# PONDICHERRY UNIVERSITY
## (A CENTRAL UNIVERSITY)



## B.Sc. Computer Science
(Choice Based Credit System)


Regulations & Syllabus



2019-20 onwards

# Pondicherry University
# B.Sc.(Computer Science)
# REGULATIONS
## (Effective from the academic year 2019-2020)

1. **Aim of the Course**

The B.Sc. (Computer Science) course aims to impart the students with fundamental and hands on knowledge of computers, science of computing and modern computer science technologies.

## 2. Eligibility of Admission

Candidates for admission to B.Sc.(CS), shall be required to have passed 10 + 2 system of Examination or equivalent with Mathematics / Business Mathematics / Computer Science / Computer Applications as one of the subjects of study.

3. **Lateral Entry Admission**

Candidates who have passed Diploma in Computer Science / Information Technology/ Computer Technology / Computer Application in I Class (10+3 years of study) are eligible to apply for the lateral entry to the $2^{nd}$ year of the course subject to availability of seats, but limited to 10% of the sanctioned intake.

## 4. Duration of the course

The course shall be of three years' duration spread over six consecutive semesters. The maximum duration to acquire prescribed number of credits in order to complete the Programme of Study shall be twelve consecutive semesters (six years).

## 5. Medium

The medium of instruction shall be English.

6. **Course Structure**

| Category | Course Name | Number Of Papers | Credits Per Paper | Total Credits |
|---|---|---|---|---|
| MIL | Modern Indian Languages | 2 | 3 | 6 |
| ENG | English | 2 | 3 | 6 |
| AECC | Ability Enhancement Compulsory Course | 2 | 2 | 4 |
| SEC | Skill Enhancement Course | 4 | 2 | 8 |
| GE | Generic Elective Course | 2 | 3 | 6 |
| DSC | Discipline Specific Core Course | Theory- 12 Practical – 9 Project -1 | Theory- 3 Practical – 2 6 | 12x3=36 9 x 2 =18 1 x 6 = 6 Total = **60** |
| DSE | Discipline Specific Elective Course | 6 | 4 | 6 x 4 =24 |
| OE | Open Elective Course | 2 | 3 | 2 x 3 =6 |
| | | | **Total** | **120** |

**MIL, ENG, AECC**

The crediting of MIL, ENG and AECC courses is as per Pondicherry University UG CBCS regulations.

**DSC and DSE**

At least 60% (72 credits) of the total minimum credit requirement must be earned by the student from DSC and DSE courses as follows in order to obtain the degree - 60 credits from Discipline Specific Core and 12 credits from Discipline Specific Elective courses.

**SEC**

Out of the 4 Skill Enhancement Courses, one course viz. - Online Course / In-Plant Training (2 weeks) / One month Internship / mini project is mandatory. The Online Course to be studied, the organization to be chosen for In-Plant Training or One month internship is to be

validated or approved by a panel of members comprising of the Department Faculty, before a student pursues the same.

For the remaining 3 SEC courses, any of the 2 credit Skill Enhancement Courses specified in the curriculum (B.Sc. CS) could be credited or substituted with Skill Enhancement Courses in the curriculum of other UG computer science courses or Skill Enhancement Courses of other UG Non-Computer Science Disciplines of study that constitute to skill development or an assortment of these without any overlap of courses.

## GE

Any 2 of the 3 credit Generic Elective Courses specified in the curriculum (B.Sc. CS) could be credited to constitute the 6 credits or substituted with Generic Elective courses in the curriculum of other UG Computer Science Disciplines of study or UG Courses of Non-Computer Science Disciplines of study that add proficiency to the students - with the advice of the Faculty Advisor, or an assortment of these without any overlap of courses.

## DSE

The six 4 credit papers to be credited under DSE can be credited from Discipline Specific Elective specialization stream courses as follows:

a. Three of the 4 credit courses can be credited from one specialization streams, thus completing 2 specialization streams. (or)
b. All six 4 credit papers can be credited from any specialization stream across the different specialization stream courses specified in the curriculum without any overlap of courses credited in above. (or)
c. Another specialization stream courses or across the different specialization stream courses in the curriculum of other UG Computer Science Disciplines of study without any overlap of courses credited in above.

## OE

Any 2 of the 3 credit Open Elective Courses specified in the curriculum (B.Sc. CS) could be credited to constitute the 6 credits or substituted with Open elective courses in the curriculum of other UG Computer Science disciplines of study or substituted with UG Courses of Non-Computer Science Disciplines of study that add proficiency to the students - with the advice of the Faculty Advisor or an assortment of these without any overlap of courses.

## 7. Faculty to Students Ratio

The Faculty to Student Ratio in all the practical / laboratory classes shall be maintained at 1:25.

## 8. Pattern of Examination

I. The End-Semester examination and internal assessments for MIL, ENG, AECC, DSC, GE and OE courses are as per Pondicherry University UG CBCS regulations.

II. All SEC courses (except Online Course / In-Plant Training (2 weeks) / One month Internship) to be treated as a practical / laboratory course and the End-Semester examination to be conducted as per Pondicherry University UG CBCS regulations.

III. The internal assessments for all practical / laboratory courses (for DSC, SEC courses) shall be as follows – 15 marks from two internal practical / laboratory assessment tests and 5 marks based on practical / laboratory course based mini application development.

IV. The internal assessment for DSE courses shall be conducted as follows - 12 marks from two internal assessment tests and 8 marks based only on two internal practical / laboratory assessment tests.

V. The attendance mark (5 marks) is applied to all courses and the awarding of attendance marks is as per Pondicherry University UG CBCS regulations.

VI. The Project work is to be evaluated as follows:

 i. The internal assessment (25 marks) is awarded as follows:

 a. 10 marks is awarded based on two internal project reviews conducted in periodic intervals by a panel comprising of members of the Department during the tenure of the project.

 b. The student's project guide awards 10 marks for the project work and 5 marks for attendance (attendance marks as specified in the Pondicherry University UG CBCS regulations).

 ii. The End Semester Examination assessment (75 marks) is evaluated under two aspects viz – i)Project Work – (50 marks) ii)Project Report and Viva-Voce (25 marks)

## Passing Minimum

Passing Eligibility and classification for the award of the Degree is as per Pondicherry University UG CBCS regulations.

## Lateral Entry

The Lateral Entry students have to complete 81 credits from the DSC, DSE, GE, SE, OE courses as per curriculum (III$^{rd}$ to VI$^{th}$ semesters). In addition, they should complete the two AECC courses (4 credits) for the award of the degree. One MIL (3 credits) and one ENG (3 credit) courses also need to be completed, if it is not studied in the last three years of the course eligible for lateral entry admission.

Other aspects of CBCS not covered in this document by default conforms to the Pondicherry University UG CBCS regulations.

**Programme Outcomes**

B.Sc (CS) programme has been designed to prepare graduates for attaining the following specific outcomes:

PO1 – It provides an ability to apply knowledge of Mathematics, Computer software and hardware in practice. It enhances not only comprehensive understanding of the theory but practical also.

PO2 - The program prepares the young professionals in wide range of areas such as Digital logics and computer architecture, Algorithms, Programming, Networking, Software Engineering, Information Security, Web Designing, Micro-processors and micro-controllers.

PO3 - In order to enhance programming skills of the young IT professionals, the program has introduced the ability to identify a problem, isolate its key components, analyze and assess the salient issues, set appropriate criteria for decision making, and draw appropriate conclusions and implications for proposed solutions.

PO4 – The program equips to demonstrate the capabilities required to apply cross-functional business knowledge and technologies in solving real-world problems and to demonstrate use of appropriate techniques to effectively manage business challenges.

PO5 - curriculum is divided based on various streams specialization that is needed in the IT Domain. Hence a student can specialize himself/herself in a particular stream.

PO6 - It provides an opportunity to prepare for the competitive examination and also getting admission to Higher Education.

PO7 - Become employable in various IT companies as programmer, system engineer, software tester, junior programmer, web developer, system administrator, software developer etc.

PO8 – Ability to work in public sector undertaking and Government organizations.

# PONDICHERRY UNIVERSITY

## Bachelor of Computer Science

### PROPOSED STRUCTURE OF THE COURSE UNDER CBCS 2019-2020

**FIRST SEMESTER**

| COURSE | SUBJECT CODE | Paper | CREDITS | | HOURS | | |
|---|---|---|---|---|---|---|---|
| | | | Th | Prac | L | T | P |
| MIL | LTAM/LHIN/ LARA/ LMAL/ LFRE 111 | Language-I | 3 | - | 3 | 2 | 0 |
| ENG | ENGL112 | English-I | 3 | - | 3 | 2 | 0 |
| DSC – 1 | CSCS113 | Introduction to Problem Solving using C | 3 | - | 3 | 2 | 0 |
| DSC – 2 | CSCS114 | Digital Logic and Computer Organization | 3 | - | 3 | 2 | 0 |
| AECC-1 | PADM115 | Public Administration | 2 | - | 2 | 0 | 0 |
| DSC – 1 (lab) | CSCS116 | Programming in C Lab | - | 2* | 0 | 0 | 4 |
| DSC – 2(lab) | CSCS117 | Digital Lab | | 2* | 0 | 0 | 4 |
| | | **TOTAL** | **18** | | **30** | | |

**SECOND SEMESTER**

| COURSE | SUBJECT CODE | Paper | CREDITS | | HOURS | | |
|---|---|---|---|---|---|---|---|
| | | | Theory | Prac. | L | T | P |
| MIL | LTAM/LHIN/LTEL LMAL121 | Language-II | 3 | - | 3 | 2 | 0 |
| ENG | ENGL122 | English-II | 3 | - | 3 | 2 | 0 |
| DSC – 3 | CSCS123 | PYTHON Programming | 3 | - | 3 | 0 | 0 |
| DSC – 4 | CSCS124 | Data Structures and Algorithms | 3 | - | 3 | 1 | 0 |
| GE – 1 (1 out of 2) | CSCS125 | Mathematics for Computer Science | 3 | - | 3 | 0 | 0 |
| | CSCS126 | Numerical Methods | | | | | |
| AECC-2 | ENVS127 | EVS | 2 | - | 2 | 0 | 0 |
| DSC-3 (lab) | CSCS128 | PYTHON lab | - | 2* | 0 | 0 | 4 |
| DSC-4(lab) | CSCS129 | Data Structures & Algorithms lab | - | 2* | 0 | 0 | 4 |
| | | **TOTAL** | **21** | | **30** | | |

**THIRD SEMESTER**

| COURSE | SUBJECT CODE | Paper | CREDITS | | HOURS | | |
|---|---|---|---|---|---|---|---|
| | | | Th | Prac | L | T | P |
| DSC – 5 | CSCS231 | Object Oriented Programming using Java | 3 | | 3 | 1 | |
| DSC – 6 | CSCS232 | Operating Systems | 3 | | 3 | 1 | |
| DSC – 7 | CSCS233 | Computer Networks | 3 | | 3 | 1 | |
| DSC-8 | CSCS234 | Software Engineering | 3 | | 3 | 0 | |
| GE-2 (1 out of 2) | CSCS235 | Applied Statistics | 3 | | 3 | 0 | 0 |
| | CSCS236 | Theory of Computations | | | | | |
| DSC – 6 (lab) | CSCS237 | Java Lab | | 2* | | | 4 |
| DSC – 7 (lab) | CSCS238 | Computer Networks Lab | | 2* | | | 4 |
| SEC-I | | Select 1SEC from SECs list | | 2* | | 1 | 3 |
| | | **TOTAL** | **21** | | **30** | | |

**FOURTH SEMESTER**

| COURSE | SUBJECT CODE | Paper | CREDITS | | HOURS | | |
|---|---|---|---|---|---|---|---|
| | | | Th | Prac | L | T | P |
| DSC – 9 | CSCS241 | Programming with Visual Basic | 3 | | 3 | 1 | |
| DSC – 10 | CSCS242 | Database Management Systems | 3 | | 3 | | |
| DSE – 1 DSE – 2 (2 out of 5) | CSCS243 | Client/Server Computing | 3 | 1 | 3 | 1 | 2 |
| | CSCS244 | Data Warehousing | | | | | |
| | CSCS245 | Object Oriented Systems Design | | | | | |
| | CSCS246 | Information Security | 3 | 1 | 3 | 1 | 2 |
| | CSCS247 | Principles of Programming languages | | | | | |
| OE-1 | | Select 1 OE from the OE list | 3 | | 3 | | 0 |
| DSC-9 (lab) | CSCS248 | Visual Programming & DBMS Lab | | 2* | | | 4 |
| SEC-II | | Select 1 SEC from SECs list | | 2* | 0 | 1 | 3 |
| | | **TOTAL** | **21** | | **30** | | |

**FIFTH SEMESTER**

| COURSE | SUBJECT CODE | Paper | | CREDITS | | HOURS | | |
|---|---|---|---|---|---|---|---|---|
| | | | Th | Prac | L | T | P |
| DSC – 11 | CSCS351 | Web Technology | | 3 | | 3 | | |
| DSE – 3<br>DSE – 4<br>(2 out of 5 streams) | CSCS352 | Distributed Systems | 3 | 1 | 3 | 1 | 2 |
| | CSCS353 | Data Mining | | | | | |
| | CSCS354 | Software Testing | | | | | |
| | CSCS355 | Network Security | 3 | 1 | 3 | 1 | 2 |
| | CSCS356 | Systems Software | | | | | |
| OE-2 | | Select 1 OE from OE list | 3 | | 3 | | 0 |
| DSC-11 (lab) | CSCS357 | Web Technology Lab | - | 2* | 0 | 0 | 4 |
| SEC-III | | Select 1 SEC form the SECs list | | 2* | | 1 | 3 |
| SEC-IV Compulsory | CSCS807<br>CSCS808<br>CSCS809<br>CSCS810 | Online Course(min-30 hrs)/<br>Mini project /<br>Internship (2-weeks)/<br>In-plant Training (one-month)<br>*Any one from the above list* | | 2* | | 1 | 3 |
| | | **TOTAL** | **20** | | **30** | | |

**SIXTH SEMESTER**

| COURSE | SUBJECT CODE | Paper | | CREDITS | | HOURS | | |
|---|---|---|---|---|---|---|---|---|
| | | | Th | Prac | L | T | P |
| DSC – 12 | CSCS361 | Microprocessors and Controllers | 3 | | 3 | 0 | |
| DSC – 13 | CSCS362 | Project work | | 6* | | 1 | 10 |
| DSE – 5<br>DSE - 6<br>(2 out of 5) | CSCS363 | Cloud Computing | 3 | 1 | 3 | 1 | 2 |
| | CSCS364 | Foundations of Data Analytics | 3 | 1 | 3 | 1 | 2 |
| | CSCS365 | Software Quality Management | | | | | |
| | CSCS366 | Ethical Hacking | | | | | |
| | CSCS367 | Principles of Compiler Design | | | | | |
| DSC-12 (Lab) | CSCS368 | Microprocessor Lab | | 2* | | | 4 |
| | | **TOTAL** | **19** | | **30** | | |

**\* University Practical Exam/ Viva Should be conducted**

# Bachelor of Science (*COMPUTER SCIENCE)*

## under *CHOICE-BASED CREDIT SYSTEM(CBCS)*

## (Effective from the academic year 2019- 2020)

| | DISCIPLINE SPECIFIC CORES (DSC) | Semester |
|---|---|---|
| 1 | Introduction to Problem Solving using C | I |
| 2 | Digital Logic and Computer Organization | I |
| 3 | Python Programming | II |
| 4 | Data Structures and Algorithms | II |
| 5 | Object Oriented Programming using JAVA | III |
| 6 | Operating Systems | III |
| 7 | Computer Networks | III |
| 8 | Software Engineering | III |
| 9 | Database Management Systems | IV |
| 10 | Programming Using Visual Basic | IV |
| 11 | Web Technology | V |
| 12 | Microprocessors and Microcontrollers | VI |
| 13 | PROJECT | VI |
| | DISCIPLINE SPECIFIC ELECTIVES (DSE)-POOL | |
| | (Specialization Stream - I) Software Engineering | |
| 1 | Object Oriented System Design | |
| 2 | Software Testing | |
| 3 | Software Quality Management | |
| | (Specialization Stream - II) Advanced Computing | |
| 1 | Client/Server Computing | |
| 2 | Distributed Computing | |
| 3 | Cloud Computing | |

| | (Specialization Stream - III)<br>Information Security | |
|---|---|---|
| 1 | **Information Security** | |
| 2 | **Network Security** | |
| 3 | **Ethical Hacking** | |
| | (Specialization Stream - IV)<br>BUSINESS INTELLIGENCE | |
| 1 | **Data Warehousing** | |
| 2 | **Data Mining** | |
| 3 | **Foundation of Data Analytics** | |
| | (Specialization Stream - V)<br>SCIENCE OF PROGRAMMING<br>LANGUAGES STREAM | |
| 1 | **Principles of Programming Languages** | |
| 2 | **System Software** | |
| 3 | **Principles of Compiler Design** | |
| | **OPEN ELECTIVES-POOL** | |
| 1 | **Business Communication** | **CSCS701** |
| 2 | **IT Enabled Services** | **CSCS702** |
| 3 | **Total Quality Management** | **CSCS703** |
| 4 | **Artificial Intelligence** | **CSCS704** |
| 5 | **Introduction to E-Business** | **CSCS705** |
| 6 | **Fundamentals of Accountancy** | **CSCS706** |
| 7 | **Principles of Management** | **CSCS707** |
| 8 | **Computer Graphics** | **CSCS708** |

| | SKILL ENHANCEMENT COURSES-POOL | |
|---|---|---|
| 1 | Soft Skills | CSCS801 |
| 2 | Office Automation | CSCS802 |
| 3 | Introduction to C++ | CSCS803 |
| 4 | Multimedia Tools | CSCS804 |
| 5 | Programming with PHP | CSCS805 |
| 6 | Mobile Application Development | CSCS806 |
| 7 | ** Online Course / mini project / Internship (2 weeks)/ In-Plant Training (2 weeks) | CSCS807 CSCS808 CSCS809 CSCS810 |

| | GENERIC ELECTIVES | |
|---|---|---|
| 1 | Mathematics for Computer Science | CSCS125 |
| 2 | Numerical Methods | CSCS126 |
| 3 | Applied Statistics | CSCS235 |
| 4 | Theory of Computations | CSCS236 |

| | NON MAJOR ELECTIVES | |
|---|---|---|
| 1 | Basics of Computers and Office Automation | CSCS171 |
| 2 | Fundamentals of Information Technology | CSCS172 |
| 3 | Fundamentals of 'C' Language | CSCS173 |
| 4 | Web Designing | CSCS174 |

## DISCIPLINE SPECIFIC CORE

**Paper Code: CSCS113**

**INTRODUCTION TO PROBLEM SOLVING USING C**

| L | T | P |
|---|---|---|
| 3 | 2 | 0 |

**Prerequisite: -** Basic knowledge of Mathematics and computers
**Objectives:**
- To learn the concepts of " C " Programming
- To develop software program using "C" language

**Outcomes:**
- In-depth understanding of various concepts of C language.
- Skill to write program code in C to solve real world problems and to debug a program

**MODULE – I**

Introduction to Computers– Introduction to Programming - How to develop a program, Algorithms, Flow-charts, Types of Programming Languages - Debugging, Types of errors - Techniques of Problem Solving – Problem solving aspects – Top- Down aspects –Structured programming concepts.

**MODULE – II**

Character Set, Structure of a 'C' Program, Data Types, Operators, Expressions, Assignment Statement, Conditional Statements, Looping Statements, Nested Looping Statements, Multi Branching Statement (Switch), Break and Continue, Differences between Break and Continue, Unconditional Branching (Go to Statement)

**MODULE – III**

Functions: Defining and accessing: Passing arguments, Function prototypes, Function calls- Categories of functions- Nesting of functions- Recursion. Use of library functions, Scope , Visibility and Lifetime of variables.

**MODULE – IV**

Arrays: Declaration and Initialization of one and two dimensional arrays – Multidimensional array – dynamic arrays -  Character arrays and strings. Structure: Defining and processing. Structure initialization Operations on individual members Arrays of structure, Arrays within Structure, Structure and Functions- Passing to a function, Union.

**MODULE – V**

Pointers: Declarations and initialization of pointer variables ,Accessing pointer variables, Passing to a function. Operations on pointers, pointer and arrays. Array of pointers, Pointer to Functions. Data Files: Open, close, create, process unformatted data files.

**TEXT BOOK**
1. E.Balagurusamy, Programming in ANSI C , 8th Edition Tata McGraw Hill,  2019
2. P. K. Sinha & Priti Sin,"Computer Fundamentals", BPB Publications, 2007.
3. Byron S. Gottfried, Programming with C , Schaum's Outline Series, TMH ,4th Edition 2018.

**Paper Code: CSCS116**

| L | T | P |
|---|---|---|
| 0 | 0 | 4 |

**PROGRAMMING IN C LAB**

**LIST OF EXERCISES**

    1. Simple C programs

    2. Program to illustrate control statements

    3. Program to illustrate FOR loop

    4. Program to illustrate SWITCH & WHILE statements

    5. Program to illustrate functions

    6. Program to illustrate user-defined functions

    7. Program to illustrate arrays

    8. Program to illustrate usage of pointers

    9. Program to illustrate character handling libraries.

    10. Program to illustrate string manipulation

    11. Program to illustrate creation of files.

    12. Program to illustrate creation, reading & accessing files

| L | T | P |
|---|---|---|
| 3 | 2 | 0 |

**Paper Code: CSCS114**

## DIGITAL LOGIC & COMPUTER ORGANIZATION

**Prerequisite:** Basic knowledge about computers
**Objectives:**
- To learn the fundamentals of digital logic and computer design.
- To learn combinational and sequential logic.

**Outcomes:**
- Skill to use the methods of systematic reduction of Boolean expression using K- Map.  Ability to interpret logic gates and its operations.
- Familiarization with combinational and sequential logic circuits in electronics.

## MODULE – I
Number systems & Conversions – Arithmetic of number systems – binary codes – BCD – The excess – 3code – Gray code – ASCII – EBCDIC - Introduction to Logic Circuits – logic functions & gates – Inversion – truth tables – logic gates – truth table of basics gates – timing diagrams of NOT, AND & OR gates – Boolean algebra – NAND& NOR logic gates - truth table of a logic circuit – de-morgan's theorem.

## MODULE – II
Logic families – factors affecting performance of a logic family – register transistor logic – diode transistor logic – DCTL – ECL – TTL logic family – Karnaugh maps – two, three & four-variables K-map – loops in K-map – mapping of K-maps – don't care condition

## MODULE – III
Combinatorial logic circuits – designing procedure– code converters – multiplexers – multiplexer tree – demultiplexers /decoders – half & full adder – half & full subtractor – encoders – BCD adder

## MODULE – IV
Sequential logic circuits – sequential circuits – SR flip flop – D flip flop – JK flip flop – T flip flop – flip flop triggering – Shift registers – Design of shift registers design of ripple counters with examples Design of synchronous counter with examples timing sequences.

## MODULE – V
Register transfer logic Inter register transfer Arithmetic, Logic and shift micro operations Conditional control statements fixed point binary data overflow Arithmetic shifts Instruction codes Design of simple computer.

**Text Books:**
1. Morris Mano M, "Digital Logic and Computer Design", Pearson Education, 4th edition, 2014.
2. S.S. Bhatti & Ragul Malhotra, "A Textbook of Digital Electronics", I.K. International publishing, New Delhi, 2013.
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization", 5th edition, McGraw Hill, 2002.

**Paper Code: CSCS117**

**DIGITAL LAB**

| L | T | P |
|---|---|---|
| 0 | 0 | 4 |

**LIST OF EXERCISES**

1. Study of Logic Gates
2. Design of Adder and Subtractor
3. Design and Implementation of Code Convertors
4. Design of 4-Bit Adder and Subtractor
5. Design and Implementation of Magnitude Comparator
6. 16 Bit Odd/Even Parity Checker and Generator
7. Design and Implementation of Multiplexer and De-multiplexer
8. Design and Implementation of Encoder and Decoder
9. Design and Implementation of Shift Register
10. Simulation of Logic Gates
11. Simulation of Adder and Subtractor
12. Design of 4-Bit Adder and Subtractor

**Paper Code: CSCS123**

| L | T | P |
|---|---|---|
| 3 | 0 | 0 |

**PYTHON PROGRAMMING**

**Prerequisite:** Knowledge of any programming language
**Objectives:**
- To learn basic python concept.
- To develop  simple Python programs and code reusing with functions

**Outcomes:**
- Skill to write codes in Python to solve mathematical or real world problems.
- Ability to isolate and fix common errors in Python programs.

**MODULE 1**

Introduction to Python  - The IDLE Python Development Environment - The    Python Standard Library - Literals -  Numeric Literals - String Literals - Control Characters - String Formatting - Implicit and  Explicit Line Joining  Variables and Identifiers - Variable Assignment and Keyboard Input- Identifier-Keywords and Other Predefined Identifiers in Python – Operators   - Various Operators - Relational Operators-Membership Operators – Boolean Operators  - Expression and Data Types -Operator Precedence and Boolean  Expressions   -  Operator Associativity - Mixed-Type Expression

**MODULE 2**

 Control Structure -Selection Control- If Statement - Indentation in Python -  Multi-Way Selection - Iterative Control -  While Statement  -  Input Error Checking - Infi nite loops - Definite vs. Indefinite Loops

**MODULE 3**

List Structures - Common List Operations - List Traversal - Lists (Sequences) in Python- Python List Type - Tuples- Sequences- Nested Lists  Iterating Over Lists (Sequences) in Python -  For Loops - The Built-in range Function - Iterating Over List Elements vs. List Index Values-While Loops and Lists (Sequences) - Dictionaries and sets

**MODULE 4**

Defining Functions - Calling Value-Returning Functions - Calling Non-Value-Returning Functions - Parameter Passing - Keyword Arguments in Python Default Arguments in Python - Variable Scope - Recursive functions - Exception Handling -The Propagation of Raised Exceptions - Catching and Handling Exceptions -Exception Handling and User Input

**MODULE 5**

String Processing - String Traversal - String-Applicable Sequence Operations -String Methods - Using Text Files - Opening Text Files - Reading Text Files - Writing Text Files

**TEXT BOOK**

1, Charles Dierbach, Introduction to Computer Science using Python , Wiley First Edition (2015), ISBN-10: 81265560132015

**REFERENCE BOOKS**

1, Zed A.Shaw, Learn Python the Hard Way Paperback, Pearson Education,  Third Edition edition (2017), ISBN-10: 9332582106

2.  Paul Barry, Head First Python, O' Reilly Publishers, First Edition, 2010, ISBN:1449382673.

**Paper Code: CSCS128**

**PYTHON LAB**

| L | T | P |
|---|---|---|
| 0 | 0 | 4 |

**LIST OF EXERCISES**

1.Create simple programs using arithmetic Boolean and logical operators

2. Develop program using control flow tools like IF.

3. Develop program using LOOP control strutures

4. Data structures

       use list as stack

       use list as queue

       tuple, sequence

5.Write a program to read and write files, create and delete directories

6. Write a program with exception handling

7. Write a program using string handling and regular expressions

**Paper Code: CSCS124**

**DATA STRUCTURES & ALGORITHMS**

| L | T | P |
|---|---|---|
| 3 | 1 | 0 |

**Pre-requisite:** Knowledge of any programming language

**Objectives:**

- To acquaint students with data structures used for programming   and manipulation of data.
- To make students to understand the basics of algorithms.

**Outcomes:**

- Skill to analyze data and to determine appropriate data structure.  Knowledge of various data structures and their implementations.
- Ability to implement algorithms to perform various operations on data structures.

**MODULE-I**

Introduction to Data Structure: Types of Data Structures - Linear & Non Linear Data Structures. Linear Data Structure - Arrays: Representation of arrays, Applications of arrays - Searching: Linear search and Binary Search. Stacks: Representation, Operations on stack, Implementation of stack using array, Application – Evaluation of Expression.

**MODULE-II**

Queues: Representation, Operations on Queues, Implementation of queues using array. List representations, implementing the list operations, Doubly linked list representation. Polynomial - representations.

**MODULE-III**

Non Linear Data Structures: Trees: Basic terminology, Binary tree, Representation, Traversal, Binary search tree.

**MODULE-IV**

Graph: Definition and Terminology – Representation, Traversal – Depth First and Breadth First traversal techniques.

**MODULE-V**

Introduction to Algorithms: Algorithm Design Techniques – Iterative techniques: Bubble Sort, Insertion Sort, Divide and Conquer: Merge Sort, Quick Sort

**TEXT BOOKS**

1. Ellis Horowitz, Sartaj Sahni and Anderson, "Fundamentals of Data Structure in C", University Press, 2nd edition, 2008.

2. T.H.Cormen, CharlesE. Leiserson, Ronald L. Rivest, Clifford Stein. " Introduction to Algorithms, PHI, 3rd edition. 2010.

**Paper Code: CSCS129**

**DATA STRUCTURE & ALGORITHM LAB**

| L | T | P |
|---|---|---|
| 0 | 0 | 4 |

**LIST OF LAB EXERCISES**

1. Linear Search
2. Binary Search
3. Implementation of Stack
4. Implementation of Evaluation of Expression
5. Implementation of Queue
6. Implementation of Singly Linked List
7. Implementation of tree traversal
8. Implementation of Graph traversal
9. Implementation of Bubble sort
10. Implementation of Insertion sort
11. Implementation of Quick sort
12. Implementation of Merge sort

**Paper Code: CSCS232**

| L | T | P |
|---|---|---|
| 3 | 1 | 0 |

## OPERATING SYSTEMS

**Pre-requisite:** Knowledge of computers & computer organization
**Objectives:**
- To learn OS management functions.
- To learn Memory management, Processor management, Device Management and I/O Management

**Outcomes:**

- Understand how memory is utilized. Understand CPU scheduling algorithms to manage tasks.

- Knowledge of methods to prevention and recover from a system deadlock. Manages I/O devices.

## MODULE –I

Operating Systems – Introduction – Basic Concepts and terminology – As OS Resource Manager – OS process view point – OS hierarchical and extended machine view – Memory management: Single contiguous memory allocation – Introduction to multiprogramming – Partitioned memory management.

## MODULE –II

Memory management: Relocatable partitioned memory management – Paged memory management – Demand paged memory management – Segmented memory management – Segmented and Demand – Paged memory management – Swapping and Overlays.

## MODULE –III

Processor management – State model – Job scheduling - Process scheduling – Multi Process system – Process Synchronization.

## MODULE –IV

Device Management: Techniques for Device Management – Device Characteristics – Channels and Control Unit – Device Allocation – I/O Controller, Scheduler, Device Handler- Virtual Devices

## MODULE –V

Information Management : A simple file system- General Model of a File System – Symbolic File System – Basic File System – Access Control Verification – Logical file system – Physical file system – Allocation strategy module.

**Text Book**

1. Stuart E.Madnick and John Donovan "Operating System",TMH Fifth Reprint 2000. (Chapter 1,3,4,5,6)

**Paper Code: CSCS231**

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## OBJECT ORIENTED PROGRAMMING USING JAVA

**Prerequisite:** Basic knowledge of programming
**Objectives:**
- To learn the basic concepts of OOP
- To develop Java programs, Swing and Applets

**Outcomes:**
- Skill to write Java application programs using OOP principles and proper program structuring.
- Ability to create packages and interfaces. Ability to implement error handling techniques using exception handling.

**MODULE - I**
Concepts of OOP: Introduction OOP, Procedural Vs Object Oriented Programming, Principles of OOP, Benefits and applications of OOPS

**MODULE – II**
Introduction to java applications – Introduction to classes, objects, methods & Strings - Control statements – Arrays - constructor – function overloading & overriding - Inheritance - Polymorphism – Interface – package - exception handling

**MODULE – III**
GUI components –Overview of Swing components –Displaying Text and Images in a Window - Text Fields , Introduction to Event Handling- GUI Event Types and Listener Interfaces - layout manager, Swings Vs AWT

**MODULE – IV**
Files, Streams & I/O – Introduction – Files & Streams – Sequential Access Text Files

**MODULE – V**
Introduction to Multi-Threading , Thread life cycle, Thread priorities. Introduction – Applets & Java Web Start – applet life-cycle, HTML tags, a simple applet program

**Text Books:**
Paul Deital & Harvey Deital, "Java: How to Program", Pearson Education, 10th edition, 2015.

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**Paper Code: CSCS237**

**OBJECT ORIENTED PROGRAMMING USING JAVA LAB**

**LIST OF EXERCISES**

1.Program to illustrate class and objects.
2. Program to illustrate control structures ( if-then, while, switch ).
3. Program to illustrate arrays (creation, initialization and processing).
4. Program to illustrate Constructor and its overloading.
5. Program to illustrate Inheritance and Packages.
6. Program to illustrate Interface and static methods.
7. Program to illustrate Exception Handling Technique with IO streams
8. Program to illustrate File handling technique.
9. Program to illustrate Swing Application
10. Program to illustrate applets using HTML

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| **COMPUTER NETWORKS** | 3 | 0 | 0 |

**Pre-requisite:** Basic Knowledge of Computers

**Objectives:**

- To educate the functions of various OSI layers in detail

**Outcomes:**

- Knowledge of OSI Layers in Computer Network.
- Ability to identify transmission media, types and topologies of network. Familiarization with the techniques of error detection and congestion control

**MODULE –I**

Introduction –Uses of Networks, Network hardware, Network Software, Network Reference Models, Example Networks.

**MODULE –II**

Physical Layer: Transmission Media: Guided, Wireless and Communication satellites – Multiplexing and Switching.

**MODULE –III**

Data Link Layer: data link Layer Design issues, Error Detection and correction, Simplex Stop-and-wait protocol, Sliding window protocols

**MODULE –IV**

Network Layer –Design issues, Routing Algorithms: Optimality Principle, Shortest path algorithm, flooding, link state routing, Hierarchical routing, Broadcast, Multicast. Congestion Control Algorithms.

**MODULE –V**

Transport Layer – Elements of Transport Protocols, Internet Transport protocols: UDP, TCP Application Layer – Domain Name System –Electronic Mail

**TEXT-BOOK**

1. Computer Networks A.S Tanenbaum, David J. Wetherall, Prentice Hall,5$^{th}$ edition, 2011 (Chapters 1.1 – 1.5, 2.1-2.6, 3.1-3.4, 5.1 – 5.3, 6.1 -6.5, 7.1,7.2)

**REFERENCES**

1. Behuouz A. Forouzan, "Data Communication & Networking ", McGraw-Hill, 4$^{th}$ Edition
2. Data and Computer communications Seventh edition William Stallings PHI

**Paper Code: CSCS238**

**COMPUTER NETWORKS LAB**

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Implementation using JAVA or PYTHON

1. Text Message Sending and Receiving

2. File Transmission

3. Basic Chat Application

4. Simple Mailing Application

5. Client Server Application

**Paper Code: CSCS234**

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**SOFTWARE ENGINEERING**

**Pre-requisite:** Basic knowledge of programming
**Objectives:**
- To gain knowledge about software development life cycle models, software design, implementation, and testing of software.
- To gain overall knowledge of how software is developed

**Outcomes:**
- Understanding of various methods or models for developing a software product.
- Ability to analyze existing system to gather requirements for proposed system. Skill to design and code a software.

## MODULE -I

Introduction to Software Engineering – evolving role of software – defining software engineering – changing nature of software – software myths – terminologies – role of software development – software life cycle models – build & fix model – waterfall model – incremental model – evolutionary model – unified model – selection of a life cycle model.

## MODULE -II

Software Cost Estimation: Software cost factors - Software Cost Estimation Techniques -Staffing-level Estimation -Estimating Software Maintenance Costs -The Software Requirements specification - Formal Specification Techniques - Languages and Processors for Requirements Specification.

## MODULE -III

Software Design: Fundamental Design Concepts - Modules and Modularization Criteria -Design Notations –Design Techniques -Detailed Design Considerations -Real-Time and Distributed System Design -Test Plans -Milestones, walkthroughs, and Inspections.

## MODULE -IV

Implementation issues: Structures Coding Techniques -Coding Style -Standards and Guidelines – Documentation guidelines -Type Checking -Scoping Rules –Concurrency Mechanisms.

## MODULE -V

Software testing – strategic approach to software testing – terminologies – functional
testing – structural testing – levels of testing – validation testing – the art of debugging – testing tools

**Text Book**

1. R. Fairley, "Software Engineering Concepts", Tata McGraw Hill Edition -2017.
2. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw Hill, 7$^{th}$ edition, 2010. (Module 1 & Module 5)

**Paper Code: CSCS241**

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**PROGRAMMING WITH VISUAL BASIC**

**Pre-requisite:** Knowledge of any programming language
**Objectives:**
- To introduce students Event Driven Programming.
- To help the students to find solution to real life problems using Visual Basic.NET
- Students will learn about connecting and accessing databases.

**Outcomes:**
- Understand Forms, module, components, menu editor and its concepts. Usage of controls such as text box, buttons, checkbox etc and control them through codes.
- Ability to develop simple project with database using data source.

**MODULE I**

Introduction to .net framework -Visual Programming, VB.net- Features, IDE- Menu System, Toolbars,Code Designer,Solution Explorer, Object Browser, Toolbox, Class View Window, Properties Window,Server Explorer, Task List, Output Window, Command Window.

**MODULE II**

Data Types, Keywords, Declaring Variables and Constants, Operators,Conditional Statements-Looping Statement. Arrays- Static and Dynamic . Functions and Procedures- Built-In Functions-Mathematical and String Functions .Object Oriented Programming- Creating Classes, Objects, Properties, Methods, Events, Constructors and destructors, Exception Handling.

**MODULE III**

Properties, Events and Methods of Form, Label, TextBox, ListBox, Combo Box, RadioButton, Button, Check Box, Progress Bar, Date Time Picker, Calendar, Picture Box,HScrollbar, VScrollBar, Group Box, ToolTip,Timer.

**MODULE IV**

Menus and toolbars- Menu Strip, Tool Strip, Status Strip, Built-In Dialog Boxes –Open File Dialogs, Save File Dialogs, Font Dialogs, Color Dialogs, Print Dialogs, InputBox, Msg Box, Interfacing With End user- Creating MDI Parent and Child.

**MODULE V**

Introduction to ADO.NET: ADO.Net Object Model, Data Provider, DataSet, Connecting to database, Reading data into a data cell: the dataset class, finding tables, rows, column values, column definition, adding, deleting and updating rows, writing updates back to data source.

**Text Books:**
1. Steven Holzner, Visual Basic .Net programming black book, Dreamtech Press , 2005
2. Jeffery R. Shapiro, Visual Basic .NET The Complete Reference, Tata McGraw Hills, 2002
**ReferenceBooks:**
1. Anne Bohem, Murach's Beginning Visual basic .Net, Mike Murach & associates, 2002

**Paper Code: CSCS242**

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**DATABASE MANAGEMENT SYSTEM**

**Prerequisite:** Knowledge of data structures and file-handling
**Objectives:**
- To learn the fundamental concepts of Database management systems.
- To learn SQL commands to manage data and PL/SQL.

**Outcomes:**
- Understand data modeling and database development process. Construct and normalize conceptual data models.
- Implement a relational database into a database management system. Become proficient in using database query language.

**MODULE  I:**

Introduction to Database System- Objectives- Entities and Attributes – Data Models

**MODULE II :**

Database Management Systems – Tree Structures – Plex Structures – Data Description Languages. Relational Databases – Third Normal Form – Canonical Data structures - Varieties of data independences.

**MODULE III:**
Basic SQL reports and commands – Datatypes and notations – String functions – Data functions – Unions – Joins – DDL – DML – DLL.

**MODULE IV:**
PL/SQL: Approach and Advantages –PL/SQL Blocks -Variables-Manipulating Data – Triggers – Procedures, functions and packages - Exception handling

**MODULE V:**
Locking Techniques – Time stamp ordering – Validation techniques -  Granularity of data items – Recovery Concepts -   log based Recovery – Database Security issues – Access Control – Statistical Database Security.

**TEXT BOOK**

1. James Martin, "Computer Database Organization", 2nd edition- PHI, 2001
2. Kevin Loney, George Koch , Oracle 9i The Complete Reference  2002 McGraw Hill
3. Henry F. Korth  Abraham Silberschatz , Sudarsan "Database System Concepts ", Sixth Edition   McGraw Hill International Edition

**Paper Code: CSCS248**

**VISUAL PROGRAMMING & DBMS LAB**

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**LIST OF EXERCISES:**

1. Building simple applications.

2. Working with controls.

3. Application with multiple forms.

4. Application with dialogs

5. Application with Menus

6. Develop any TWO case studies listed below:

    i)        Students marksheet processing

    ii)       Electricity bill processing

    iii)     Bank Transaction

    iv)     Payroll processing

    v)       Gas booking and delivery

    vi)     Library information system

**Paper Code: CSCS351**

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**WEB TECHNOLOGY**

**Pre-requisite:** Knowledge of Operating system, computer network, DBMS, and Java .
**Objectives:**
- To gain knowledge in HTML and DHTML
- To design interactive web pages using Style sheets, Java-script and ASP.

**Outcomes:**
- Understand the various steps in designing Creative and dynamic website.
- Ability to write HTML, JavaScript, CSS and ASP.

## MODULE – I

Introduction to Internet – The World Wide Web – Web Browsers, Web Servers, Uniform Resource locators, Multipurpose Internet mail extensions. HTTP Request Message - HTTP Response Message.

## MODULE – II

Introduction to HTML – Elementary tags in HTML – List in HTML – Displaying Text in Lists – Using Ordered List – Using Unordered Lists- HTML Description Lists - Nested HTML Lists, Control List – Combining List Types – Graphics and Image Formats – Graphics and HTML document- image and hyperlink anchors – Image maps – Tables – Frames – Forms.

## MODULE – III

Introduction to DHTML – Introduction to style sheets – Setting the default style sheet language – Inline style information – External Style sheets – Cascading Style sheets.

## MODULE – IV

Introduction to Java script - script tag, interactive data, DOM,  A simple document, Add a form, Add a text input element, Add a button element, properties, methods and event handlers. Scripts and HTML.

## MODULE – V

Introduction to ASP – Database Management with ASP: Database access with ADO, working with ADO's Connection object, Using Command objects, Working with ADO's Recordset Object.

**TEXT BOOKS**
1. Robert W. Sebesta, "Programming the World Wide Web", Addison Wesley, 2011 (Chapter 1 only)
2. Elisabeth Freeman and Eric Freeman, " Head First HTML with CSS & XHTML (Head First",O'Reilly , 2005
3. A.Russell Jones, "Active Server Pages 3", BPB Publications, 2000
4. Danny Goodman, "JavaScript Bible", 7th edition, Wiley Publishing Inc,2010, (Chapters 6,7 only)

**Paper Code: CSCS357**

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**WEB TECHNOLOGY LAB**

**LIST OF EXPERIMENTS**

**LIST OF EXERCISES**

1. Usage of Simple HTML commands, Graphics and image formats and hyperlinks
2. Usage of Tables, Frames, Forms, Background Graphics and Color
3. Simple application using HTML
4. Simple application using DHTML and Cascading style sheet
5. Simple application using Java script
6. Simple application using ASP (Any Application Of Student's Choice)

**Paper Code: CSCS361**

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**MICROPROCESSORS AND MICROCONTROLLERS**

**Prerequisite:** Knowledge of computer organization
**Objectives:**
- To understand the architectures and the instruction set of 8085 microprocessor
- To understand the architectures and the instruction set of 8051 microcontroller

**Outcomes:**
- Get clear idea about the architectures and instruction set of microprocessor and microcontroller.
- Do the arithmetic operation, logical operations and code conversion

**MODULE – I**
Intel 8085 Microprocessor: Introduction - Need for Microprocessors – Evolution –Intel 8085 Hardware - Architecture – Pin description - Internal Registers – Arithmetic and Logic Unit – Control Unit – Instruction word size

**MODULE – II**
Addressing modes –Instruction Set –Timing Diagrams. Evolution of Microprocessors – 16-bit and 32-bit microprocessors. Intel 8085 Interrupts and DMA: 8085 Interrupts – Software and Hardware Interrupts –8259 Programmable Interrupt Controller –

**MODULE – III**
Data Transfer Techniques – Synchronous, Asynchronous and Direct Memory Access (DMA) and 8237 DMA Controller- 8253 Programmable Interval Timer.

**MODULE – IV**
Memory & I/O Interfacing: Types of memory – Memory mapping and addressing –Concept of I/O map – types – I/O decode logic – 8279 Interfacing key switches and LEDs – 8255 Programmable Peripheral Interface –

**MODULE – V**
Microcontroller**:** Intel 8051 Microcontroller: Introduction – Architecture – Memory Organization – Special Function Registers – Pins and Signals – Timing and control – Port Operation – Memory and I/O interfacing – Interrupts – Instruction Set and Programming.

**Text Books:**
Krishna Kant, "Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096", PHI, 2013.

**Paper Code: CSCS368**

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**MICROPROCESSOR LAB**

**LIST OF EXERCISES**

1. Basic Arithmetic and Logical Operations   Addition
2. Basic Arithmetic and Logical Operations   Subtraction
3. Basic Arithmetic and Logical Operations   Multiplication
4. Basic Arithmetic and Logical Operations   Division
5. Move a Data Block Without Overlap
6. Code Conversion- Arithmetic Operations.
7. Code Conversions –Decimal to Hexadecimal
8. Code Conversion – Hexadecimal to Decimal
9. Floating Point Operations
10. Ascending & Descending operation

**Paper Code: CSCS362**

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**PROJECT**

**Objective**

The objective of the project is to motivate them to work in emerging/latest technologies, help the students to develop ability, to apply theoretical and practical tools/techniques to solve real life problems related to industry, academic institutions and research laboratories.

**Outcome**

The course outcome is the ability of the student to apply Software Development Cycle to develop a software module. The student will be able to use the techniques, skills and modern software engineering tools necessary for software development. Develop a software product along with its complete documentation.

The project is of 2 hours/week for one (semester VI) semester duration and a student is expected to do planning, analyzing, designing, coding, and implementing the project. The initiation of project should be with the project proposal. The synopsis approval will be given by the project guides.

The project proposal should include the following:
- Title
- Objectives
- Input and output
- Details of modules and process logic
- Limitations of the project
- Tools/platforms, Languages to be used
- Scope of future application

The project work should be either an individual one or a group of not more than three members and submit a project report at the end of the semester. The students shall defend their dissertation in front of experts during viva-voce examinations.

# DISCIPLINE SPECIFIC ELECTIVE (DSE) PAPERS

## Specialization Stream – I [ADVANCED COMPUTING STREAM]

**Paper Code: CSCS243**

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**CLIENT/SERVER COMPUTING**

**Prerequisite:** Knowledge of computer networks & DBMS
**Objectives:**
- To learn about objective evaluations and details of Client/Server development tools, used in operating system and database management system
- To learn the basics of middleware architecture

**Outcomes:**
- Understand the objective evaluations and details of Client/Server development tools, used in operating system and database management system
- Get an idea about the basics of middleware architecture

## MODULE – I
Introduction – defining client/server computing – Classification of client/server systems – clients/server – advantages & disadvantages –driving forces behind client/server computing

## MODULE – II
Architectures of client/server systems – introduction – components – principles behind client/server systems – client components – server components – communication middleware components – architecture for business information system – existing client/server architecture

## MODULE – III
Client/Server databases – Introduction – client/server in respect of databases – client/server database architecture – database middleware component – access to multiple databases – distributed client/server database systems – distributed DBMS – web/database system for client/server applications

## MODULE – IV
Client/server application components – introduction – technologies for client/server application – services of a client/server application – categories of client/server applications – client services – server services – client/server application connectivity – client/server application: Layered Architecture

## MODULE - V
System development – hardware & software requirements – communication interface technology – client/server technology & web services – what are web services – web services & client/server/browser – server technology – client/server technology & web applications

**Text Book:**
Subhash Chandra Yadav & Sanjay Kumar Singh,"An Introduction to Client/Server Computing", New Age International Publishers, 2009.

**Paper Code: CSCS352**

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**DISTRIBUTED  COMPUTING**

**Prerequisite:** Knowledge of Database and Networks.
**Objective**
- To make the students to understand the collaborative operations of collections of computer systems.

**Outcomes**

- Understand the collaborative operations of collections of computer systems.

# MODULE I
Introduction – Examples of Distributed Systems–Trends in Distributed Systems – Focus on resource sharing – Challenges - Case study: World Wide Web.

# MODULE II
System Model – Inter process Communication - the API for internet protocols – External data representation and Multicast communication - Network virtualization: Overlay networks. Case study: MPI

# MODULE III
Remote Invocation – Introduction - Request-reply protocols - Remote procedure call - Remote method invocation - Group communication

# MODULE IV
Publish-subscribe systems - Message queues - Shared memory approaches - Distributed objects - Case study

# MODULE V
Distributed File Systems –Introduction - File service architecture - Distributed mutual exclusion – Elections

**Text Book:**
George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems Concepts and Design", Addison Wesley, 5th edition, 2011.

**Paper Code: CSCS363**

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**CLOUD COMPUTING**

**Prerequisite:** Knowledge of operating system, distributed system.
**Objectives:**
- To impart the principles and paradigm of Cloud Computing
- To comprehend the Cloud Computing architecture and implementation

**Outcomes**

- Understand the principles and paradigm of Cloud Computing
- Get an idea about the Cloud Computing architecture and implementation

**MODULE – I**
Computing Paradigms - Cloud Computing Fundamentals - Motivation for Cloud Computing - Defining Cloud Computing - Principles of Cloud computing - Cloud Ecosystem - Requirements for Cloud Services - Cloud Application - Benefits and Drawbacks - Cloud Computing Architecture and Management Cloud Architecture - Anatomy of the Cloud- Network Connectivity in Cloud Computing - Applications on the Cloud- Managing the Cloud .

**MODULE – II**
Cloud Deployment Models – Introduction - Private Cloud - Public Cloud- Hybrid Cloud- Cloud Service Models- Infrastructure as a Service- Platform as a Service- Software as a Service

**MODULE – III**
Virtualization - Approaches to Virtualization- Hypervisors

**MODULE – IV**
From Virtualization to Cloud Computing- Programming Models for Cloud Computing

**MODULE – V**
Software Development in Cloud Introduction - Different Perspectives on SaaS Development - New Challenges - Cloud-Aware Software Development Using PaaS Technology

**Text Book:**
K.Chandrasekaran, "Essentials of Cloud Computing", CRC Press, Taylor & Francis Group, 2015.

# DISCIPLINE SPECIFIC ELECTIVE (DSE) PAPERS

## Specialization Stream – II [BUSINESS INTELLIGENCE STREAM]

**Paper Code: CSCS244**

**DATA WAREHOUSING**

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**Pre-requisite:** Knowledge of database management system.
**Objectives:**
- To learn the fundamentals of data warehouses
- To study the architecture, design, hardware and planning of a data warehouse.

**Outcomes:**
- Acquire knowledge in the fundamental concepts, benefits and problem areas associated with data warehousing. Understand the various architectures and main components of a data warehouse.
- Ability to design a data warehouse, and be able to address issues that arise when implementing a data warehouse.

**MODULE I**
Introduction: Data Warehouse-History, Difference between Database and Data Warehouse – Differences between OLTP Systems and Data Warehouse– working of Data warehouse – General stages of Data Warehouse– Need for Data warehouse – Advantages & Disadvantages– Steps to Implement Data Warehouse –Applications– Types.

**MODULE II**
Data Warehouse Architecture: Concepts and Components: Data warehouse Characteristics– Data Warehouse Architectures– Data warehouse Components: Data Warehouse DB, ETL, Metadata, Query Tools – ETL: Need, ETL Process: Extraction, Transformation, Loading, ETL Tools, ETL vs ELT. Data mart: need for data mart, its types, steps to implementing data mart, Advantages & Disadvantages.

**MODULE III**
Design aspects: Data Modeling –Need for Data Model - Types of Data Models: Conceptual Model, Logical Data Model, Model Advantages, OLAP: OLAP, Characteristics, Basic analytical operations of OLAP, Steps in the OLAP Creation Process, Advantages & Disadvantages.

**MODULE IV**
Hardware and operational design: server hardware, network hardware, Client hardware – Physical layout: parallel technology, Disk technology, Database layout, File systems – Security – introduction to Service level Agreement.

**MODULE V**
Planning and Development: Capacity planning – Estimating the load – Tuning the data warehouse – Assessing performance –Tuning the data load and queries – Testing data warehouse – Development of test plan – Testing the data base and operational environment.

**TEXT BOOKS:**
1. Sam Anahory & Dennis Murray, "Data Warehousing in the real world", Pearson Education, 2008

2. Prabhu C.S.R, "Data Warehousing: Concepts, Techniques, Products and Applications", PHI Learning, 3rd edition, 2009

**Paper Code: CSCS253**

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**DATA MINING**

**Prerequisite:** Knowledge of Data Warehouse.

**Objectives:**
- To understand the concepts of Data Mining.
- To learn about Classification, prediction and cluster analysis techniques.

**Outcomes:**
- Acquire knowledge to compare and contrast OLAP and data mining as techniques for extracting knowledge from a data warehouse.
- Implement data mining techniques like clustering, association rule and decision tree etc on the real data set.

**MODULE I**
Introduction to Data Mining: Definition of data mining - Stages of the Data Mining Process – Basic data types – Major building blocks –Scope of Data Mining – Data Mining working – Data Mining Architecture – Data Mining implementation process – Data Mining Techniques – Advantages & Disadvantages.

**MODULE II**
Data: Types of Data, Data quality, Data preprocessing- Measures of similarity and dissimilarity – Exploring data: summary statistics, visualization, OLAP and multi-dimensional data analysis.

**MODULE III**
Data preprocessing: Data preprocessing introduction, Data cleaning - Data integration - Data reduction – Data transformation and data Discretization.

**MODULE IV**
Classification: Problem definition - General approach - Decision tree induction - Rule based classifiers – nearest neighbor - Bayesian classifiers - Pattern Mining – Introduction- pattern mining in multilevel, multi-dimensional space - Frequent Pattern Mining Model.

**MODULE V**
Cluster analysis basic concepts and methods: Introduction – requirements for cluster analysis – Over view of clustering methods.  Data mining Applications – Data Mining Tools

**TEXTBOOKS:**
1. Data Mining: Concepts and Techniques by Jiawei Han and Micheline Kamber, Elsevier, 2010.
2. Introduction to Data Mining by Pang-Ning Tan, Michael Steinbach and Vipin Kumar, 2005.

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**Paper Code: CSCS364**

**FOUNDATIONS OF DATA ANALYTICS**

**Pre-requisite**: Knowledge of Data Mining.

**Objectives:**
- To learn to explore data, sample and model them
- To gain knowledge about Big Data and analyse them.

**Outcomes:**
- Understand need for big data and its associated methodologies
- Understand the various techniques to analyze and learn from data

**MODULE - I**

Introduction to Data Science: Definition of Data Science, Need for Data Science, components of data science - Data science process – Introduction to NoSQL.

**MODULE II**

Business Intelligence Systems Application and Development: BIG DATA Overview: Types, Characteristics, Architecture, BI vs Data Science - Data Analytics Life Cycle - Big Data Analytics: Methodology - Technologies – Advantages.

**MODULE III**

Big data Management - Operational Databases: importance of RDBMS in Big Data Environment, Non-Relational databases, key value pair database, document database, columnar database, graph database, spatial database

**MODULE - IV**

MapReduce Fundamentals: Tracing the Origins of MapReduce, Understanding the map Function, Adding the reduce Function, Putting map and reduce Together, Optimizing MapReduce Tasks.

**MODULE V**

Introduction to Machine Learning for Data Analysis: Introduction: Need, Types of ML learning algorithms: Supervised and Semi-supervised, Unsupervised, reinforcement.

**TEXT BOOKS:**
1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", manning publications, 2016 (Chapter 1 to 3 for Module I &Module V)
2. "Data Science and Big Data Analytics", EMC Education Service, Wiley. 2015 (Chapter 1 & Chapter 2 for module II)
3. Alan Nugent, Dr. Fern Halper, Marzia Kaufman, "Big Data for Dummies", by Judith Hurwitz, , Wiley pub, 2013. (Chapter 7 & 8 for module III and IV)
4. Rudolph Russell, "Machine Learning Step-by-Step Guide To Implement Machine Learning algorithms with Python", 2018. (Chapter I for module V)

**Specialization Stream – III [SOFTWARE ENGINEERING STREAM]**

**Paper Code: CSCS245**

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**OBJECT ORIENTED SYSTEM DESIGN**

**Prerequisite:** Knowledge of object oriented programming
**Objectives:**
- Understand software modeling and Architectural Concepts
- Understand and apply UML notations in designing software
- Gain knowledge about Static and Dynamic modeling

**Outcomes:**
- Ability to develop the design phase of software development using UML

### MODULE 1

System development - object basics - development life cycle - methodologies - patterns - frameworks - unified approach - UML.

### MODULE 2

Use - Case models - object analysis - object relations - attributes - methods, class and object responsibilities

### MODULE 3

Design processes - design axioms- class design - object storage - object interoperability

### MODULE 4

PO User interface design - view layer classes - micro - level processes - view layer interface

### MODULE 5

Quality assurance tests - testing strategies - object orientation on testing - test cases - test plans - continuous testing - debugging principles - system usability - measuring user satisfaction - case studies.

**Text books:**

1. Ali Bahrami, "Object Oriented Systems Development using the unified modeling language", 1st edition, TMH, 2008.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", 2nd edition, Pearson Education, 2007.

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| **Paper Code: CSCS354** | 3 | 1 | 2 |

**SOFTWARE TESTING**

**PRE-REQUISITE:** Knowledge in Software Engineering.

**Objectives:**
- To understand the Concepts of Software Testing.
- Introducing about various Testing Tools.

**Outcomes:**
- Understand the problems of defects and need of Testing
- Acquire knowledge about various testing strategies that are used in the industries to test their products

**MODULE – I**
Objectives of Testing - The Psychology of Testing – Economics of Testing – Software Testing Principles– Testing as a phase of SDLC- Software testing life cycle.

**MODULE – II**
Developing a test case: Testing Strategies – White Box Testing Techniques: Statement Coverage – Branch Coverage - Condition Coverage – Multiple Condition Coverage – Data flow Coverage- loop coverage. Black Box Testing Techniques: Boundary Value Analysis – Decision tables - Equivalence Partitioning - State based or graph based testing.

**MODULE- III**
Levels of Testing: Unit Testing – Integration Testing: Top down integration and bottom up integration – System Testing: overview – functional Vs Non-functional testing – Functional testing: Design Verification, Business vertical testing, deployment testing and Beta Testing. Non-functional Testing: Scalability testing, reliability testing, stress testing and inter-operatablity testing - Acceptance testing.

**MODULE - IV**
Regression Testing: Types- smoke test – criteria for selecting the test case – classifying test case – selecting test case – resetting the test case for regression testing – concluding the results – best practices.

**MODULE - V**
Software Test Automation: Approaches to Automation: partial automation, full automation- Choosing the right tool - Challenges in software test automation.

**Text Books**
1. Glenford J. Myers, Correy Sandler et. el, "The Art of Software Testing", John Wiley & Sons, 2011. (Chapter 1 for module 1)

2. Srinivasan Desikan, Gopalaswamy Ramesh, "Software Testing Principles and Practices", Pearson Education, 2008. (Chapters 3,4,5,6,8,16.8,16.10 for modules 2, 3,4,5)

**Paper Code: 365**

**SOFTWARE QUALITY MANAGEMENT**

| L | T | P |
|---|---|---|
| 3 | 1 | 2 |

**Prerequisite:** Knowledge of software engineering
**Objectives**
- To learn how to apply quality assurance tools &techniques
- To learn about standards and certifications

**Outcomes:**
- Able to understand the importance of quality and standards
- Understand various models of dealing with software quality

**MODULE - I**

Introduction, Environment, Characteristics, tasks and Goals, Software Quality Challenge - Software Quality requirements, factors: McCall's factor model, - Components of the Software Quality Assurance System : SQA Architecture, Pre-Project Components – Software PLC components.

**MODULE - II**

Integrating Quality Activities in the Project Life Cycle – Reviews - Assuring the Quality of Software Maintenance components - Case Tools and their effect on SoftwareQuality.

**MODULE - III**

Software Quality Infrastructure Components **-** Procedures and Work Instructions – Staff Training and Certification - Software Configuration Management - Documentation Control.

**MODULE - IV**

Software Quality Management Components **-** Project Progress Control - components of project progress control- Progress control of internal projects and external participants- Implementation of project progress control

**MODULE - V**

Software Quality Metrics - Objectives of quality measurement- Classification - Product metrics – Implementation – limitation; scope of quality management standards: ISO 9000 family, CMM and CMMI.

**TEXT BOOK**
1. Daniel Galin, "Software Quality Assurance: From Theory to Implementation" - Pearson Addison-Wesley,2012.

**REFERENCE BOOKS**
1. KshirasagarNaik and Priyadarshi Tripathy, "Software Testing and Quality Assurance", John Wiley,2008.
2. Allen Gilles, "Software quality: Theory and management", 2$^{nd}$edition, CengageLearning, 2003.

# DISCIPLINE SPECIFIC ELECTIVE (DSE) PAPERS

## Specialization Stream – IV [INFORMATION SECURITY STREAM]

**Paper Code: CSCS246**

**INFORMATION SECURITY**

| L | T | P |
|---|---|---|
| 3 | 1 | 2 |

**Prerequisite:** Basic knowledge of computers

**Objectives:**
- To provide an understanding of principal concepts, major issues, technologies and basic approaches in information security.

**Outcomes:**
- Understand the history and the need for information security.
- Acquire knowledge about legal and ethical aspects of information security and risk control strategies.

**MODULE – I**
Introduction – History of Information Security – defining security – CNSS Security Model – Components of an Information Security – Approaches to Information Security Implementation – System Development Life Cycle.

**MODULE – II**
The Need for Security – Introduction - Business Needs First – Threats – Attacks - Secure Software Development

**MODULE – III**
Legal, Ethical, and Professional Issues in Information Security - Law and Ethics in Information Security - Relevant U.S. Laws - International Laws and Legal Bodies.

**MODULE – IV**
Ethics and Information Security - Codes of Ethics and Professional Organizations - Risk Management - Introduction - An Overview of Risk Management – Risk Identification - Risk Assessment.

**MODULE – V**
Risk Control Strategies - Selecting a Risk Control Strategy - Quantitative Versus Qualitative Risk Control Practices - Risk Management Discussion Points

**TEXT BOOK:**
1. Michael E. Whitman & Herbert J. Mattord, "Principles of Information Security", Course Technology, Cengage Learning, 4th edition, 2011. (Chapters 1,2,3,4,5)

**Paper Code: CSCS355**

| L | T | P |
|---|---|---|
| 3 | 1 | 2 |

**NETWORK SECURITY**

**Prerequisite:** Knowledge of & computer networks.

**Objectives:**
- To learn Computer Network Vulnerabilities
- To learn how to deal with Network Security Challenges and counter measures

**Outcomes:**
- familiarization with the benefits and issues regarding Network Security
- Ability to understand the threat and deal with vulnerabilities

**MODULE – I**
Computer Network Fundamentals - Introduction - Computer Network Models- Computer Network Types - Data Communication Media Technology - Network Topology -Network Connectivity and Protocol - Network Services.

**MODULE – II**
Understanding Network Security - Defining Network Security - Security Services - Security Standards - Elements of Security - Security Threats to Computer Networks- Sources of Security Threats - Security Threat Motives - Security Threat Management - Security Threat Correlation

**MODULE – III**
Security threats to Computer Networks: Sources of security threats, Threat motives, Security threat management. Computer Network Vulnerabilities - Sources of Vulnerabilities- Vulnerability Assessment.

**MODULE – IV**
Dealing with Network Security Challenges - Access Rights - Access Control Systems – Authorization - Types of Authorization Systems – Authorization principles, Authorization granurality.

**MODULE – V**
Authentication - Multiple Factors and Effectiveness of Authentication - Authentication Elements Types of Authentication - Authentication Methods Developing an Authentication Policy. Introduction to firewalls - Types of Firewalls.

**TEXT BOOK**
1. Joseph Migga Kizza**, "**Computer Network Security", Springer, 2005. (Chapter 1,2,3,4,8,9)

**REFERENCES**
1. William Stallings, "Cryptography & Network Security", Pearson Education, 4<sup>th</sup> edition, 2010

**Paper Code: CSCS366**

**ETHICAL HACKING**

| L | T | P |
|---|---|---|
| 3 | 1 | 2 |

**Pre-requisite:** Knowledge of Networks

**Objectives:**
- Understanding need for Ethical Hacking
- Understanding the procedure for hacking and malware attacks

**Outcomes:**
- Acquire knowledge of ethical hacking, need and procedure.
- Understand various malwares and hacking methodologies.

**MODULE I**

Introduction to Ethical Hacking : Defining hacker, Ethical Hacking, Understanding the Need to Hack Your Own Systems, Understanding the Dangers Your Systems Face, Nontechnical attacks Network-infrastructure attacks, Operating system attacks, Application and other specialized attacks, Obeying the Ethical hacking Commandments, Working ethically Respecting privacy Not crashing your systems, The Ethical hacking Process: Formulating your plan, Selecting tools Executing the plan, Evaluating results.

**MODULE II**

Cracking the Hacker Mindset:  Determining who you're up against, who hacks, why hackers hack. Planning and Performing Attacks, Maintaining Anonymity, Developing Your Ethical Hacking Plan, Getting Your Plan Approved, Establishing Your Goals, Determining What Systems to Hack, Creating Testing Standards: Timing, Specific tests, Blind versus knowledge assessments, Location, Reacting to major exploits that you find, Silly assumptions, Selecting Tools.

**MODULE III**

Hacking Methodology : Setting the Stage, Seeing What Others See, Gathering public information, Mapping the network, Scanning Systems, Hosts, Modems and open ports, Determining What's Running on Open Ports, Assessing Vulnerabilities, Penetrating the System

**MODULE IV**

Putting Ethical Hacking in Motion: Social Engineering, Why Hackers Use Social Engineering, Understanding the Implications, Performing Social-Engineering Attacks: Fishing for information, Building trust, exploiting the relationship. Social-Engineering Countermeasures: Policies, awareness.

**MODULE V**

Implications of Malware Attacks, Types of Malware: Trojan horses, Viruses, Worms, Rootkits, Spyware, Built-in programming interfaces, Logic bombs Security tools, How Malware Propagates: Automation, E-mail, Hacker backdoors, Testing: Vulnerable malware ports, Manual assessment, Antivirus software testing, Network scanning, Behavioral-analysis tools, Malware Countermeasures: General system administration, E-mails, Files.

**TEXT BOOK**
1. Kevin Beaver, "Hacking for Dummies", Wiley Publishing Inc, 6th edition 2018 (Chapters 1,2,3,4,5,14)

# DISCIPLINE SPECIFIC ELECTIVE (DSE) PAPERS

## Specialization Stream – V [SCIENCE OF PROGRAMMING LANGUAGE STREAM]

**Paper Code: CSCS247**

**PRINCIPLES OF PROGRAMMING LANGUAGES**

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**Prerequisite:** Knowledge of programming
**Objectives:**
- To understand the constructs of programming language
- To know the different programming paradigms

**Outcomes:**
- Get the clear idea about the construction of Programming language
- Use different programming paradigms in and application

## MODULE - I
The challenge of programming language design - Criteria for language design-some possible solutions - Defining syntax: General problem of describing syntax, formal methods of describing syntax, BNF, Syntax Graphs - Syntax and program Reliability.

## MODULE - II
Variables, Expressions and statements - Variables and assignment statement, Binding Time and Storage Allocation, Constants and initialization, Expressions, Statements-Conditional, Iteration - GOTO and Labels – Types - Data types and Typing. Enumerated and elementary, pointer, structured Data types, Type coercion & Equivalence - Scope and Extent

## MODULE - III
Procedures - General features, Parameter evaluation & passing, Call-By-Name, Specification of objects in a procedure, aliasing, Overloading, Generic functions, Co-routines - Abstract data types - concept of abstraction, Encapsulation, Introduction to data abstraction, design issues, parameterized abstract data types.

## MODULE - IV
Exception Handling - Introduction, Exception Handling in PL/I, Exception Handling in Ada, Exception Handling in C++ - Concurrency - Basic concepts, subprogram-level concurrency, statement-level concurrency, semaphore, Monitors, Message passing.

## MODULE - V
Case Studies: Functional programming Languages- Introduction- Mathematical functions- functional programming languages – LISP - Application of functional languages- Logic programming Languages – Introduction to predicate Calculus - An overview of logic programming- Applications of logic programming

**Text Books**
1. Ellis Horowitz, "Fundamentals of programming languages",  2nd Edition Galgotia Publications,
2. Robert W. Sebesta, "Concepts of programming languages", 10th edition, Pearson.

**Paper Code: CSCS356**

| L | T | P |
|---|---|---|
| 3 | 1 | 2 |

**SYSTEM SOFTWARE**

**Prerequisite:** Knowledge of computer organization and programming

**Objectives:**
- To understand the functions of assemblers, loaders, linkers, macro-processors and compilers.

**Outcomes:**
- Understand the importance of assemblers, loaders, linkers, macro-processors and compilers
- Know the working principles of assemblers, loaders, linkers, macro-processors and compilers

**Module – I**
Introduction: System software and machine architecture, traditional (CISC) machines, RISC machines.

**Module - II**
Assemblers: Basic assembler functions, machine dependent and machine independent assembler features, one-pass assemblers, multi pass assemblers, MASM assembler, SPARC assembler.

**Module - III**
Loaders and Linkers: Basic loader functions, machine dependent and machine independent loader features, linkage editors, dynamic linking, bootstrap loaders.

**Module - IV**
Macro Processors: Basic macro processor functions, machine dependent and machine independent macro processor features, macro processor design options.

**Module - V**
Compilers: Basic compiler functions, machine-dependent compiler features, machine-independent compiler features, compiler design options the YACC compiler-compiler.

**Text Books:**
1. Leland L Beck, Manjula D, "System Software An Introduction To Systems Programming", Pearson Education, 3rd edition, 2016.

2. A.V. Aho, R. Semi, J.D. Ullman, "Compilers - Principles, techniques and tools", 2nd edition, Pearson Education, 2008.

**Paper Code: CSCS367**

| L | T | P |
|---|---|---|
| 3 | 1 | 2 |

**PRINCIPLES OF COMPILER DESIGN**

**Prerequisite:** Knowledge of system software and principles of programming
**Objectives:**
- To gain basic features of compilers
- To gain knowledge on data structures required for designing compliers

**Outcomes:**
- Understand the phases of compilers in detail
- Know how the data structures are used in compilers

**MODULE - I**
Introduction to Compiler – Compliers – Analysis of the source program – Phases of compiler – cousins of the compiler – grouping of phases – compiler construction tools – simple one pass compiler – overview – syntax definition – syntax directed translation – parsing – lexical analysis – incorporating symbol table

**MODULE - II**
Lexical analysis – role of lexical analyzer – input buffering – specification of tokens – recognition of token – finite automata – from a regular expression to NFA – design of a lexical analyzer generator – optimization of DFA based pattern matches

**MODULE - III**
Syntax Analysis – role of the parser – top-down parsing – bottom-up parsing – operator precedence parsing – LR parsers – using ambiguous grammar – syntax directed translation – syntax directed definitions – construction of syntax trees

**MODULE - IV**
Runtime environment – source language issues – storage organization – storage allocation strategies – storage allocation in C, parameter parsing – intermediate code generation – intermediate languages – declaration – assignment statements

**MODULE - V**
Code generation – issues in the design of a code generator – runtime storage management – basic blocks and flow graph – register allocation and assignment – DAG representation of basic blocks, generating code from DAGs- introduction to code generation.

**Text Book:**
   A.V. Aho, R. Semi, J.D. Ullman, "Compilers - Principles, techniques and tools", 2nd edition, Pearson Education, 2008

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## OPEN ELECTIVE-I

**Paper Code: CSCS701**

**BUSINESS COMMUNICATION**

**Pre-requisite:** Basic knowledge in English.

**Objectives:**
- To understand and learn to communicate effectively
- Learn to write business reports and letters

**Outcomes:**
- Understand the importance of communication and able to communicate business deals verbally and non-verbally
- Acquire knowledge to write efficient business reports and equip to appear for interviews

**MODULE I**

The fact and meaning of communication: the need for communication, the communication process, interpersonal communication, business communication, characteristics of business communication, many meaning of communication; direct communication, non-direct of written communication, non-method of communication, non-verbal communication, visual communication, audio-visual communication, Tele-communication.

**MODULE II**

Objectives of communication process, types of communication-internal and external communication, formal and informal channels, the grapevine, internal communication networks, downward communication, upward communication, horizontal communication, barriers to communication and how to handle them.

**MODULE III**

Public relations advertising- concepts and types, interviews: types and techniques, meetings, committees, conference and communication problems.

**MODULE IV**

Business reports, memoranda and representation, business correspondence: theory principles of business correspondence, parts of a letter, forms / formats of letters.

**MODULE V**

Business correspondence in practice- applications, reference, testimonials, appointments, confirmation, promotion, termination, resignation enquiries and replies, orders and acknowledgements, circulars, public speaking, precise writing.

**TEXT BOOK**
1. Rajendra Pal & J.S. Korlahalli, "Essentials of Business Communications", Sultan Chand& Sons, 2017
2. M.K. Sehgal, Vandana Khetarpal, " Business Communication", 2<sup>nd</sup> edition Excel books, 2013

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**Paper Code: CSCS702**

**IT ENABLED SERVICES**

**Prerequisite:** Knowledge of Information Technology

**Objective:**
- To understand importance of IT enabled services.
- To develop the ability to integrate various resources for optimization in the industry as well as for strategic utilization of IT enabled services and functions.

**Outcomes:**
- Understand the various IT business openings and strategies
- Acquire knowledge about various business models such as outsourcing

### MODULE - I
Business Strategy: Challenges and Opportunities For IT - Business Strategy: Challenges and Opportunities in the Globalized, Interconnected, Convergent World, Establish Principles before Practice, IT Strategy, Application Strategy, Technology Strategy for IT, IT Management Strategy, Developing IT Strategy for Competitive Advantage, Stages of IT Strategy Development and Implementation, Challenges of IT and Business Strategy Alignment, Inhibitors of Business and IT Strategy Alignment, Three-D Framework for Business and IT Strategy Alignment.

### MODULE – II
Strategic IT Planning - Business Implications for IT Strategic and Planning, Strategic IT Planning Motivations, SITP Process: Prevalent Planning Approaches, Difficulties in Developing and Executing SITP, Best Practices for Achieving Good SITP, SITP Approaches- Prevalent Researches.

### MODULE – III
Enterprise IT Architecture – Challenges of EITA, Defining EITA, Need for EITA study, Contents of Typical Enterprise IT Architecture and Standards for Enterprise IT Architecture.

### MODULE - IV
IT Application Strategy: Introduction, Need, COTS, COTS package selection life cycle, COTS implementation Strategy, Post implementation support and management.

### MODULE – V
IT sourcing strategy: Introduction, Imperatives for outsourcing, motivation and need to outsource, Outsourcing and associated risk, IT management layers and considerations for outsourcing, strategic Vs generic sourcing, Business process outsourcing, process to succeed outsourcing contract management and governance.

**Text Books:**
1. Sanjiva Shankar Dubey, " IT strategy and Management", PHI, fifth edition, 2016 (Chapters: 1, 2, 4, 5, 6, 10)

**Paper Code: CSCS703**

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**TOTAL QUALITY MANAGEMENT**

**Prerequisite:** Knowledge of Software Engineering and Software Quality Assurance.
**Objectives:**
- To learn how to understand the customer's perception and to satisfy the customer
- To understand process capability and Reliability concepts

**Outcome:**
- Understand the importance of quality from the customer perspective and translate to requirements
- Understand the significance of statistical tool in Quality

**MODULE I**

Quality – vision, mission and policy statements. Customer Focus – customer perception of quality, Translating needs into requirements, customer retention. Dimensions of product and service quality. Cost of quality.

**MODULE II**

Overview of the contributions of Deming, Juran Crosby, Masaaki Imai, Feigenbaum, Ishikawa, Taguchi techniques – introduction, loss function, parameter and tolerance design, signal to noise ratio. Concepts of Quality circle, Japanese 5S principles and 8D methodology.

**MODULE III**

Meaning and significance of statistical process control (SPC) – construction of control charts for variables and attributed. Process capability – meaning, significance and measurement – Six sigma - concepts of process capability. Reliability concepts – definitions, reliability in series and parallel, and product life characteristics curve.Total productive maintenance (TMP), Terotechnology. Business process Improvement (BPI) – principles, applications, reengineering process, benefits and limitations.

**MODULE IV**

Quality functions development (QFD) – Benefits, Voice of customer, information organization, House of quality (HOQ), building a HOQ, QFD process. Failure mode effect analysis (FMEA) – requirements of reliability, failure rate, FMEA stages, design, process and documentation. Seven Tools (old & new). Bench marking and POKA YOKE.

**MODULE V**

Introduction to IS/ISO 9004:2000 – quality management systems – guidelines for performance improvements. Quality Audits. TQM culture, Leadership – quality council, employee involvement, motivation, empowerment, recognition and reward - TQM framework, benefits, awareness and obstacles.

**TEXT BOOKS**
1. Dale H.Besterfield, Carol Besterfield – Michna, Glen H. Besterfield, Mary Besterfield – Sacre, Hermant – Urdhwareshe, RashmiUrdhwareshe, Total Quality Management, Revised Third edition, Pearson Education, 2011
2. Shridhara Bhat K, Total Quality Management – Text and Cases, Himalaya Publishing House, First Edition 2002.

**REFERENCES**
1. Douglas C. Montgomery, Introduction to Statistical Quality Control, Wiley Student Edition, 6 th Edition, Wiley, 2008.
2. James R. Evans and William M. Lindsay, The Management and Control of Quality, Sixth Edition, Thomson, 2005.

| L | T | P |
|---|---|---|
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**Paper Code: CSCS704**

**ARTIFICIAL INTELLIGENCE**

**Pre-requisite:** Basic knowledge of algorithms.

**Objectives:**
- To study the concepts of Artificial Intelligence and Methods of solving problems using Artificial Intelligence

**Outcomes:**
- Understand concepts of artificial intelligence and underlying characteristics
- Learn various techniques of knowledge representation

**MODULE-I**

Introduction to Artificial Intelligence- definition - underlying Assumption - A.I Techniques - Space search - production system - control strategies - Heuristic search - problem characteristics - production system characteristics.

**MODULE-II**

Heuristic search techniques - Generate and test - Hill Climbing – best first search - problem reduction - Knowledge Representation issues: Representation and mapping - Approaches to Knowledge Representation - Issues in Knowledge Representation - Frame problem.

**MODULE-III**

Representing simple facts in logic - representing instance and Isa relationship- computable functions and predicates - resolution – frames - strong slot and filler structure Conceptual Dependency – scripts- advanced problem solving system.

**MODULE-IV**

Game playing - minimax search procedure - adding alpha beta cuts offs - additional refinements.

**MODULE-V**

Planning – An example Domain: the blocks world – components of planning system- goal-stack planning - Expert Systems: Definition of Expert Systems – Role of Expert Systems Knowledge Acquisition- example expert systems: MYCIN.

**TEXT BOOK:**
1. Artificial Intelligence - Elaine Rich, Kevin Knight, Shivasankar B.Nair –Third edition- McGraw Hill- 2017

**REFERENCE BOOK:**
1. Stuart Russel, Peter Norvig "AI – A Modern Approach", 2nd edition, Pearson Education, 2007

**Paper Code: CSCS705**

| L | T | P |
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**INTRODUCTION TO E-BUSINESS**

**Pre-requisite:** Basic knowledge of Information Technology

**Objectives:**
- This course introduces students to various aspects and models fore-business.
- At the end of the course, students should have an understanding of the impacts which

  e- business is having on society, markets and commerce.

**Outcomes:**
- Understand the various E-Business solutions available today such as E-Commerce and its mechanisms
- Acquire knowledge from e-governance to e-learning

**MODULE I**

Introduction E-Commerce (EC)- Definition and concept, EC Framework, Classification based on transaction, application, History–Digital Revolution, Business Environment, EC Business models: Structure, typical EC business models, Benefits and Limitation of EC.

**MODULE II**

EC mechanisms – E-Marketplaces: Components, Types, Mechanisms, Merchant Solutions, Auctions, Bartering and negotiating online, EC applications: Internet marketing and B2C electronic retailing: E-Tailing business models.

**MODULE III**

Online Travel and Tourism - Employment and Job Market Online - Online Real Estate - Online Publishing and e-Books Banking and Personal Finance Online - On-Demand Delivery Systems and E-Grocers - Online Delivery of products, Digital items, Entertainment and Gaming, B2B E-Commerce: Concepts, Characteristics, and Models

**MODULE IV**

From E-Government to E-Learning, Collaborative Commerce and C2C Commerce: E -Government- Definition and scope –G2C, G2B, G2G, Efficiency and effectiveness, Implementation of E-Government Services. E-Learning, E-Training and E-books: Definition-Benefits and drawbacks - Distance learning and Online Universities, Online corporate training, E-Books.

**MODULE V**

E-Commerce security, fraud issue and protection: Basic security issues, Technical malware attack methods: Virus to DoS, Nontechnical attack methods: Phishing to spam.

**TEXT BOOK**

1. Electronic Commerce: A Managerial Perspective, Turban, E. et al., Prentice Hall 2008. Chapters(1.1,1.2,1.3,1.7,1.8,2.1,2.2,2.5,3.2,3.1-3.7, 4.1, 5.1,5.2,10.1-10.4)

**Paper Code: CSCS706**

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**FUNDAMENTALS OF ACCOUNTANCY**

**Pre-requisites**: Basic knowledge in mathematics

**Objectives:**
- To understand the basic Accountancy.
- To understand concepts of cash maintenance and Cost Accounting.

**Outcomes:**
- Acquire knowledge about basic account for maintaining record in a company
- Understand to manage profit and loss and trading accounts so that the student can maintain an account register

**MODULE -I**

Accounting – Introduction-Meaning-Accounting and book keeping distinguished-objectives of accounting-Branches of accounting-accounting concepts and conventions-accounting standards in India-systems of Accounting

**MODULE - II**

Double entry system-personal accounts, real accounts, nominal accounts-journal-ledger-preparation of trial balance-rectification of errors.

**MODULE –III**

Subsidiary books including cash book, bank Reconciliation statement

**MODULE –IV**

Preparation of trading account- preparation of profit and loss account and balance sheet- Final accounts with adjustments

**MODULE –V**

Basics of cost Accounting – Basic Concepts- Elements of cost – prime cost – works cost – cost of production – concept of inventory – reorder level – minimum level – maximum level – average level – safety stock.

**TEXT BOOKS**
1. S.N. Maheswari, "Advanced Accountancy Vol I", Vikas Publishing, 2009
2. R.L. Gupta, "Advanced accounting", S. Chand & Co. New Delhi, 2010
3. Pillai and Baghawati, "Cost Accounting", 2010
4. Jam and Narang, "Cost Accounting", Kalyani Publications

# OPEN ELECTIVE - VII

| L | T | P |
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| 3 | 0 | 0 |

**Paper Code: CSCS707**

**PRINCIPLES OF MANAGEMENT**

**Pre-requisites**: No specific pre-requisite

**Objectives:**
- To understand the importance and functions of management
- To understand the purpose of planning and leadership

**Outcomes:**
- Understand the need for management and learn the nuances of management.
- Acquire knowledge about various form of organizations, their structure and scope

**MODULE –I**
Meaning, Definition and importance of Management-Functions of a Manager-Management process- Role of a Manager-Social responsibility of Management-Co-Ordination-Meaning and scope requirements of effective co-ordination-problems in co-ordination.

**MODULE –II**
Meaning and purpose of planning – steps in planning Process-Limitations-Types of plans, objectives, Strategies, policies, procedures, programmes, management by objectives (MBO) – Decision making- Types of decisions-process of decision making-difficulties in decision making

**MODULE –III**
Nature and purpose of organizations-different forms of organizations-merits and demerits – linear and staff concepts- organisational charts- departmentations - bases for departmentation - product, function and territory-span of management

**MODULE –IV**
Authority-responsibility-accountability-delegation of authority-principles of delegation-unity of command – centralization and decentralization –advantages and disadvantages

**MODULE –V**
Nature and scope of direction-motivation meaning-major theories of motivation – Maslow's theory - Herbertg's two factor Theory-Leadership Styles-Nature and purpose of controlling

**TEXT BOOK**
   1.Kathiresan and Radha, " Business Management", Bhavani publications, Chennai,2004

| L | T | P |
|---|---|---|
| 3 | 0 | 0 |

**Paper Code: CSCS708**

**COMPUTER GRAPHICS**

**Prerequisite:** Knowledge of computers and programming
**Objectives:**

- Gain knowledge about graphics hardware devices and software used.
- Understand the two dimensional graphics and their transformations.

**Outcomes:**

- Get an idea about graphics hardware devices and software used.
- Understand the two dimensional graphics and their transformations.

**MODULE - I**

Overview of Computer Graphics System: Video Display Devices – Raster Scan Systems – Random – Scan Systems - Graphics Monitors and Workstations – Input Devices – Hardcopy Devices – Graphics Software.

**MODULE - II**

Output Primitives: Line Drawing Algorithms – Loading the Frame Buffer – Line Function – Circle – Generating Algorithms - Attributes of Output Primitives: Line Attributes – Curve Attributes –

**MODULE - III**

2D Geometric Transformations: Basic Transformation – Matrix Representations – Composite Transformations – Window to View port Co-Ordinate Transformations - Clipping: Point Clipping – Line Clipping – Cohen-Sutherland Line Clipping - Polygon Clipping – Sutherland – Hodgman Polygon Clipping Curve Clipping – Text Clipping.

**MODULE - IV**

Graphical User Interfaces and Interactive Input Methods: The User Dialogue – Input of Graphical Data – Input Functions – Interactive Picture Construction Techniques.

**MODULE - V**

Three Dimensional Concepts: 3D-Display Methods – Three Dimensional Graphics Packages.

**Text Book**:

Donald Hearn M. Pauline Baker, Computer Graphics C Version, 2$^{nd}$ edition, Pearson Education, 2014.

# SKILL ENHANCEMENT COURSES (SEC)

**Paper Code: CSCS801**

| L | T | P |
|---|---|---|
| 0 | 1 | 3 |

**SOFT SKILLS**

**Prerequisite:** Basic knowledge of English language
**Objectives:**
- To enable learners to develop their communicative competence.
- To facilitate learners to improve their soft skills.
- To equip learners with employability skills to enhance their prospect of Placements.

**Outcomes**
- Develop their communicative competence.
- Understand employability skills to enhance their prospect of placements.

## MODULE - I
Nature of technical communication: Stages of communication – Channels of communication – Nature of technical communication – Importance and need for technical communication – Technical communication skills - The Listening process: Types of listening – Listening with a purpose – Barriers to listening – The speech process – Conversion and oral skills – Body language.

## MODULE - II
Job interviews: Pre – interview preparation techniques – Interview questions – Answering strategies – Frequently asked interview questions – Projecting a positive image – Alternative interview formats - Group Discussion: Nature of group discussion – Characteristics of successful group discussions – Selection group discussion – Group discussion strategies – Techniques for individual contribution – Group interaction strategies.

## MODULE - III
Presentation Skills: Planning the presentation – Preparing the presentation – Organizing your presentation – Rehearsing the presentation – Improving delivery

**Text Book:**
M. Ashraf Rizvi , "Effective Technical Communication",  2nd edition , Tata McGraw – Hill Education, 2017

**SOFT SKILLS LAB – EXERCISES**

1. ORAL PRESENTATION
- TV violence.
- Is the Fast-Food Industry Accountable Legally for poor health?
- Intelligence depends more on the environment than genetic factors.
- Environment vs. technology Impact of technology on learning
- Learning does not eradicate ignorance
- How WiFi improved your life?

2. GROUP DISCUSSION
- NGOs - Do they serve peoples' interests or are they pressure groups?
- Role of women in development.
- Kids today are not what they used to be.
- Repeated elections - Should taxpayers pay for it?
- In India, the whole is less than the parts - Do we lack in team spirit?
- "Dot.com" companies - Is there room for everyone?
- Artificial Intelligence - Will man be ever replaced by machines?

3. INTERVIEW SKILLS
- How to make a good impression
- Basic Interview Questions
- Behavioural Interview Questions

**Paper Code: CSCS802**

| L | T | P |
|---|---|---|
| 0 | 1 | 3 |

**INTRODUCTION TO OFFICE AUTOMATION**

**Pre-requisite:** Basic use of computers.

**Objectives:**
- To practically learn to use Microsoft word, excel and power point

**Outcomes:**
- Students will be able to draft official and personal letters using various functions of MSWord.
- Understand, manipulate, represent data with MSExcel using formula and graphs
- Acquire knowledge to prepare presentation for presenting their data through PowerPoint

**MODULE – I**

MS-WORD - Working with MS Word - Creating a New Document – Working with Font, Page setup, Paragraph and Page background - Text Editing using various features – Margins, Inserting Page Numbers, Pictures, Files, Word Art, Symbols – Header and footer, Page border, working with Columns, Tabs & Indents - Creation & Working with Tables -Margins & Space management in Document - Mail Merge

**MODULE – II**

MS-EXCEL: Working with MS Excel - concepts of Workbook & Worksheets - Working with Data & Ranges - Different Views of Worksheets - Using different features with Data and Text - Use of Formulas, Calculations & Functions - Cell Formatting including Borders & Shading; Working with Different Chart Types - Printing of Workbook.

**MODULE – III**

MS-POWERPOINT: Creating and Viewing Presentations – Editing a Presentation – Working with Presentation, slide transitions and Special Effects

**Text Books:**
1. Dinesh Maidasani , Straight to the Point – MS Office 2010, Laxmi Publications, 2010.
2. Sherry Kinkoph Gunter, Master Visually Microsoft Office 2010, WILEY, 2010.

**LIST OF LAB EXERCISES:**
1. To create a personal letter using MS-WORD
2. To create company letter head using MS-WORD
3. To create a memo using MS-WORD
4. To create a greeting card using MS-WORD
5. To create a cover page of a project report.
6. To create letter using mail merge.
7. To create a spreadsheet for mark statement of students.
8. To create various graphs with respect to students' academic details.
9. To create a slide show regarding our college and department.

**Paper Code: CSCS803**

| L | T | P |
|---|---|---|
| 0 | 1 | 3 |

**INTRODUCTION TO C++**

**Prerequisite:** Knowledge of C programming

**Objectives:**
- To learn the basics of C++ programming languages.
- To learn concepts of object oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance

**Outcomes:**
- Understand and Apply object oriented programming concepts in problem solving through C++.

**MODULE - I**
C++ Basics - Objects and Classes: Basics of object and class in C++, Private and public members, static data and function members, constructors and their types, destructors, operator overloading, type conversion

**MODULE - II**
Inheritance: Concept of Inheritance, types of inheritance: single, multiple, multilevel, hierarchical, hybrid, protected members, overriding, virtual base class-Polymorphism.

**MODULE - III**
Pointers in C++, Pointes and Objects, this pointer, virtual and pure virtual functions, implementing polymorphism

**Text Books:**
1. E Balagurusamy , Object Oriented Programming with C++, 7th edition, Tata McGraw, 2017.
2. Deitel and Deitel , "C++: How to Program", 9th Edition, Pearson, 2013.


**C++ LAB – LIST OF EXERCISES**
1. Program to illustrate class and objects
2. Program to illustrate inline member function
3. Program to illustrate static data and member functions
4. Program to illustrate constructors.
5. Program to illustrate friend functions
6. Program to illustrate operator overloading (Unary and Binary)
7. Program to illustrate function overloading.
8. Program to illustrate inheritance
9. Program to illustrate pointer to objects
10. Program to illustrate virtual functions & exception handling.

**Paper Code: CSCS804**

**MULTIMEDIA TOOLS**

| L | T | P |
|---|---|---|
| 0 | 1 | 3 |

**Prerequisite:** Familiarity with computers

**Objectives:**
- Understanding the key principles of animation and its applications.

**Outcomes:**
- Acquire knowledge of how to create animation using Flash.
- Acquire knowledge of how to create story board, work with files create movies and publish

**MODULE – I**

Action Scripting Using actions to control a timeline - Using frame labels - Creating button symbols - Creating animated buttons using movie clips – Movie Clip Controls – Browser / network.

**MODULE - II**

Advanced Animation Methods Creating movies playing within movies (movie clips and .swf) - Controlling multiple timelines (movies) through action scripting - Critique storyboards.

**MODULE - III**

Streamlining Files for Use on the Web, Publishing Files to the Internet & Pre-loaders- Controlling sound with script - Exploring types of output - Work on final project in class - Importing video - Publishing demo (video) reels on web - Publishing and exporting files.

**REFERENCE BOOKS**
1. E. A. Vander Veer and Chris Grover, "Flash CS3", O'reilly, 2007
2. Richard Williams, "The Animator's Survival Kit", 2009

**LIST OF PRACTICAL**

1. Creating Company Title
2. Create new Clip art Company Logo
3. Animated Buttons and Menus
4. Text Graphics
5. Morphing
6. Shape and Motion Tween
7. Creating an animated Web site
8. Working with Audio and video

**Paper Code: CSCS805**

| L | T | P |
|---|---|---|
| 0 | 1 | 3 |

## PHP PROGRAMMING

**Prerequisite**: Knowledge of web Technology and DataBase programming.

**Objectives:**
- To learn the fundamentals of PHP language
- To learn how to use PHP language to create websites

**Outcomes:**
- Understand how to write code using PHP
- Acquire knowledge about web techniques

### MODULE – I

Introduction to PHP – brief history – installing PHP – Language basics – Lexical structure – data types – variables – expressions and Operators – flow-control statements – including code – embedding PHP in web pages

### MODULE – II

Functions – Strings – Arrays -  Multidimensional Arrays- Extracting Multiple Values - Slicing an Array - Checking Whether an Element Exists - Traversing Arrays – Sorting - Objects – Terminology - Creating an Object - Accessing Properties and Methods - Declaring a Class – Introspection

### MODULE – III

Web Techniques - HTTP Basics - Server Information - Processing Forms - Setting Response Headers - Maintaining State - Databases - Using PHP to Access a Database - Relational Databases

**Text Book:**

Kevin Tatroe, Peter MacIntyre, and Rasmus Lerdorf, "Programming PHP: Creating Dynamic Web Pages", O'Reilly, 3rd edition, 2013.

## PHP Lab – List of Exercises

1. Create a PHP page using functions for comparing three integers and print the Largest number.
2. Write a function to calculate the factorial of a number (non-negative integer). The function accept the number as an argument.
3. WAP to check whether the given number is prime or not.
4. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.
5. Write a PHP function that checks if a string is all lower case.
6. Write a PHP script that checks whether a passed string is palindrome or not? ( A palindrome is word, phrase, or sequence that reads the same backward as forward, e.g., madam or nurses run)
7. WAP to sort an array.
8. Write a PHP script that removes the whitespaces from a string.

   Sample string : 'The     quick " " brown fox'

   Expected Output : The quick""brownfox
9. Write a PHP script that finds out the sum of first n odd numbers.
10. Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered (i.e.name is present in the database) otherwise error message should be displayed.

**Paper Code: CSCS806**

**MOBILE APPLICATION DEVELOPMENT**

| L | T | P |
|---|---|---|
| 0 | 1 | 3 |

**Prerequisite :** Basic Understanding of Programming Concepts.

**Objectives:**
- To introduce students to the Mobile application development ecosystem.
- To impart mobile application development skills.

**Outcomes:**
- Understand the anatomy of Android app and develop small application
- Understand to use multimedia handling in android application

**Module I**: Introduction to Mobile Apps - Mobility Panorama - Various Mobile Platforms - Different Approaches to Mobile Development - Comparison of Various Mobile app development platforms - Overview of Android App Development Scenario - Mobile App development challenges.

**Module II**: Android App Development - Setting up the development environment - Building the Hello World Android App - Anatomy of Android Apps - Logical Components. Android Activities - UI Resources and Elements - Activity interaction - Fragments - Services - App Data Persistence.

**Module III**: Multimedia Handling in Android Apps : Audio, Video and Images, Capture and Storage - Graphics and Animation - Location Services - Sensor handling in Android apps - App markets and publishing apps.

**Text Book:**
- *Composing Mobile Apps : Learn, Explore and Apply using Android*, by Anubhav Pradhan and Anil V Deshpande, Wiley Publications, 2014, ISBN: 978-81-265-4660-2.

**Web Resources:**
- https://developer.android.com/training/basics/firstapp/index.html
- https://developers.google.com/training/android/#for-new-programmers

**Lab Exercises:**
- Design and develop a mobile app to compute Body Mass Index.
- Design and Develop a mobile app for an event registration form.
- Design and develop a mobile app for storage and retrieval of data.
- Design and develop a mobile app with multimedia components.
- Design and develop a mobile app to utilize various sensors.
- Design and develop a mobile app to utilize location services.

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| L | T | P |
|---|---|---|
| 0 | 1 | 3 |

**Paper Code: CSCS807:ONLINE COURSE (Min 30 hrs)/**

**Paper Code: CSCS808:MINI PROJECT/**

**Paper  Code: CSCS809: INTERNSHIP(2 Weeks)/**

**Paper Code: CSCS810:IN-PLANT TRAINING (1-month) /**

# GENERIC ELECTIVE - I

**Paper Code: CSCS125**

**MATHEMATICS FOR COMPUTER SCIENCE**

| L | T | P |
|---|---|---|
| 3 | 0 | 0 |

**Prerequisite:** Knowledge of basic mathematics
**Objectives:**
- To learn rules and techniques to recognize valid logical argument
- To learn graphs with all types and trees with all algorithms

### MODULE - I
Connectives, Statement formulae, well-formed formulae-Tautologies - Equivalence of Statement formulae, Duality law-Tautological implications- Functionally complete set of connectives-NAND and NOR connectives.

### MODULE - II
Principal conjunctive and disjunctive normal forms Inference calculus-validity of conclusion using truth table- Rules of inference.

### MODULE - III
Graphs-Applications of graphs-Incident and degree-pendant and isolated vertices- Number of odd vertices in a graph-Isomorphism of graphs-sub graphs -Walks-paths and circuits - Connected graphs and related theorems & problems.

### MODULE - IV
Euler graphs operations on complete graphs- More on Euler graphs – Konigsberg bridge problem- Hamilton paths and circuits.

### MODULE - V
Trees-properties of Trees with proof-Pendant vertices in a Tree-Distance and Center in a Tree-rooted and binary trees-spanning trees- Fundamental Circuits-Distance between spanning trees shortest spanning trees- Kruskal's algorithm.

### Text Books:

1. J.P.Tremblay & R.Manohar, "Discrete Mathematical Structures with applications to Computer science", Tata McGraw-Hill, 2002.
2. Narsingh Deo, "Graph Theory with applications to Engineering and Computer science", PHI, 2002.

**Paper Code: CSCS126**

| L | T | P |
|---|---|---|
| 3 | 0 | 0 |

### NUMERCIAL METHODS
**Prerequisite:** Knowledge of basic mathematics

**Objectives:**
- To learn about linear interpolation methods
- To learn about numerical integration & Differentiation methods

**Outcomes**

On successful completion of the course students will be able to:
- Understand the linear interpolation methods.
- Understand the numerical integration & Differentiation methods

**MODULE - I**

Roots of Non-Linear Equations - Iterative methods , Bisection methods, method of false position – Newton-Raphson method – Statement of Fixed Point Theorem – Fixed point iteration: $x=g(x)$ method.

**MODULE - II**

Direct Solution of linear Equations - Gaussian elimination and Gauss-Jordon methods - Iterative methods: Gauss Jacobi and Gauss-Seidel methods- Inverse of a matrix by Gauss Jordon method – Eigen value of a matrix by power method.

**MODULE - III**

Curve Fitting Interpolation - Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton's forward and backward difference formulas.

**MODULE – IV**

Numerical Differentiation - Derivatives from difference tables – Divided differences and finite differences. Numerical integration - Trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Two and Three point Gaussian quadrature formulas.

**MODULE - V**

Ordinary Differential Equation - Taylor series method – Euler and modified Euler methods – Fourth order Runge – Kutta method for solving first and second order equations.

**Text Books:**
1. Balagurusamy, E., "Numerical Methods", Tata McGraw-Hill, 1999.

**Reference Book:**
2. Kandasamy, P., Thilagavathy, K. and Gunavathy, K., "Numerical Methods", S. Chand Co. Ltd., New Delhi, 2003
3. A.Singaravelu,"Numerical Methods" Meenatchi Agency.
4. Dr.M.K.Venkataraman, " Numerical Methods in Science and Engineering, The National Publication Company.

**Paper Code: CSCS235**

| L | T | P |
|---|---|---|
| 3 | 0 | 0 |

**APPLIED STATISTICS**

**Objectives:**
- To learn the basics of statistics concepts
- To learn solving correlation and regression problems

**Outcomes:**
- Ability to understand and represent data
- Ability to analyze and interpret data.

## MODULE - I

Diagrammatic and Graphic Presentation: General Rules for Constructing Diagrams, Types of Diagrams, One Dimensional or Bar Diagrams, Types of Bar Diagrams, Two-Dimensional Diagrams, Limitations of Pie Diagrams.

## MODULE - II

Measures of Central Value: Arithmetic Mean: Calculation of Simple Arithmetic Mean-Individual Observations, Calculation of Arithmetic Mean-Discrete Series, Calculation of Arithmetic Mean-Continuous Series, Merits and Limitations of Arithmetic Mean.
Median: Calculation of Median-Individual Observations, Computation of Median-Discrete Series, Calculation of Median-Continuous Series, Merits and Limitations of Median

Mode :Calculation of Mode-Individual Observations, Calculation of Mode-Discrete Series, Calculation of Mode-Continuous Series, Merits and Limitations of Mode.

## MODULE - III

Measures of Dispersion: Significance of Measuring Variation, Properties of a Good Measure of Variation, The Interquartile Range or the Quartile Deviation, Merits and Limitations, The Mean Deviation, Calculation of Mean Deviation, Calculation of Mean Deviation-Continuous Series, Merits and Limitations, The Standard Deviation, Difference Between Mean Deviation and Standard Deviation, Calculation of Standard Deviation, Merits and Limitations.

## MODULE - IV

Correlation Analysis: Types of Correlation, Scatter Diagram Method, Merits and Limitations of the Method, Karl Pearson's Coefficient of Correlation, Direct Method of Finding Out Correlation Coefficient, Origin is made and Problems, Rank Correlation Coefficient, Merits and Limitations of the Rank Method.

## MODULE - V

Regression Analysis: Uses of Regression Analysis, Difference Between Correlation and Regression Analysis, Regression Lines, Regression Equations, Regression Equation of Yon X, Regression Equation of X on Y and Problems

**TEXT BOOK**
S.P.GUPTA, "Statistical Methods", Sultan Chand & Sons, Educational Publishers, New Delhi, 2016
**REFERENCE BOOK:**
P.R.Vittal, "Mathematical Statistics", Margham Publications, 2016

**Paper Code: CSCS236**

| L | T | P |
|---|---|---|
| 3 | 0 | 0 |

**THEORY OF COMPUTATIONS**
(Only statements and applications of Theorems)

**Prerequisites:**
Basic knowledge of programming languages and data structures
**Objectives:**
- To understand the foundation of computing
- To realize the theoretical knowledge behind the computation
- To understand the construction of formal languages

**Outcomes:**
1. Understand the basic computation and construction of formal languages
2. Gain the knowledge about automated system

**MODULE - I**
Automata Theory: Finite State Systems – Definition of an Automaton - Non-Deterministic Finite Automaton - Equivalence of DFA and NFA - Finite automata with output ( Mealy and Moore Models ) - Minimization of Finite Automata – Regular Expressions.

**MODULE - II**
Push Down Automata Theory: Context-Free Languages and Derivation Trees – Ambiguity in Context-Free Grammars – Chomsky Normal Form – Greibach Normal Form. Push Down Automata – Definition, Acceptance by Push Down Automata – Push Down Automata and Context Free Languages.

**MODULE - III**
Turing Theory: Turing Machines – Computable Language and Functions – Techniques for TM Construction – Modification of TM.

**MODULE - IV**
Chomsky Hierarchy: Regular Grammars – Unrestricted Grammars – Context Sensitive Languages.

**MODULE – V**
Linear Bounded Automata – Definition – Linear Bounded Automata and Context Sensitive Languages

**Text Books:**
1. Daniel I.A. Cohen, "Introduction to Computation Theory", John Wiley & sons. 2nd edition
2. John E.Hopcraft and Jeffery D. Ullman, "Introduction to Automata theory, languages and computations", Narosa Publication. 1st edition
3 "K.L.P. Mishra & N. Chandrasekaran" Theory of Computer Science (Automata, Languages and Computation ), PHI.

**Paper Code: CSCS171**

| L | T | P |
|---|---|---|
| 3 | 1 | 0 |

**BASICS OF COMPUTERS & OFFICE AUTOMATION**

**Pre-requisite:** No specific pre-requisite.

**Objectives:**

- To understand how to use software packages viz MS-Word, Excel and Powerpoint for day-to-day activities.

**Outcomes:**

- Non computer science will be able to understand the basics of computers and understand the office automation tools such as word, excel and power point

**MODULE – I**

DOS: Internal & External commands; Wildcard Character; file name; Creating/Editing file; batch file - MS Windows: Windows Basic - Introduction to Windows- Using My Computer; Using Windows Explorer - Printing- Introduction to Accessories and Control Panel

**MODULE – II**

Word processing - Introduction  - Introduction to MS Word - Working with MS Word - Creating a New Document-Different Page Views and layouts - Working with Styles, Text Attributes; Paragraph and Page Formatting - Text Editing using various
features - Advanced Features of MS-Word – bookmarks - Spell Check and Thesaurus; Find & Replace; Headers & Footers ; Inserting – Page Numbers, Pictures, Files, Auto texts, Symbols -Working with Columns, Tabs & Indents;- Creation & Working with Tables -Margins & Space management in Document - Mail Merge.

**MODULE – III**

MS Excel - Introduction and area of use -Working with MS Excel - concepts of Workbook & Worksheets - Working with Data & Ranges - Different Views of Worksheets - Column Freezing, Labels, Hiding, Splitting etc.;-Using different features with Data and Text - Use of Formulas, Calculations & Functions-Cell Formatting including Borders & Shading; Working with Different Chart Types - Printing of Workbook & Worksheets with various options.

**MODULE -IV**

MS PowerPoint - Introduction & area of use- Working with MS PowerPoint-Creating a New Presentation-Working with Presentation; Using Wizards- Slides & it's different views; Inserting, Deleting and Copying of Slides

**MODULE – V**

Working with Notes, Handouts, Columns & Lists- Adding Graphics, Sounds and Movies to a Slide-Working with PowerPoint Objects; Designing & Presentation of a Slide Show.

**Text Books:**
1. Rob Tidrow, Master Visually Windows 7, John Wiley, 2010.
2. Dinesh Maidasani , Straight to the Point – MS Office 2010, Laxmi Publications, 2010.
3. Sherry Kinkoph Gunter, Master Visually Microsoft Office 2010, WILEY, 2010.
4**.** Faithe Wempen, Computing Fundamentals: Introduction to Computers, WILEY, 2014.

**Paper Code: CSCS172**

**FUNDAMENTALS OF INFORMATION  TECHNOLOGY**

| L | T | P |
|---|---|---|
| 3 | 1 | 0 |

**Pre-requisite:** No specific pre-requisite.

**Objective:**
- To acquire the basic knowledge about computers

**Outcomes:**
- Understand the concepts and various components of computers. Acquire knowledge about internet and other applications

**Module - I**
Introduction to Computers - Generation of Computers - Classification of Digital Computer - Anatomy of Digital Computer.

**Module - II**
CPU and Memory - Secondary Story Devices - Input Devices - Output Devices.

**Module - III**
Introduction to Computer Software - Programming Language – Operating Systems - Introduction to Database Management System.

**Module -  IV**
Computer Networks - WWW and Internet - Email - Web Design

**Module - V**
Computers at Home, Education, Entertainment, Science, Medicine and Engineering - Introduction to Computer Security - Computer Viruses, Bombs, Worms.

**Text Books:**
1. Fundamentals of Information Technology, Alexis Leon and Mathews Leon, Vikas Publishing House Pvt. Ltd., ISBN-10: 8182092450 & ISBN-13: 978-8182092457,  2009.
2. Faithe Wempen, Computing Fundamentals: Introduction to Computers, WILEY, 2014.

**Paper Code: CSCS173**

| L | T | P |
|---|---|---|
| 3 | 0 | 1 |

**FUNDAMENTALS OF 'C' LANGUAGE**

**Pre-requisite:** No specific pre-requisite.

**Objective:**
- To learn how to solve common types of computing problems.
- To learn about various programming constructs of C

**Outcomes:**
- Analyze a given problem and develop an algorithm to solve the problem
- Use the 'C' language constructs in the right way. Design, develop and test programs written in 'C'

**MODULE- I**
Introduction to Programming - How to develop a program, Algorithms, Flow-charts, Types of Programming Languages, Compiler and Linker, Testing and Debugging a program, Documentation. Constants, Variables & Data Types - Character set, C Tokens, Identifiers and Keywords, Constants, Variables, Data types - Operators & Expressions - Managing Input & output operations

**MODULE - II**
Decision Making – Branching & Looping - Arrays - One dimensional array: Array Manipulation, Different operations on one dimensional arrays, two dimensional array, operations on two dimensional arrays, multi-dimensional array- Handling of Character Strings.

**MODULE - III**
Functions - Top down approach of problem solving, standard library functions, passing values between functions, scope rules of functions, calling convention, return type of functions, call by value and call by reference, recursive functions

**MODULE – IV**
Storage Classes - Scope and extent, Storage Classes in a single source file: auto, extern and static, register,
.
**MODULE - V**
 Structures and Unions - Defining a structure, Declaring Structure variables, accessing structure members, structure initialization, copying and comparing structure variables, operation on individual members, arrays of structures, arrays within structures, structures and functions, union, size of structure,

**Text Books:**
1. E. Balagurusamy, "Programming with ANSI-C", 8th Edition, Tata McGraw Hill, 2019,
2. Hanly J R & Koffman E.B, "Problem Solving and Programming design in C", 7th edition, Pearson Education, 2012.

**Paper Code: CSCS174**

| L | T | P |
|---|---|---|
| 3 | 0 | 1 |

**WEB DESIGNING**

**Pre-requisite:**
- Knowledge of computers.

**Objectives:**
- To acquire the fundamental knowledge about internet & WWW.
- To learn how to develop static and dynamic web pages / websites for any organization.

**Outcomes:**
- Understand the scenario of web page development
- Ability to develop web pages using HTML and Cascading Style Sheets.

**MODULE - I**
Internet and the World Wide Web **-** Internet - Introduction to internet and its applications, E-mail, telnet, FTP, e-commerce, video conferencing, e-business. Internet service providers, domain name server, internet address, World Wide Web
(WWW) - World Wide Web and its evolution, uniform resource locator (URL), browsers – internet explorer, Netscape navigator, opera, Firefox, chrome, Mozilla. search engine, web saver – apache, IIS, proxy server, HTTP protocol

**MODULE – II**
HTML5 **–** Introduction - formatting text by using tags, using lists and backgrounds, creating hyperlinks and anchors - Style sheets, CSS formatting text using style sheets, formatting paragraphs using style sheets.

**MODULE – III**
Page layout and navigation **-** Creating navigational aids: planning site organization, creating text based navigation bar, creating graphics based navigation bar, creating graphical navigation bar, creating image map, redirecting to another URL, creating division based layouts.

**MODULE – IV**
Tables, Forms and Media **-** Creating tables: creating simple table, specifying the size of the table, specifying the width of the column, merging table cells, using tables for page layout, formatting tables: applying table borders, applying background and foreground fills, changing cell padding, spacing and alignment

**MODU|LE – V**
Creating user forms: creating basic form, using check boxes and option buttons, creating lists, additional input types in HTML5, Incorporating sound and video: audio and video in HTML5, HTML multimedia basics, embedding video clips, incorporating audio on web page.

**Text Book:**
Faithe Wempen, "HTML5 Step by Step", Microsoft Press, 2011.

**Computer Science**

**Semester**
**Subject Name**

**Time: Three hours**                                                                 **Maximum: 75 marks**

## SECTION – A (10 X 2 = 20 marks)

Answer **ALL** the questions
Totally 10 questions. 2 questions from each unit

## SECTION – B (5 X 5 = 25 marks)

Answer **ALL** the questions, choosing either (a) or (b).

11. a)

(OR)

   b)

12. a)

(OR)

   b)

13. a)

(OR)

   b)

14. a)

(OR)

   b)

15. a)

(OR)

   b)

one question (a & b) from each Unit [Equal distribution for all 5 units]

## SECTION – C (3 X 10 = 30 marks)

Answer any **THREE** questions.

16.

17.

18.

19.

20.

One question from each Unit