Course Content | Hours Allotted | Pedagogy |
|---|---|---|
| **Module I: INTRODUCTION TO MACHINE LEARNING**<br>• Overview of Machine Learning-Definition ,scope ,Applications<br>• Types of Learning – Supervised, Unsupervised and Reinforcement<br>• Basic Concepts and python Basics for ML, understanding Datasets, features and labels<br>• Exploratory Data Analysis ,Data Visualization<br>• Libraries:Numpy, Pandas,Matplotlib | **(12)**<br>2<br>3<br>2<br>3<br>2 | Power point presentations/ Lectures |

| | | |
|---|---|---|
| **Module II: SUPERVISED LEARNING**<br>• Linear Regression-Basic and Mathematical Representation<br>• Introduction to regression – Linear and Multiple regression<br>• Classification algorithms – Logistic regression, KNN, Decision Trees and SVM<br>• Evaluation Metrics: Accuracy, Precision and Recall | **(12)**<br>2<br>2<br>2<br>2<br>2<br>2 | Case Studies / Review of research articles |
| **Module III: UNSUPERVISED LEARNING**<br>• Clustering – Kmeans, Hierarchical<br>• Dimensionality Reduction – PCA(Principle Component Analysis)<br>• Association Rule Learning – Apriori Algorithm | **(12)**<br>2<br>2<br>2<br>2<br>2<br>2 | Assignments |
| **Module IV: INTRODUCTION TO NEURAL NETWORK**<br>• Basics of Neural Networks – Neurons, Layers and Activation Functions<br>• Feedforward and back propogation<br>• Types of Neural Networks – MLPs, CNNs, RNNs | **(12)**<br>2<br>2<br>2<br>2<br>2<br>2 | Lectures |
| **Module V: ADVANCE TOPICS IN MACHINE LEARNING**<br>• Natural Language Processing(NLP) Basics and applications in text processing<br>• Transfer Learning – Understanding transfer learning, application of pre-trained models<br>• Artificial Intelligence Integration Exploring intersections between AI and ML, Applications and synergies.<br>• Reinforcement Learning Fundamental Basics, algorithms, and key concepts. | **(12)**<br>2<br>2<br>2<br>1<br>1<br>1<br>2<br>1 | Assignments |

**ESSENTIAL READING**

**1.** An Introduction to Machine Learning & quot; by Alpaydin, Ethem(Edition: 4th, Year: 2020)
2.Python Machine Learning & quot; by Raschka, Sebastian (Edision: 3rd, Year: 2019)
3.Hands-On Machine Learning with Scikit-Learn, Keras and Tensor Flow & quot; by Geron, Aurelien(Edition: 2nd, Year: 2019)

**SUGGESTED READINGS:**

**1.** ny Ng, Andrew (Year: 2018)Machine Learning Yearning & quot; Edition: 1st

2. Bishop, Christopher M.(Year: 2006) Pattern Recognition and Machine Learning and quot;
Edition: 1st,

# DATABASE SECURITY

Credits:3 Semester: VI

CourseCode: **CSCS26505** No of Lecture Hours: 45

## Course Objective:

- Study of principles and practices of implementing computer database security in modern businesses and industries, including database security principles, database auditing, security implementation and database reliability.

## Course Outcome:

**CO1:Understand** current database technology and typical database products.

**CO2: Identify** contemporary practices of operating system security.

**CO3: Formulate** a working definition of database security, administration and auditing
**CO4: Explain** virtual private database, its importance and security
**CO5:** Implement Auditing Database Activities and database services

| **Course Content** | **Hours Allotted** | **Pedagogy** |
|---|---|---|
| **Module I:**<br><br>• Importance of database security<br>• Common threats and challenges on Databases<br>• Data Protection tools and platform<br>• Database security best practices<br>• Database security solutions<br>• Database security and General Data Protection Regulation | **(12)**<br><br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module II:**<br>• Operating system security environment from a database perspective<br>• Components of an operating system security environment<br>• Differences between authentication methods<br>• User administration best practices<br>• Strong password policies, operating system vulnerabilities, security risk in e-mail service | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module III:**<br>• User administration<br>• Operation system Authentication.<br>a. Creating users,<br>b. Removing users,<br>c. Modify users<br>• Database, Remote users authentication<br>• Database link, authentication links<br>• Security Auditing<br>• Define and use a profile, Design and implement password policies<br>• Implementation of password policies<br>• Grant and revoke user privileges , Create, assign, and revoke user roles | **(12)**<br>3<br>3<br>3<br>3 | Power point presentations / Lectures/Assignments |
| **Module IV:**<br>• Define virtual private database ,Necessity of VPD, Implementation of VPD ,<br>• Problems of VPD<br>• Implementing a virtual private database by using the VIEW database object<br>• Data dictionary to view virtual private database<br>• Policy Manager to view virtual private database<br>• Implementing row-level and column-level security | **(12)**<br>3<br>3<br>3<br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| • Launch SQL injection attacks , Countermeasures | | |
| **Module V:**<br><br>• Action Auditing Architecture and DML changes fine-grained auditing ,<br>• DML statement audit trail, Data manipulation history<br>DML statement auditing using a repository, application errors auditing<br>• Database as a service : Challenges in outsourced database,Merke Hash Tree,Data confidentiality: relational encryption | **(12)**<br><br>4<br><br>2<br><br>4<br><br>2 | Power point presentations / Lectures/Assignments |

| **LearningResources** |
|---|
| Textbook:<br>1. Hassan A. Afyouni, 2013. **Database Security and Auditing: Protecting Data Integrity and Accessibility,** Thomson Course Technology (c2006).<br>2. Ron Ben-Natan,2009. **Secure and Audit Oracle 10g and 11g** Auerbach Publications; 1 edition ISBN-10: 1420084127 ISBN-13: 978- 1420084122<br>Natan,2022.<br>**Implementing Database Security and Auditing** 1St Edition, Elsevier India |

# DISASTER RECOVERY AND RISK MANAGEMENT

Credits:4 Semester:V

Course Code: **CSCS23506** No of Lecture Hours: 60

## Course Objective:

- To address the issues faced by management for ensuring the security of organizational technology and data infrastructure.
- To address topics in operational risk, project management, cyber security, disaster recovery and protecting intellectual property.

## Course Outcome:

**CO1**: An organizational asset that has utility, and a value – which may be relative depending on the perspective taken, and therefore can be classified to reflect its importance to an organization or individual.
**CO2**: Clear understandability in the field of security threats, vulnerabilities, and consequences are essential in managing cyber security.
**CO3**: Cyber security lifecycle and strategy for planning are key factors in enterprise security services.
**CO4**: The security models and management concepts are taken as additional concepts in learning process of risk management in cyber security.
**CO5**: Information risk management is a term referring to the process of documenting what information

| **Course Content** | **Hours Allotted** | **Pedagogy** |
|---|---|---|
| **Module I: Title: Introduction To Cybersecurity**<br>• The Security Environment: Threats, vulnerabilities, and consequences<br>• Principles of Cyber security: The interrelated components of the computing environment<br>• information security, and information assurance<br>• Cyber security Management Concepts: Management models, roles, and functions<br>• Enterprise Roles and Structures: Information security roles and positions. | **(9)**<br>2<br>3<br>2<br>1<br>1 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module II: Title : Strategic Planning And Security Plans**<br>• Strategy and Strategic Planning: Strategy - Strategic planning and security strategy<br>• The information security lifecycle - Architecting the enterprise<br>• Security Plans and Policies: Levels of planning -Planning misalignment<br>• Policy development and implementation<br>• Security standards and controls - Certification and accreditation | **(9)**<br>2<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |
| **Module III: Title: RISK MANAGEMENT**<br>• Principles of risk - Types of risk<br>• Risk strategies - The Risk Management Framework (RMF)<br>• Physical and environmental threats<br>• Physical and environmental controls<br>• Protecting Remote Connections: Securing Authentication with Kerberos | **(9)**<br>2<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |
| **Module IV: Title: SECURITY AWARENESS**<br>• Developing a contingency plan - Understanding the different types of contingency plan<br>• Security Education, Training, and Awareness<br>• Human factors in security | **(9)**<br>2<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |
| **Module V: Title: SECURITY PLAN**<br>• Developing and implementing a security training plan<br>• Cross-domain training (IT and other security domains).<br>• Future of cyber security: Key future uncertainties<br>• Possible future scenarios | **(9)**<br>2<br>3<br>2<br>2 | Power point presentations / Lectures/Assignments |

**LearningResources**

Textbook:

1. Rhodes-Ousley, Mark, 2013,**Information Security: The Complete Reference,Information Security Management: Concepts and Practice**,Second Edition, New York, McGraw-Hill.

2. Whitman, Michael E. and Herbert J. Mattord,2011, **Roadmap to Information Security for IT andInfosec Managers**, Boston, MA: Course Technology .
3. Michael E. Whitman and Herbert J. Mattord, Nov, 2018., **Principles of Information Security, CourseTechnology**,Sixth Edition, Cengage Learning.

**Web Resources:**

1. file:///C:/Users/admin/Desktop/Online%20work/Course/Risk%20management%20in%20Cyber
%20Security/Whitman.pdf
2. https://www.cyberralegalservices.com/detail-casestudies.php.
3.https://rtinagpur.cag.gov.in/uploads/CaseStudies/CaseStudiesonCyberCrimesNOTSENT/CaeStudiesonCyberCrimes.pdf

# DATABASE SECURITY-LAB

**Credits: 1** **Semester: VI**

**Course Code: CSCS26509** **No. of Practical Hrs: 30**

**Objective:** To develop databases and provide security at different levels using Oracle 10g/11g enterprise edition with Enterprise Manager (EM)

1. Create the following database users with the parameters specified in the table.

| User | Password | Other Parameters |
|---|---|---|
| DBSEC_ADMIN | tec5363admin | Tablespace: USERS<br>Temporary tablespace: TEMP |
| DBSEC_CLERK | tec5363clerk | Same as above |
| DBSEC_DEV | tec5363dev | Same as above |
| DBSEC | tec5363#1 | Same as above |
| VPD_CLERK1 | jessie$22 | Same as above |
| VPD_CLERK2 | lassie$46 | Same as above |

2. Create a CUSTOMER table as a sample database object to implement security. The DBSEC user is the owner of the CUSTOMER table, which has the following columns.

| Column Name | Data Type |
|---|---|
| SALES_REP_ID | NUMBER(4) |
| CUSTOMER_ID | NUMBER(8) NOT NULL |
| CUSTOMER_SSN | VARCHAR2(9) |
| FIRST_NAME | VARCHAR2(20) |
| LAST_NAME | VARCHAR2(20) |
| ADDR_LINE | VARCHAR2(60) |
| CITY | VARCHAR2(30) |
| STATE | VARCHAR2(30) |
| ZIP_CODE | VARCHAR2(9) |

| | |
|---|---|
| PHONE | VARCHAR2(15) |
| EMAIL | VARCHAR2(80) |
| CC_NUMBER | VARCHAR2(20) |
| CREDIT_LIMIT | NUMBER |
| GENDER | CHAR(1) |
| STATUS | CHAR(1) |
| COMMENTS | VARCHAR2(1024) |
| CTL_UPD_DTTM | DATE |
| CTL_UPD_USER | VARCHAR2(30) |
| CTL_REC_STAT | CHAR(1) |

Populate data using the file provided.
You may either put all "insert" statements within this file, or provide a link to another file. Refer to the dbsec_ch4_setup.sql file in your downloaded file if you like to see how it was done. If you use the link, please make sure your link works on your computer.
Create password complexity policy function (named "complexity _function"). The password policy will enforce the following complexity so that the password:

Is at least six (6) characters long
Differs from the user name
Has at least one alpha, one numeric, and one punctuation mark character
Is not simple or obvious, such as welcome, account , oracle, database , or user.
Differs from the previous password by at least 3 characters

3. Create profiles and manage all database users using the profiles including enforcing the password complexity.

You will create the following profiles:

| Profile | Resources | Password |
|---|---|---|
| DBSEC_ADMIN_PROF | SESSIONS_PER_USER=5<br>CONNECT_TIME=8 hours<br>IDLE_TIME=1 hour | PASSWORD_LIFE_TIME= 1 month<br>PASSWORD_GRACE_TIME=7 days<br>PASSWORD_VERIFY_FUNCTION=complexity _function |

| | | |
|---|---|---|
| DBSEC_DEV_PRO F | CONNECT_TIME=12 hours IDLE_TIME=2 hours CPU_PER_CALL=1 minute | PASSWORD_LIFE_TIME= 1 month PASSWORD_GRACE_TIME=14 days PASSWORD_VERIFY_FUNCTION=co mplexity _function |
| DBSEC_CLERK_P ROF | SESSIONS_PER_USER=1 CPU_PER_CALL=5 seconds CONNECT_TIME=8 hours IDLE_TIME=30 minutes LOGICAL_READS_PER_CA LL=10 KB | FAILED_LOGIN_ATTEMPTS=3 PASSWORD_LIFE_TIME= 1 month PASSWORD_LOCK_TIME=3 days PASSWORD_GRACE_TIME=14 days PASSWORD_VERIFY_FUNCTION=co mplexity _function |

You will create the following roles:

| Role Name | Privileges |
|---|---|
| DBSEC_ADMIN_ROLE | SELECT and ALTER on all DBSEC tables |
| DBSEC_CLERK_ROLE | SELECT, INSERT, and UPDATE on all DBSEC tables |
| DBSEC_SUPERVISOR_ROLE | SELECT, INSERT, UPDATE and DELETE on all DBSEC tables |
| DBSEC_QUERY_ROLE | SELECT only on CUSTOMER table owned by DBSEC |

You will assign roles and profiles to database users as follows:

| User Name | Role | Profile |
|---|---|---|
| DBSEC_ADMIN | DBSEC_ADMIN_ROLE | DBSEC_ADMIN_PROF |
| DBSEC_CLERK, VPD_CLERK1, VPD_CLERK2 | DBSEC_CLERK_ROLE | DBSEC_CLERK_PROF |
| DBSEC_DEV | DBSEC_ADMIN_ROLE plus DBSEC_SUPERVISOR_ROLE | DBSEC_DEV_PROF |

1. Implement view on CUSTOMER table. You will create a VIEW named as CUSTOMER_F_VIEW to display only rows that belong to the logged on user. Enable VPD_CLERK1 to access the CUSTOMER data through the view.

Implement virtual private database (VPD) on CUSTOMER table so that only the owner of data can access their own row. (15 points)

First, you will create a policy function, named "DBSEC_ROW_OWNER" so that only the data

that belong to the current user will be accessed. Then, you will add the policy using DBMS_RLS.ADD_POLICY function.
Audit the activities on CUSTOMER table. (15 points)

2. Design and implement the following auditing functions on the CUSTOMER table.
   Track all "SELECT" activities on the CUSTOMER table, including database user, operating system user, and time when the operation is performed.
   Track the changes when CREDIT_LIMIT is set to a value above $50,000.
   Track the CUSTOMER table when a customer record was deleted.

Audit the user activities of two users. You will set up an audit mechanism to monitor all activities by two (2) database users: VPD_CLERK1, VPD_CLERK2

# GOLANG PROGRAMMING LAB

Credits: 1 Semester : V

**Course Code : CSCS23507** **No. of Practical Hours: 30**

**Objective:** To get hands on experience on installations, configuration GO Environment

**Outcome:** Students will be able to demonstrate the core GO programming

## TOPICS

1. Installation and setting environment for GO Lang
2. Go Program to Count Digits in a Number
3. Go Program to find Product of Digits in a Number
4. Count Positive and Negative Numbers in an Array
5. Print Array Items in Even Index Position
6. Print Array Items in Odd Index Position
7. Sum of Each Row and Column of a Matrix
8. Sum of Matrix Diagonal
9. ASCII value of String Characters
10. Concat Two String
11. String Length, First character and last character
12. Go Program to demonstrate structure

# MACHINE LEARNING LAB

**Credits: 1** **Semester: IV**

**Course Code: CSCS26508** **No. of Lecture Hours30**

**Objectives:**

- To understand and implement fundamental machine learning algorithms for supervised, unsupervised, and neural network models
- To apply machine learning techniques to real-world problems through hands-on programming and case studies
- To analyze, evaluate, and interpret machine learning models using appropriate performance metrics.

**Outcome:** Students will be able to design, implement, and evaluate basic machine learning models to solve data-driven problems.

**PROGRAMS:**

1. Linear Regression
2. Logistic Regression
3. K Nearest Neighbour (KNN)
4. Decision Tree Algorithm
5. Support Vector Machine (SVM)
6. K-Means Algorithm
7. Apriori Algorithm
8. Artificial Neural Networks (ANN)
9. **CASE STUDIES:**

- ## Case Study 1: Movie Recommendation System

**Scenario:** An online streaming platform wants to enhance user experience by recommending movies based on user preferences.

**Objective:** To develop a basic recommendation system using user ratings and movie metadata.

### Tasks:

Explore and preprocess movie ratings data.
Implement a simple collaborative filtering

algorithm.

Evaluate the effectiveness of the recommendation system.

**Learning Type:** Supervised Learning

- ## Case Study 2: Predicting Housing Prices

**Scenario:** A real estate agency wants to predict housing prices based on features such as square footage, number of bedrooms, and location.

**Objective:** To build a regression model to predict house prices.

### Tasks:

Collect and preprocess housing data.

Train a linear regression model using scikit-learn.

Evaluate the model's performance and interpret the coefficients.

**Learning Type:** Unsupervised Learning

- ## Case Study 3: Customer Segmentation for an E-commerce Platform

**Scenario:** An online retailer wants to understand its customer base and tailor marketing strategies accordingly.

**Objective:** To apply clustering algorithms to segment customers based on their purchasing behaviour.

### Tasks:

Analyse and preprocess customer transaction data.

Apply K-Means clustering to identify customer segments.

Visualize and interpret the customer segments.

**Learning Type:** Neural Networks

- ## Case Study 4: Image Classification of Animals

**Scenario:** A zoo wants to automate the classification of animals in images captured by security cameras.

**Objective:** To build a neural network model that classifies images into different animal categories.

### Tasks:

Collect and preprocess a dataset of animal images.

Implement a simple neural network using a deep learning framework. Train the model and assess its accuracy.

**Learning Type:** Neural Networks

# YEAR AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
# DEPARTMENT OF COMPUTER SCIENCE AND CYBER SECURITY
# B.Sc. (COMPUTER SCIENCE AND CYBER SECURITY)
# SIXTH SEMESTER
# ACADEMIC YEAR 2026-27 OF Batch 2024-27

| Sl. No. | Part | Subject Code | Title of the Subject | Hours /Week | Credits | Marks | | | Duration of Exam (hrs.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Internal | External | Total | |
| **THEORY** | | | | | | | | | |
| 1 | II | CSCS23601A | Electives-1(DSE-3)<br>Cyber Threat Intelligence | 3 | 3 | 40 | 60 | 100 | 3 |
| | II | CSCS23601B | Blockchain and cryptocurrency | | | | | | |
| 2 | II | CSCS23602 | Web Application and Testing (SEC-4) | 4 | 4 | 40 | 60 | 100 | 3 |
| 3 | II | CSCS26603 | Cloud Computing (Core 19) | 3 | 3 | 40 | 60 | 100 | 3 |
| **PRACTICALS** | | | | | | | | | |
| 4 | II | CSCS23604 | Web Application and testing lab(Core) | 2 | 1 | 40 | 60 | 100 | 3 |
| 5 | II | CSCS26605 | Cloud Computing Lab(Core) | 2 | 1 | 40 | 60 | 100 | 3 |
| 6 | II | CSCS23606 | Major Project(DSE) Project Hour | 15+1 | 6 | 40 | 60 | 100 | 3 |
| | | Total | | 30 | 18 | 240 | 360 | 600 | - |

*** Skill Enhancement course(SEC)**
***Discipline -Specific Elective(DSE)**
***Core**

# CYBER THREAT INTELLIGENCE

Credits: 3 Semester: VI

Course Code: **CSCS23601A** No of Lecture Hours: **45**

## Course Objective:

By understanding the myriad cyber threats and actor motivations, leaders can guide organizations in accurately accessing threats, risks, and vulnerabilities, to minimize the potential for incidents and, when necessary, provide more thoughtful responses.

## Course Outcome:

**CO1**: **Study** of different Cyber Threat.

**CO2: Learn** the technique to Develop Cyber Threat Intelligence Requirements
**CO3: Collect** Cyber Threat Information.

**CO4: Analyse** and Disseminate Cyber Threat Intelligence.

**CO5: Select** right Cyber threat intelligence partner for improved security

| **Course Content** | **Hours Allotted** | **Pedagogy** |
|---|---|---|
| **Module I:** | **(9hr)** | Power point presentations / Lectures/Assignments |
| • Defining Cyber Threat Intelligence: Introduction | 1 | |
| • The Need for Cyber Threat Intelligence | 1 | |
| • The menace of targeted attacks, The monitor-and-respond strategy | 1 | |
| • Why the strategy is failing, Cyber Threat Intelligence defined | 1 | |
| • Key Characteristics: Adversary , Risk focused | 2 | |
| • Process oriented, Tailored for diverse consumers | 2 | |
| • The Benefits of Cyber Threat Intelligence | 1 | |

| | | |
|---|---|---|
| **Module II:**<br><br>• **Developing Cyber Threat Intelligence Requirements :** Assets That Must Be Prioritized: | **(9hrs)**<br><br>3 | Power point presentations / Lectures/Assignments |
| • Personal information,<br>• Intellectual property,<br>• Confidential business information,<br>• Credentials and IT systems information,<br>• Operational systems.<br>• **Adversaries:**<br>• Cybercriminals, Competitors and cyber espionage agents<br>• **Hacktivists.**<br>• Intelligence Consumers: Tactical users, Operational users, Strategic users | <br><br><br><br><br>3<br><br><br><br><br>3 | |
| **Module III:**<br><br>• Collecting Cyber Threat Information: Level 1: Threat Indicators, File hashes andreputation data<br><br>• Technical sources: honeypots and scanners<br><br>• Industry sources: malware and reputation feeds.<br><br>• Level 2: Threat Data Feeds, Cyber threat statistics, reports, and surveys,Malware analysis<br><br>• Level 3: Strategic Cyber Threat Intelligence, Monitoring the underground, Motivation and intentions, Tactics, techniques, and procedures. | **(9hr)**<br><br>1<br><br>1<br><br>1<br><br>3<br><br>3 | Power point presentations / Lectures/Assignments |
| **Module IV:**<br><br>• Analyzing and Disseminating Cyber Threat Intelligence: Information versus Intelligence,<br><br>• Validation and Prioritization: Risk scores, Tags for context, Human assessment.<br>• Interpretation and Analysis: Reports, Analyst skills, Intelligence platform, Customization.<br>• Dissemination: Automated feeds and APIs, | **(9hr)**<br><br>1<br><br><br>2<br>2 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| • Searchable knowledge base, Tailored reports. | 2<br>2 | |

| | | |
|---|---|---|
| **Module V:**<br>• **Selecting the Right Cyber Threat Intelligence Partner:** Types of Partners:<br>  • Providers of threat indicators,<br>  • Providers of threat data feeds,<br>  • Providers of comprehensive cyber threat intelligence.<br>• **Important Selection Criteria:**<br>  • Global and cultural reach,<br>  • Historical data and knowledge,<br>  • Range of intelligence deliverables,<br>• APIs and integrations, Intelligence platform, knowledge base, and portal,<br>• Client services, Access to experts. Intelligence-driven Security. | **(9hr)**<br>3<br>3<br>3<br>3 | Power point presentations / Lectures/Assignments |

**LearningResources**

Textbook:
1. Jon Friedman. Mark Bouchard, CISSP. Foreword by John P. Watters,2015.,**Cyber Threat Intelligence, Definitive Guide TM** .
2. Scott J. Roberts, Rebekah Brown, 2017., **Intelligence- Driven Incident Response: Outwitting the Adversary**, O'Reilly Media.
3. Henry Dalziel, 2014, **How to Define and Build an Effective Cyber Threat Intelligence Capability Elsevier Science & Technology**.
4. John Robertson, Ahmad Diab, Ericsson Marin, Eric Nunes, Vivin Paliath, Jana Shakarian, Paulo Shakarian, 2017.,**DarkWeb Cyber Threat Intelligence Mining,** Cambridge University Press.
5. Bob Gourley, 2014., **The Cyber Threat, Createspace Independent Pub**.

# BLOCKCHAIN AND CRYPTOCURRENCY

Credits: 3 Semester: VI

**Course Code**: CSCS23601B **No of Lecture Hours**: 45

## Course Objective:

To understand how block chain systems work, where they are used, their limitations, and how they affect organizations and society now and in the future.

## Course Outcome:

**CO-1:**Understand that how bitcoin works, when a transaction is created and when it isconsidered part of the blockchain.
**CO-2:**To interact with a blockchain system by sending and reading transactions.
**CO-3:**To learn about different kinds of forking and explain the Bitcoin's network mechanisms for maintaining and upgrading
**CO-4:**To describe differences between proof-of-work and proof-of-stake consensus.
**CO-5:**Design, build, and deploy smart contracts and distributed applications.

| **Course Content** | **Hours Allotted** | **Pedagogy** |
|---|---|---|
| **Module I:**<br>• INTRODUCTION: Data Distributed Database, Two General Problem, Byzantine General Problem and Fault Tolerance<br>• Hadoop Distributed File System, Distributed Hash Table<br>• ASIC resistance, Turing Complete<br>• Cryptography: Hash function, Digital Signature – ECDSA<br>• Memory Hard Algorithm, and Zero Knowledge Proof.<br>, .<br>. | **(9)**<br>2<br>2<br>1<br>2<br>1<br>1 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module II:**<br><br>• BLOCKCHAIN Introduction: Advantage over conventional distributed database<br>• Blockchain Network, Mining<br>• Mechanism, Distributed Consensus, Merkle Patricia Tree<br>• Gas Lmit, Transactions and Fee, Anonymity<br>• Reward, Chain Policy, Life of Blockchain application<br>• Soft & Hard Fork, Private and Public Blockchain | **(9)**<br><br>1<br><br>2<br>2<br>1<br>1<br>2 | Power point presentations / Lectures/Assignments |
| **Module III:**<br><br>• DISTRIBUTED CONSENSUS: Nakamoto consensus, Proof of Work<br>• Proof of Stake<br>• Proof of Burn<br>• Difficulty Level, Sybil Attack<br>• Energy utilization and alternate | **(9)**<br><br>3<br>1<br>1<br>2<br>2 | Power point presentations / Lectures/Assignments |
| **Module IV:**<br><br>• CRYPTOCURRENCY: History, Distributed Ledger<br>• Bitcoin protocols - Mining strategy and rewards<br>• Ethereum -Construction,DAO<br>• Smart Contract, GHOST,Vulnerability, Attacks<br>• Sidechain, Namecoin Cryptocurrency<br>• Regulation: Stakeholders, Roots of Bit coin<br>• Legal Aspects-Crypto currency Exchange<br>• Black Market and Global Economy. | **(9)**<br><br>**2**<br>**2**<br>**1**<br>**1**<br>**1**<br>**1** | Power point presentations / Lectures/Assignments |
| **Module V: :**<br><br>• CASE STUDY:Applications: Internet of Things, Medical Record Management System<br>• Domain Name Service and future of Blockchain. Naive Blockchain construction<br>• Memory Hard algorithm – Hashcash implementation<br>• Direct Acyclic Graph,Smart Contract Construction<br>• Toy application using Blockchain, Mining puzzles | **(9)**<br><br>2<br>2<br>2<br>2<br>1 | Power point presentations / Lectures/Assignments |

| **LearningResources** |
| --- |
| Textbook: 1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, July, 2016**Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction**,Princeton University Press.<br><br>2. Antonopoulos, 2014., **Mastering Bitcoin: Unlocking Digital Cryptocurrencies,**O'Reiley, 1st Edition.<br>3. Satoshi Nakamoto, 2008**Bitcoin: A Peer-to-Peer Electronic Cash System.**<br>4. Dr. Gavin Wood, 2014, **ETHEREUM: A Secure Decentralized Transaction Ledger,** Yellow paper.<br>5. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, 2016., **A survey of attacks onEthereum smart contracts.** |

# WEB APPLICATION TESTING

Credits: 4 Semester: VI

CourseCode: **CSCS23602** No of Lecture Hours: 60

## Course Objective:

- To study the concepts of web application testing
- To learn different testing methods on server side and client side

## Course Outcome:

**CO1**: **Identify** Web applicationtechnologies
**CO2**: **Experiment** using Client-Side Controls
**CO3**: **Explain** authentication and authorization
**CO4**: **Implement** SQL injection

**CO5**: **Develop** Cross-Site Scripting

| **Course Content** | **Hours Allotted** | **Pedagogy** |
|---|---|---|
| **Module I:**<br>• The Evolution of Web Applications, Benefits and Functions of Web Applications<br>• The New Security Perimeter,The Future of Web Application Security<br>• Core DefenseMechanisms : Handling User Access, Handling User Input<br>• Handling Attackers, Handling Errors, Maintaining Audit Logs, Alerting Administrators<br>• Managing the Application, Reacting to Attacks | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module II:**<br>• The HTTP Protocol, HTTP Requests, Response, Methods HTTPHeaders,Cookies<br>• Status codes, HTTPS, HTTPS Proxies and Authentication<br>• Web Functionality, Server-Side Functionality, Client-Side Functionality<br>• Enumerating Content and Functionality: Web Spidering, User-Directed Spidering | **(12)**<br>2<br>2<br>2<br>2<br>2 | Power point presentations / Lectures/Assignments |
| • Analyzing the Application: Identifying Entry Points for User Input, Identifying Server-Side Technologies | 2 | |
| **Module III:**<br>• Attacking Authentication ,Authentication Technologies<br>• Design Flaws in Authentication<br>• Implementation Flaws in Authentication ,Securing Authentication<br>• Attacking Session Management, Weaknesses in Token Generation<br>• Weaknesses in Session Token Handling and Securing Session Management | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |
| **Module IV:**<br>• Attacking Data Stores: Bypassing a Login ,Injecting into SQL<br>• Exploiting a Basic Vulnerability, Injecting into Different Statement Types<br>• Finding SQL Injection Bugs, Finger printing the Database<br>• Injecting into NoSQL (MongoDB) and Injecting into XPath<br>• Subverting Application Logic, Informed And Preventing XPath Injection | **(12)**<br>2<br>3<br>2<br>2<br>3 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **Module V:**<br><br>• Attacking Application Logic: The Nature of Logic Flaws<br>• Real-World Logic Flaws, Avoiding Logic Flaws<br>• Attacking Users: Cross-Site Scripting<br>• Varieties of XSS, Reflected XSS Vulnerabilities<br>• Stored XSS Vulnerabilities and DOM-Based XSS Vulnerabilities | **(12)**<br><br>3<br>3<br><br>2<br>2<br>2 | Power point presentations / Lectures/Assignments |

**LearningResources**

Textbook:

1. Dafydd Stuttard, Marcus Pinto. 2011. **The Web Application Hacker's Handbook Finding and Exploiting Security Flaws**. 2nd Edition. John Wiley & Sons Inc.
2. Gupta, Richa. 2021. **Hands-on Penetration Testing for Web Applications. 1st** Edition. BPB Publications. India: New Delhi

# CLOUD COMPUTING

**Credits:3** **Semester: VI**

**Course Code: CSCS26603** **No ofLecture Hours: 45**

**Course Objective:**

- To implement Basics, techniques and tools for Cloud Computing.
- To understand any kind of heterogeneous resources over a network using open standards.

C**ourse Outcome:**

**CO1**: **Explain** differences of system models.

**CO2**: **Identify** different types of clouds

**CO3**: **Analyze** virtualization and data centre working procedure
**CO4**: **Classify** public cloud platforms

**CO5**: **Choose** a particular data security in the cloud

| **CourseContent** | **Hours Allotted** | **Pedagogy** |
|---|---|---|
| **ModuleI:Title: Cloud Computing Models & Services**<br>• Standard cloud Mode;<br>• Cloud Deployment models<br>• Choosing the appropriate Deployment models<br>• Service Delivery models<br>• Service Abstraction<br>• The SPI Model<br>• A Tradition System Vs Cloud System Model | **(9)**<br>2<br>3<br>3<br>1 | Power point presentations / Lectures/Assignments |

| | | |
|---|---|---|
| **ModuleII:Security Reference Model**<br><br>• Open cloud services<br>• The security Concern in Cloud<br>• Cloud Security working Groups<br>• Elements of Cloud security model<br>• Cloud Security reference Model<br>• Security policy | **(9)**<br><br>2<br>3<br>3<br>1 | Power point presentations / Lectures/Assign ments |

| | | |
|---|---|---|
| **ModuleIII:Resource Virtualization**<br><br>• What is Virtualization<br>• Virtualizing Physical Computing Resources<br>• Understanding Abstraction<br>• Machine or Server level Virtualization<br>• Exploring Hypervisor or Virtual Machine Monitor<br>• Advantages of Virtualization<br>• Virtualization security Threats | **(9)**<br><br>4<br>3<br>2 | Power point presentations / Lectures/Assign ments |
| **ModuleIV:Title:Resource Pooling Sharing and Provisioning**<br><br>• Resource pooling<br>• Commoditization of data Centre<br>• Standardization,, Automation and optimization<br>• Resource Sharing<br>• Resource provisioning | **(9)**<br><br>3<br>3<br>2<br>1 | Power point presentations / Lectures/Assign ments |
| **ModuleV:Scaling in the Cloud**<br><br>• Introduction to Scaling<br>• Scaling in Traditional and cloud Computing<br>• Foundation of cloud Scaling<br>• Scalable application<br>• Scaling Strategies in Cloud<br>• Auto Scaling in Cloud<br>• Types of Scaling | **(9)**<br><br>2<br>3<br>2<br>2 | Power point presentations / Lectures/Assign ments |

**LearningResources**

## TEXTBOOKS:


1. Sandeep Bhowmik,2025,Cloud Computing Cambridge University press
2. Buyya,RajKumar, Vecchiola,Christian.AndSelvi,ThamaraiS.2012.**Mastering Cloud Computing**. New Delhi:TMH.
3. CloudComputing,TheBlackbook,DreamTechPress
4. A Practical Approach Author: Anthony T. Velte, Toby J. Velte, Robert Elsenpeter Publisher: (2009) McGraw-Hill
5. Buyya,RajKumar,Vecchiola,Christian.AndSelvi,ThamaraiS.2013.**Mastering Cloud Computing**. New Delhi:TMH
6.


**SUGGESTEDREADING**


1. Geoffrey,Kaittwang,FoxCandJackJ,Elsevier,Dongarra.2012.**Distributedand loud Computing**. India.
2. House,Ritting,Ramsome,JohnW.,JamesF.2012.**CloudComputing**.CRCPress.


WEB LINK:
https://www.geeksforgeeks.org/cloud-computing/cloud-computing/

# CLOUD COMPUTING LAB

**Credits: 1** **Semester:VI**

**Course Code: CSCS26605** **No of Lecture Hours:30**

**Course Objective:**

**The student should be made to:**

- Be exposed to tool kits for grid and cloud environment.
- Be familiar with developing web services/Applications in grid framework

Learn to run virtual machines of different configuration

**Course Outcomes:**

**CO1:** To develop web applications in cloud

**CO2:** To learn the design and development process involved in creating a cloud-based application

**Programs**

1. Install VirtualBox / VMware Workstation with different Flavors of Linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create Hello World App and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm that is not present in Cloud Sim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine
7. Find a procedure to launch virtual machine using try stack (Online OpenStack Demo Version)
8. Implementation of Para-Virtualization using VMWare‘s Workstation/ Oracle‘s Virtual Box and Guest O.S.
9. **Case Study: Banking Services Using Cloud Computing** – Study how cloud infrastructure provides secure, scalable, and 24/7 online banking services.
10. **Case Study: Online Education Platform Using Cloud** – Study how cloud supports online classes, content delivery, and examinations.

11. **Case Study: Hospital Management System Using Cloud** – Study the use of cloud for patient data storage and availability.
12. **Case Study: E-Commerce Application Using Cloud** – Study how cloud enables scalability, secure payments, and global access.
13. **Case Study: Government Digital Services Using Cloud** – Study the role of cloud computing in digital governance.
14. **Case Study: Amazon Web Services (AWS)** – Study the overview and features of AWS cloud platform.
15. **List and study any five cloud services provided by AWS.**

**Reference Links:**

- https://support.microsoft.com/visio
- https://www.virtualbox.org/wiki/Documentation
- https://gcc.gnu.org/onlinedocs/
- https://cloud.google.com/sdk

https://linux.die.net/man/1/scp

# WEB APPLICATION TESTING LAB

**Credits: 1** **Semester: VI**

**Course Code : CSCS23604** **No. of Practical Hours: 30**

**Objective:** To get hands on experience on installation and configuration of burp suite and also to identify different vulnerabilities present in web applications.

**Outcome:** Students will be able to test for different vulnerabilities present in web applications

## Topics

1. Learn the top 10 vulnerabilities from OWASP
2. Installation of burp suite and configuring burp suite to browser.
3. Testing for account enumeration and guessable user accounts
4. Testing for weak password policy
5. Testing for privilege escalation
6. Testing for insecure direct object references
7. Testing for session fixation
8. Testing for cross site request forgery (CSRF)
9. Testing for reflected cross site scripting
10. Testing for stored cross site scripting
11. Testing for SQL injection
12. Testing for http verb tampering
13. Testing for SSL/TLS
14. Testing for click jacking
15. Testing for cross origin resource sharing

# MAJOR PROJECT

## EVALUATION CRITERIA FOR MAJOR PROJECT

**Credits: 6** **Semester : VI**

**Course Code: CSCS23606** **No. of Practical Hours: 15**

Third year students in the Sixth Semester are required to take up a project work which carries a total of 100 marks i.e. internal 40 marks and external 60 marks.

The criteria for the Internal Evaluation of Project for 40 marks are as follows:

| | | |
|---|---|---|
| 1. | Attendance | 5 marks |
| 2. | Review of weekly report | 5 marks |
| 3. | Internal Project Presentation–every week end (Presentation & communication skills, objectives, Work submission, methodology, results, and Practical relevance.) | 10 marks |
| 4. | Final internal presentation- at the end of semester (50% marks Evaluation done bythe internal guide, and 50% marks evaluated by other internal lecturers guiding the projects) | 15 marks |
| 5. | Project Report | 5 marks |

External Evaluation of the Project (60 marks): The Controller of Examination sends the Project Reports to the External Examiner in advance. The External Examiner evaluates the project for 60 marks based on project work done by the student. (The Project Report is evaluated for 40 marks and Viva-voce for 20 marks.

# ADD ON
## Data Visualization Tools (Excel & Power BI)

**Semester: VI**

**CourseCode:039A** **No ofLectureHours:30**

**Course Objectives:**

- Understand the role of data visualization in data-driven decision making.
- Apply principles of effective visual design to create meaningful charts.
- Use Microsoft Excel for data preparation and basic visualization.
- Build interactive dashboards using Microsoft Power BI.
- Transform raw data into insightful visual reports.
- Communicate analytical findings clearly using dashboards and reports.

**Course Outcomes (COs):**

- Design meaningful data visualizations using appropriate charts and dashboards.
- Use Excel and Power BI tools for data preparation and visualization.
- Build interactive dashboards for business and academic use cases.
- Interpret visual data to identify trends and insights.
- Present data-driven findings effectively to stakeholders.

**UNIT – I: Foundations of Data Visualization** (6)
- Introduction to Data Visualization
- Types of Data: Categorical, Numerical, Temporal
- Common Visualization Mistakes
- Introduction to Excel and Power BI Environment
- Overview of Dashboards and Reports

**UNIT – II: Data Visualization using Microsoft Excel** (6)
- Data Cleaning and Preparation in Excel
- Excel Charts: Column, Bar, Line, Pie, Area, Scatter
- Formatting and Customizing Charts
- Conditional Formatting
- PivotTables and PivotCharts

**UNIT – III: Advanced Excel for Data Visualization** (6)
- Power Query in Excel (Data Import & Transformation)
- Data Validation and Data Models
- Advanced Charts (Combo Charts, Waterfall, Funnel)
- Dynamic Charts using Form Controls

**UNIT – IV: Data Visualization using Power BI** (6)

- Introduction to Power BI Desktop
- Connecting to Data Sources
- Creating Visuals in Power BI
- Filters, Slicers, Drill-down
- Designing Reports and Dashboards
- Publishing Reports to Power BI Service

**UNIT – V: Advanced Power BI & Data Storytelling** (6)

- DAX Basics for Visualization
- Advanced Visuals (Maps, Tree Maps, KPI Cards)
- Designing Interactive Dashboards
- Row-Level Security (Overview)

| **Suggested Textbooks & References:** | |
|---|---|
| 1 | - Kieran Healy – Data Visualization: A Practical Introduction |
| 2 | - Cole Nussbaumer Knaflic – Storytelling with Data |
| 3 | - Michael Alexander, Richard Kusleika, John Walkenbach – Excel 2021 Bible |
| 4 | - Devin Knight et al. – Microsoft Power BI Complete Reference |
| 5 | - Gil Raviv – Collect, Combine, and Transform Data Using Power Query in Excel and Power BI |

# Self study course

## INTRUSION DETECTION SYSTEMS

**Course Code:039S** **Semester: IV**

**No. of Lecture Hrs: 15Hrs**

## Course Objective:

To prepare students to know regarding the common threats faced today and the necessity of intrusion detection systems for securing the systems. To understand the essential concepts of intrusion detection and prevention. Be familiar with principles and techniques used in intrusion detection and taxonomy of intrusion detection systems. Acquiring knowledge on the state of art of the research in intrusion detection and prevention systems. Enable students to do independent research and be able to model and implement intrusion detection systems.

## UNIT I

**INTRODUCTION** **3Hrs**

Understanding Intrusion Detection –Intrusion detection and prevention basics –IDS and IPS analysis schemes, Attacks, Detection approaches – Misuse detection – anamoly detection – specification-based detection – hybrid detection.

## UNIT II

**THEORETICAL FOUNDATIONS OF DETECTION** **3Hrs**

Taxonomy of anomaly detection system –fuzzy logic –Bayes theory –Artificial Neural networks Support vector machine –Evolutionary computation – Association rules –Clustering.

## UNIT III

**IMPLEMENTATION** **3Hrs**

Centralized – Distributed –Cooperative Intrusion Detection -Tiered architecture.

## UNIT IV

**JUSTIFYING INTRUSION DETECTION** **3Hrs**

Intrusion detection in security –Threat Briefing –Quantifying risk –Return on Investment

(ROI)

## UNIT V

**CASE STUDY** **3Hrs**

Tool Selection and Acquisition Process - Bro Intrusion Detection – Prelude Intrusion Detection – Cisco Security IDS -Snorts Intrusion Detection –NFR security Legal Issues And Organizations Standards: Law Enforcement / Criminal Prosecutions –Standard of Due Care –Evidentiary Issues, Organizations and Standardizations.

## Books for References:

1. Ali A. Ghorbani, Wei Lu, "Network Intrusion Detection and Prevention: Concepts and Techniques", Springer, 2010.
2. Carl Enrolf, Eugene Schultz, Jim Mellander, "Intrusion detection and Prevention", McGraw Hill, 2004.
3. Paul E. Proctor, "The Practical Intrusion Detection Handbook ", Prentice Hall, 2001.
4. Ankit Fadia and Mnu Zacharia, "Intrusion Alert", Vikas Publishing house Pvt., Ltd, 2007.

Earl Carter, Jonathan Hogue, "Intrusion Prevention Fundamentals

**BRIDGE COURSE**

**FUNDAMENTALS OF COMPUTERS & SECURITY**

**Semester : I**

**Subject Code : 039B** **No. of Lecture Hours: 30**

**Objectives:**

- To develop applications using Office tools
- To learn able to basic security fundamentals

## Outcome:

- Student will be able to install windows 10, work with control panel, manage different applications and practice safe browsing techniques.
- Students will be able to develop the applications

MS-Word

1. Create a news-paper document with at least 200 words,
   a. Use margins as, top:1.5, bottom:2, left:2, right:1 inches.
   b. Use heading "Gandhi Jayanti", font size: 16, font color: red, font face:Arial Black.
   c. With first letter "dropped" (use drop cap option) of the first paragraphcontaining a picture at the right side
   d. Use three columns from the second paragraph onwards till the half of the page.
   e. Then use heading "Computer basics"
   f. Create paragraph using two columns till the end of the page.
2. Create a Mathematical question paper using, at least five equations
   a. With fractions, exponents, summation function
   b. With at least one „m*n" matrix
   c. Basic mathematical and geometric operators.
   d. Use proper text formatting, page color and page border.
3. Create a flowchart using,
   a. Proper shapes like ellipse, arrows, rectangle, and parallelogram.
   b. Use grouping to group all the parts of the flowchart into one single object.
4. Create a table using table menu with,
   a. At least 5 columns and 10 rows.
   b. Merge the first row into one cell.
   c. Merge the second row into one cell, then split the second

row into three cells.

d. Use proper table border and color.
e. Insert proper content into the table with proper text formatting.

5. Create a table using two columns,
   a. The left column contains all the short-cut keys and right side column contains the function of the short-cut keys.
   b. Insert a left column using layout option. Name the heading as Serial No.
6. Create two letters with the following conditions in Ms Word and find the difference.
   a. Write a personal letter to your friend using at least 100 words and two paragraphs. The date must be in top-right corner. Use „justify" text- alignment and 1.5 line spacing for the body of the letter. Letter must contain proper salutation and closing.

   b. Use step by step mail-merge wizard to design a letter. (Mailing step by step mail merge wizard letters start from a template select template letters select proper template create new document OK)

(MS Excel)

1. Create a table "Student result" with following conditions.
   a. The heading must contain, Sl. No., Name, Mark1, Mark2, Mark3, Total,average and result with manual entry.
   b. Use formulas for total and average.
   c. Find the name of the students who has secured the highest and lowest marks.
   d. Round the average to the nearest highest integer and lowest integer (use ceiling and floor function respectively).
2. Do as directed
   a. Create a notepad file as per the following fields

   Slno name th1 th2 th3 th4 th5 total % grade

   b. Import this notepad file into excel sheet using „data from text" option.
   c. Grade is calculated as,
      i. If %>=90, then grade A
      ii. If %>=80 and <90, then grade B
      iii. If %>=70 and <80, then grade C
      iv. If %>=60 and <70, then grade D
      v. If %<60, then grade F
3. Create a sales table using the following data,

| Item | Year1 | Year2 | Year3 | Year4 |
|---|---|---|---|---|
| Item1 | 1000 | 1050 | 1100 | 1200 |
| Item2 | 950 | 1050 | 1150 | 1200 |

| | | | | |
|---|---|---|---|---|
| Item3 | 1100 | 1200 | 1200 | 1300 |

a. Draw the bar-graph to compare the sales of the three items for four years using insert option.
b. Draw a line-graph to compare the sales of three items for four years using insert option.
c. Draw different pie-charts for the given data using insert option.
d. Use condition, to highlight all the cells having value >=1000 with redcolor (use conditional formatting)

(MS PowerPoint)

1. Create a power-point presentation with minimum 5 slides.
   a. The first slide must contain the topic of the presentation and name of the presentation.
   b. Must contain at least one table.
   c. Must contain at least 5 bullets, 5 numbers.
   d. The heading must be, font size:32, font-face: Arial Rounded MT Bold,font-color: blue.
   e. The body must be, font size: 24, font-face: Comic Sans MS, font-color: green.
   f. Last slide must contain „thank you".
2. Create a power-point presentation with minimum 10 slides
   a. Use word art to write the heading for each slides.
   a. Insert at least one clip-art, one picture
   b. Insert at least one audio and one video
   c. Hide at least two slides
3. Create a power-point presentation with minimum 5 slides
   a. Use custom animation option to animate the text; the text must move left to right one line at a time.
   b. Use proper transition for the slides.

(MS Access)

1. Create a database "Student" with,
   a. At least one table named "mark sheet" with field name "student name, rollnumber, mark1, mark2, mark3, mark4, total"
   b. The data types are, student name: text, roll number: number, mark1 to mark4: number, total: number. Roll number must be the primary key.
   c. Enter data in the table. The total must be calculated using update query.
   d. Use query for sorting the table according to the descending/ascending order of the total marks.
2. With addition to the table above,
   a. Add an additional field "result" to the "mark sheet" table.
   b. Enter data for at least 10 students

c. Calculate the result for all the students using update queries, if total>=200, then pass, else fail.
d. Search the students, whose name starts with “sh”.
e. Show the names and total marks of the students who have passed the examination.

**SECURITY CONCEPTS**

1. Introducing Windows 10
2. Overview of Deploying Windows 10-Auto Pilot mode, Manual Mode
3. Windows 10 User Experience
4. Security in Windows 10
5. Perform Post installation Configuration Task
6. Managing Apps in Window
7. Windows 10 Networking
8. Windows 10 on Phones and Tablets
9. Safe browsing techniques of Internet
10. Best security Practices in Using Social media Platform

Book Recommended:-

1.Computer Course Kit,Comdex 14-lin-1 Vikas Gupta,Dream Tech

2.Master in MS-Office,Bittu Kumar

**ESSENTIAL READING**

- Ed Bott, “Introducing Windows 10 for IT Professionals”, MicroSoft Press ,2020.