
Estd: 2008

# Proposed Program Structure for

# B. E

# (Computer Science and Engineering)

## Scheme of Instruction and Examination

*Proposed for the Academic Years 2024 - 2028*

## Scheme of Instruction & Examination
## B. E. - Computer Science and Engineering

| S. No | Course Code | Course Title | CSE Semester - I | | | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | | Scheme of Instruction | | | | Scheme of Examination | | |
| | | | Hours Per week | | | Contact Hours / week | Maximum Marks | | |
| | | | L | T | P/D | | CIE | SEE | |
| **Theory Courses** | | | | | | | | | |
| 1 | M24BS02HS | Engineering Mathematics –I | 3 | 1 | 0 | 4 | 40 | 60 | 4 |
| 2 | M24BS04HS | Engineering Physics | 3 | 1 | 0 | 4 | 40 | 60 | 4 |
| 3 | M24ES05CS | Programming for Problem Solving | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 4 | M24ES02EE | Fundamentals of Electrical and Electronics Engineering | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 5 | M24MC03CE | Environmental Science | 2 | 0 | 0 | 2 | 40 | 60 | 0 |
| **Practical / Laboratory Courses** | | | | | | | | | |
| 6 | M24BS52HS | Engineering Physics Lab | 0 | 0 | 3 | 3 | 40 | 60 | 1.5 |
| 7 | M24ES54CS | Programming for Problem Solving Lab | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| 8 | M24ES52EE | Fundamentals Of Electrical And Electronics Engineering Lab | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| 9 | M24ES53CE | Engineering Graphics Lab | 1 | 0 | 4 | 5 | 40 | 60 | 3 |
| | | **Total** | **15** | **2** | **11** | **28** | **360** | **540** | **20.5** |

| S. No | Course Code | Course Title | Semester - II | | | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | | Scheme of Instruction | | | | Scheme of Examination | | |
| | | | Hours Per week | | | Contact Hours / week | Maximum Marks | | |
| | | | L | T | P/D | | CIE | SEE | |
| **Theory Courses** | | | | | | | | | |
| 1 | M24BS03HS | Engineering Mathematics – II | 3 | 1 | 0 | 4 | 40 | 60 | 4 |
| 2 | M24BS01HS | Chemistry | 3 | 1 | 0 | 4 | 40 | 60 | 4 |
| 3 | M24HS01HS | English | 2 | 0 | 0 | 2 | 40 | 60 | 2 |
| 4 | M24ES01CS | Data Structures | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| **Practical / Laboratory Courses** | | | | | | | | | |
| 5 | M24BS51HS | Chemistry Lab | 0 | 0 | 3 | 3 | 40 | 60 | 1.5 |
| 6 | M24HS51HS | English Lab | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| 7 | M24ES51CS | Data Structures lab | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| 8 | M24ES56ME | Engineering Workshop Practice | 0 | 0 | 4 | 4 | 40 | 60 | 2 |
| 9 | M24MC04HS | Yoga/NSS/Sports | 0 | 0 | 2 | 2 | 50 | - | 0 |
| | | **Total** | **11** | **2** | **13** | **26** | **370** | **480** | **18.5** |

## Scheme of Instruction & Examination
## B. E. - Computer Science and Engineering

| CSE Semester - III | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. No. | Course Code | Course Title | Scheme of Instruction | | | | Scheme of Examination | | Credits |
| | | | L | T | P / D | Contact Hours / week | CIE | SEE | |
| **Theory Courses** | | | | | | | | | |
| 1 | M24BS306HS | Probability and Statistics | 3 | 1 | 0 | 4 | 40 | 60 | 4 |
| 2 | M24ES301EC | Logic Design and Computer Architecture | 3 | 1 | 0 | 4 | 40 | 60 | 4 |
| 3 | M24PC301CS | Design and Analysis of Algorithms | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 4 | M24PC302CS | Software Engineering | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 5 | M24PC303CS | Database Management Systems | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 6 | M24MC302HS | Essence of Indian Traditional Knowledge | 2 | 0 | 0 | 2 | 40 | 60 | 1 |
| **Practical / Laboratory Courses** | | | | | | | | | |
| 7 | M24PC351CS | Database Management Systems Lab | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| 8 | M24PC352CS | Java Programming Lab | 0 | 0 | 2*2 | 4 | 40 | 60 | 2 |
| 9 | M24SE351CS | Skill Enhancement Course - IOT | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| | | **Total Credits** | | | | **27** | **360** | **540** | **22** |

| CSE Semester - IV | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. No. | Course Code | Course Title | Scheme of Instruction | | | | Scheme of Examination | | Credits |
| | | | L | T | P / D | Contact Hours / week | CIE | SEE | |
| **Theory Courses** | | | | | | | | | |
| 1 | M24PC404CS | Discrete Structures | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 2 | M24PC405CS | Data Mining and Data Analytics | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 3 | M24PC406CS | Operating Systems | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 4 | M24PC407CS | Computer Networks | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 5 | M24HS402HS | Human Values Professional Ethics | 2 | 0 | 0 | 2 | 40 | 60 | 2 |
| 6 | M24PC408CS | MOOCS | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| **Practical / Laboratory Courses** | | | | | | | | | |
| 7 | M24PC453CS | Operating Systems Lab | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| 8 | M24PC454CS | Computer Networks Lab | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| 9 | M24PC455CS | Python Programming Lab | 0 | 0 | 2*2 | 4 | 40 | 60 | 2 |
| 10 | M24SE452CS | Skill Enhancement Course – CISCO CCNA Module I | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| | | **Total Credits** | | | | **24** | **360** | **540** | **22** |

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University College of Engineering (A)
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Hyderabad-500 007.

Head of the Department
Department of CSE
Methodist College of Engg. & Tech
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Dept. of Computer Science
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King Koti, Hyderabad.

## Scheme of Instruction & Examination
## B. E. - Computer Science and Engineering

| CSE Semester - V | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. No. | Course Code | Course Title | Scheme of Instruction | | | | Scheme of Examination | | Credits |
| | | | L | T | P / D | Contact Hours / week | CIE | SEE | |
| **Theory Courses** | | | | | | | | | |
| 1 | M24ES502EC | Digital Image Processing | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 2 | M24PC509CS | DevOps | 3 | 1 | 0 | 4 | 40 | 60 | 4 |
| 3 | M24PC510CS | Artificial Intelligence & Machine Learning | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 4 | M24PE5(01-05) CS | Professional Elective – I | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 5 | M24OE501xx | Open Elective – I | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| **Practical / Laboratory Courses** | | | | | | | | | |
| 6 | M24ES551EC | Digital Image Processing Lab | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| 7 | M24PC556CS | Artificial Intelligence and Machine Learning Lab | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| 8 | M24PW557CS | Mini Project I - App Development- Android/ Flutter/Flask | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| 9 | M24SE553HS | Soft Skills Lab - I | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| | | **Total Credits** | | | | **24** | **360** | **540** | **20** |

| CSE Semester – VI | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. No. | Course Code | Course Title | Scheme of Instruction | | | | Scheme of Examination | | Credits |
| | | | L | T | P / D | Contact Hours / week | CIE | SEE | |
| **Theory Courses** | | | | | | | | | |
| 1 | M24PC611CS | Deep Learning | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 2 | M24PC612CS | Full Stack Development | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 3 | M24PC613CS | Automata Languages and Compiler Design | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 4 | M24PE6(06-10) CS | Professional Elective – II | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 5 | M24PE6(11-15) CS | Professional Elective – III | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 6 | M24HS604HS | Effective Technical Communication | 2 | 0 | 0 | 2 | 40 | 60 | 2 |
| **Practical / Laboratory Courses** | | | | | | | | | |
| 7 | M24PC658CS | Deep Learning Lab | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| 8 | M24PC659CS | Full Stack Development Lab | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| 9 | M24PW660CS | Mini Project II - Real Time/Societal Research Project | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| 10 | M24SE654HS | Employability Skills-I | | | 2 | 2 | 40 | 60 | 1 |
| | | **Total Credits** | | | | **25** | **400** | **600** | **21** |

**Professional Elective - I**

| | | |
|---|---|---|
| 1 | M24PE501CS | Mobile Computing |
| 2 | M24PE502CS | Information Retrieval Systems |
| 3 | M24PE503CS | Software Project Management |
| 4 | M24PE504CS | Scripting Languages |
| 5 | M24PE505CS | Digital Marketing |

**Professional Elective - II**

| | | |
|---|---|---|
| 1 | M24PE606CS | Digital Forensics |
| 2 | M24PE607CS | Big Data Analytics |
| 3 | M24PE608CS | Agile Methodologies |
| 4 | M24PE609CS | Principles of Programming Languages |
| 5 | M24PE610CS | Natural Language Processing |

**Professional Elective - III**

| | | |
|---|---|---|
| 1 | M24PE611CS | Ethical Hacking |
| 2 | M24PE612CS | Business Intelligence |
| 3 | M24PE613CS | Software Architecture and Design Patterns |
| 4 | M24PE614CS | E-Commerce |
| 5 | M24PE615CS | MLOps |

## Scheme of Instruction & Examination
## B. E. - Computer Science and Engineering

| CSE Semester - VII | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. No. | Course Code | Course Title | Scheme of Instruction | | | | Scheme of Examination | | Credits |
| | | | L | T | P / D | Contact Hours / week | CIE | SEE | |
| **Theory Courses** | | | | | | | | | |
| 1 | M24HS7xxHS | Managerial Economics and Financial Accounting | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 2 | M24PC714CS | Cloud Computing | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 3 | M24PC715CS | Cryptography and Network Security | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 4 | M24PE7(16-20) CS | Professional Elective – IV | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 5 | M24OE702xx | Open Elective - II | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 6 | M24OE703xx | Open Elective - III | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| **Practical / Laboratory Courses** | | | | | | | | | |
| 7 | M24PC761CS | Cryptography and Network Security Lab | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| 8 | M24PW762CS | Project Work – I | 0 | 0 | 4 | 4 | 40 | 60 | 2 |
| 9 | M24PW763CS | Summer Internship | - | - | - | - | 40 | 60 | 1 |
| | | **Total Credits** | | | | **24** | **360** | **540** | **22** |

| CSE Semester - VIII | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. No. | Course Code | Course Title | Scheme of Instruction | | | | Scheme of Examination | | Credits |
| | | | L | T | P / D | Contact Hours / week | CIE | SEE | |
| **Theory Courses** | | | | | | | | | |
| 1 | M24PE8(21-25) CS | Professional Elective – V | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 2 | M24MC801HS | Constitution Of India | 2 | 0 | 0 | 2 | 40 | 60 | 1 |
| **Practical / Laboratory Courses** | | | | | | | | | |
| 3 | M24PW864CS | Project Work – II | | | 20 | 20 | 80 | 120 | 10 |
| | | **Total Credits** | | | | **25** | **160** | **240** | **14** |

**Professional Elective – IV**

| | | |
|---|---|---|
| 1 | M24PE716CS | Adhoc Sensor Networks |
| 2 | M24PE717CS | Web Mining |
| 3 | M24PE718CS | Software Requirements and Estimations |
| 4 | M24PE719CS | Web and Social Media Analytics |
| 5 | M24PE720CS | Semantic Web and Social Networks |

**Professional Elective - V**

| | | |
|---|---|---|
| 1 | M24PE821CS | Information Security |
| 2 | M24PE822CS | Nature Inspired Computing |
| 3 | M24PE823CS | Software Testing Methodologies |
| 4 | M24PE824CS | Web Security |
| 5 | M24PE825CS | Blockchain Technology |

## DEPARTMENT OF CSE – CREDIT STRUCTURE

| Category | Sem - I | Sem - II | Sem - III | Sem – IV | Sem – V | Sem - VI | Sem - VII | Sem - VIII | Total |
|---|---|---|---|---|---|---|---|---|---|
| **HS** | | 3 | | 2 | | 2 | 3 | | 10 |
| **BS** | 9.5 | 9.5 | 4 | | | | | | 23 |
| **ES** | 11 | 6 | 4 | | 4 | | | | 25 |
| **PC** | | | 12 | 19 | 8 | 11 | 7 | | 57 |
| **PE** | | | | | 3 | 6 | 3 | 3 | 15 |
| **OE** | | | | | 3 | | 6 | | 9 |
| **PW** | | | | | 1 | 1 | 3 | 10 | 15 |
| **SEC** | | | 1 | 1 | 1 | 1 | | | 4 |
| **MC** | 0 | 0 | 1 | | | | | 1 | 2 |
| **Total** | **20.5** | **18.5** | **22** | **22** | **20** | **21** | **22** | **14** | **160** |
| **Number of Theory Subjects** | 5 | 4 | 6 | 6 | 5 | 6 | 6 | 2 | |
| **Number of Practical Subjects** | 4 | 5 | 3 | 4 | 4 | 4 | 3 | 1 | |

| Course Summary | Inter-Departmental | Departmental | Total |
|---|---|---|---|
| Total Theory Courses | 20 | 20 | 40 |
| Total Practical Courses | 12 | 16 | 28 |

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| S. No. | Networks/ Security | Data Science and Machine Intelligence | Software and Technology | Web Applications | Emerging Technologies |
|---|---|---|---|---|---|
| 1 | Mobile Computing | Information Retrieval Systems | Software Project Management | Scripting Languages | Digital Marketing |
| 2 | Digital Forensics | Big Data Analytics | Agile Methodologies | Principles of Programming Languages | Natural Language Processing |
| 3 | Ethical Hacking | Business Intelligence | Software Architecture and Design Patterns | E Commerce | MLOps |
| 4 | Adhoc Sensor Networks | Web Mining | Software requirements and Estimation | Web and Social Media Analytics | Semantic Web and Social Networks |
| 5 | Information Security | Nature Inspired Computing | Software Testing Methodologies | Web Security | Blockchain Technologies |

## OPEN ELECTIVES OFFERED BY CSE to OTHER DEPARTMENTS

### Open Elective - I

| | | |
|---|---|---|
| 1 | M24OEx01CS | OOPS Using Java |

### Open Elective - II

| | | |
|---|---|---|
| 1 | M24OEx02CS | Software Engineering |

### Open Elective - III

| | | |
|---|---|---|
| 1 | M24OEx03CS | Data Science |

# III SEMESTER
# SYLLABUS

## Scheme of Instruction & Examination
## B. E. - Computer Science and Engineering

| CSE Semester - III | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. No. | Course Code | Course Title | Scheme of Instruction | | | | Scheme of Examination | | Credits |
| | | | L | T | P / D | Contact Hours / week | CIE | SEE | |
| **Theory Courses** | | | | | | | | | |
| 1 | M24BS306HS | Probability and Statistics | 3 | 1 | 0 | 4 | 40 | 60 | 4 |
| 2 | M24ES301EC | Logic Design and Computer Architecture | 3 | 1 | 0 | 4 | 40 | 60 | 4 |
| 3 | M24PC301CS | Design and Analysis of Algorithms | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 4 | M24PC302CS | Software Engineering | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 5 | M24PC303CS | Database Management Systems | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 6 | M24MC302HS | Essence of Indian Traditional Knowledge | 2 | 0 | 0 | 2 | 40 | 60 | 1 |
| **Practical / Laboratory Courses** | | | | | | | | | |
| 7 | M24PC351CS | Database Management Systems Lab | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| 8 | M24PC352CS | Java Programming Lab | 0 | 0 | 2*2 | 4 | 40 | 60 | 2 |
| 9 | M24SE351CS | Skill Enhancement Course - IOT | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| | | **Total Credits** | | | | **27** | **360** | **540** | **22** |

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| M24ES301EC | LOGIC DESIGN AND COMPUTER ARCHITECTURE | | | | | | ES |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| | 3 | 1 | - | 4 | 40 | 60 | 4 |

**COURSE OBJECTIVES:**

**The objective of this course is to make the student**

1. To understand basic number systems, logical gates, Boolean algebra & k map to minimize the Boolean expressions.
2. To understand design of combinational and sequential circuits
3. To learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design.
4. To be familiarized with the hardware components and concepts related to the memory organization.
5. To be familiarized with the hardware components and instruction set related to 8086 microprocessor

**COURSE OUTCOMES:**

**After the completion of course the students will be able to:**

1. Explain binary number systems, Boolean algebra principles, computer organization components, memory hierarchies, and parallel processing architectures.
2. Apply Boolean algebra and K-map techniques to simplify logic expressions and design basic combinational circuits.
3. Demonstrate instruction execution cycles with addressing modes and analyze CPU register operations in 8086 architecture.
4. Compare memory technologies and I/O transfer modes with their performance characteristics.
5. Analyze pipelining challenges in processor architectures and evaluate multiprocessor organization trade-offs.

| PO/CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | | | 1 | | | | 1 | | 2 | 2 | | 1 |
| CO2 | 3 | 2 | 1 | | 1 | | | | | | 2 | 2 | 1 | 1 |
| CO3 | 3 | 3 | 1 | 1 | 1 | | | | | | 2 | 3 | | 1 |
| CO4 | 3 | 3 | | 2 | 1 | | | | | | 2 | 3 | | |
| CO5 | 3 | 3 | 1 | 3 | | | | | 1 | | 2 | 3 | | 1 |

## UNIT I

**Binary Systems, Boolean algebra and Logic Gates:** Number Base Conversions- Binary, Decimal, Octal and Hexadecimal, Complements – 1's Complement, 2's Complement.Digital Logic gates, Boolean algebra, Boolean Functions, Canonical and Standard Forms

**Gate Level Minimization:** The K Map Method, Four-Variable Map, Product of Sums Simplification. Don't-Care Conditions

## UNIT II

**Combinational Logic Design:** NAND and NOR Implementation, Exclusive-OR Function, Design Procedure for Binary Adder, Subtractor, Decoders, Encoders, Multiplexer, Demultiplexer

**Sequential Logic Design:** Flip-Flops – SR, D, JK, T Flipflops.

## UNIT III

**Basic Computer Organization:** Functions of CPU, I/O Units, Memory Unit, Instruction Cycle
**Central Processing Unit Organizations:** General Register Organization, Stack Organization Instruction Formats- One address, two addresses, zero addresses and three addresses, addressing modes with numeric examples.

## UNIT IV

**Input-Output Organizations** Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Direct Memory Access (DMA), Input-Output Processor (IOP), Intel 8089 IOP
**Memory Organizations:** Memory hierarchy, Main Memory, Associative Memory, Cache Memory, Miss and Hit ratio, Virtual memory

## UNIT V

**8086 Architecture:** General purpose registers, Segment register, 8086 Flag register, Address Generation
**Parallel Processing:** Pipelining - Arithmetic Pipeline, Instruction Pipeline
**Multiple Processor Organizations** - Types of Parallel Processor Systems, Parallel Organizations, Symmetric Multiprocessors - Organization, Multiprocessor Operating System Design Considerations, A Mainframe SMP, Multicore Organization

## TEXTBOOKS


1. Digital Design, M. Morris Mano, IV Edition, Pearson Education, Inc, 2002
2. Computer system architecture, M. Morris Mano. III Edition, Prentice-Hall, Inc., 1993.
3. Advanced Microprocessors and Peripherals Bhurchandi, Kishor M, III Edition, Tata McGraw Hill India, 2006.


## REFERENCE BOOKS


1. Computer organization and architecture: designing for performance, William Stallings, VIII Edition, Pearson Education India, 2016.
2. Microprocessor 8086: Architecture, Programming and Interfacing, Sunil, Mathur. PHI Learning Pvt. Ltd., 2010.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| M24PC301CS | DESIGN AND ANALYSIS OF ALGORITHMS | | | | | | PC |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| | 3 | - | - | - | 40 | 60 | 3 |

**COURSE OBJECTIVES:**

**The objective of this course is to make the student**

1. To provide an understanding of AI fundamentals, including problem-solving, search algorithms and game-playing techniques.
2. To teach knowledge representation methods and uncertainty handling techniques.
3. To introduce planning techniques such as hierarchical task network, constraint satisfaction and Markov decision process.
4. To provide an understanding of machine learning techniques for solving real-world problems.
5. To explore AI applications in NLP, computer vision while addressing ethical concerns.

**COURSE OUTCOMES:**

**After the completion of course the students will be able to:**

1. Explain fundamental algorithm analysis techniques, design paradigms (divide-and-conquer, greedy, dynamic programming), and complexity classes (P, NP, NP-complete).
2. Apply divide-and-conquer techniques to solve sorting and search problems with recurrence analysis.
3. Implement greedy, dynamic programming, backtracking, and branch-and-bound strategies for optimization and constraint satisfaction problems.
4. Analyze NP-completeness proofs and reductions for classical problems like clique and vertex cover.
5. Evaluate the suitability of different algorithm design paradigms for given problem characteristics.

| PO/CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | | | 1 | | | | 1 | | 2 | 2 | | 1 |
| CO2 | 3 | 3 | 1 | | 1 | | | | | | 2 | 3 | 1 | 1 |
| CO3 | 3 | 3 | 2 | 1 | 1 | | | | | | 2 | 3 | 1 | 2 |
| CO4 | 3 | 3 | | 3 | | | | | | | 2 | 3 | | 1 |
| CO5 | 3 | 3 | 1 | 3 | | | | | 1 | | 2 | 3 | | 1 |

## UNIT I

**Introduction & Elementary Data Structures:** Introduction, Fundamentals of algorithm (Line Count, Operation Count), Analysis of algorithms (Best, Average, Worst case), Asymptotic Notations (O, Ω, Θ) Recursive Algorithms, Analysis using Recurrence Relations, Master's Theorem.

**Review of elementary data structures–Graphs:** BFS, DFS, Articulation points, Bi-Connected Components.

**Sets:** representation, UNION, FIND operations.

## UNIT II

**Divide-and-Conquer Method:** The general method, Binary search, Finding maximum and minimum, Merge sort, Quick sort.

**Brute Force:** Knapsack, Travelling salesman problem, Convex-Hull.

## UNIT III

**Greedy Method:** Knapsack problem, Minimum spanning trees, Single source shortest path, Job sequencing with deadlines, Optimal storage on tapes, Optimal merge pattern.

**Dynamic programming method:** All pairs shortest paths, Optimal binary search tress, 0/1 Knapsack problem, Reliability design, Travelling salesman problem.

## UNIT IV

**Back-tracking:** N-queen's problem, Graph coloring, Hamiltonian cycles.

**Branch-and-bound:** FIFO & LC branch and Bound methods, 0/1 Knapsack problem, Travelling salesperson.

## UNIT V

**NP-Hard and NP-Complete problems:** Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem, Proofs for NP Complete Problems: Clique, Vertex Cover.

## TEXTBOOKS


1. Fundamentals of Computer Algorithms, Horowitz E, Sahni S, II Edition, Universities Press, 2007.
2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, III Edition, PHI Learning Private Limited, 2012.


## REFERENCE BOOKS


1. Algorithm Design: Foundations, Analysis and Internet Examples, Michael T. Goodrich, Roberto Tamassia, I Edition, John Wiley & Sons,2002
2. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, II Edition, Pearson education.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| M24PC302CS | SOFTWARE ENGINEERING | | | | | | PC |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| | 3 | - | - | - | 40 | 60 | 3 |

**COURSE OBJECTIVES:**

**The objective of this course is to make the student**

1. To understand the fundamental concepts, principles, and practices of software engineering.
2. To learn various software development process models and project planning techniques.
3. To develop skills in system modelling using UML diagrams and Data Flow Diagrams (DFDs).
4. To gain knowledge of software implementation, testing strategies, and maintenance activities.
5. To familiarize with software quality assurance, configuration management, and recent trends in software engineering.

**COURSE OUTCOMES:**

**After the completion of course the students will be able to:**

1. Explain foundational software engineering concepts, including process models, requirement engineering, and UML diagrams.
2. Describe software testing strategies, product metrics, and risk management frameworks.
3. Select appropriate process models and architectural styles for given project scenarios.
4. Compare the effectiveness of validation testing techniques and metrics for software quality assessment.
5. Assess risk management strategies and their impact on software project success.

| PO/CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | | 1 | | 1 | | 1 | | 2 | 2 | | 2 |
| CO2 | 3 | 3 | 2 | | 2 | | | | | | 2 | 3 | 2 | 3 |
| CO3 | 3 | 3 | 2 | 1 | 2 | | | | | | 2 | 3 | 2 | 3 |
| CO4 | 3 | 3 | 1 | 2 | 1 | | | | | | 2 | 3 | 1 | 2 |
| CO5 | 3 | 3 | 1 | 3 | | | | | | | 2 | 3 | | 2 |

## UNIT I

**Software Engineering Fundamentals:** Introduction to Software Engineering: Nature and characteristics of software, Software crisis and software myths, Software Process: Prescriptive process models: Waterfall, Incremental, Spiral, Concurrent, Process assessment and improvement (CMMI overview), Agile Development: Agile manifesto and principles, Agile process models: Scrum, Extreme Programming (XP)

## UNIT II

**Requirements Engineering and Project Planning:** Requirements Engineering: Elicitation, analysis, specification, and validation, Functional and non-functional requirements, Software Requirements Specification (SRS), Software Project Management: Estimation techniques (LOC, Function Points), Scheduling: Gantt charts, PERT, Risk management and mitigation planning

## UNIT III

**System Modelling Using UML and Data Flow Diagrams:** UML Diagrams for System Modelling: Use Case Diagram, Class Diagram, Sequence Diagram, Activity Diagram, State Chart Diagram, Deployment Diagram, Data Flow Diagrams (DFD): DFD symbols and rules,

Context-level DFD, Level 0 and Level 1 DFD, Case-based examples and DFD modelling best practices, Brief Overview of Design Concepts: Abstraction, modularity, cohesion, coupling (only definitions and relevance to modelling)

**UNIT IV**

**Software Implementation, Testing, and Maintenance:** Software Construction: Coding practices, standards, documentation, Software Testing: Testing fundamentals and principles, Unit, integration, system, and acceptance testing, White-box and black-box testing, Test case design techniques, Maintenance and Reengineering: Maintenance types, Software evolution and legacy systems, Basics of reverse engineering

**UNIT V**

**Software Quality, SCM, and Case Study:** Software Quality Assurance: Product and process quality, Software reviews, audits, and metrics, Software Configuration Management (SCM): Version control, change control, repositories

**Emerging Trends:** DevOps and CI/CD, Cloud-based development practices, Security in software engineering, Ethics in software development,

**Case Study:** End-to-end analysis of a software development project, From requirements to design (UML/DFD), testing, and deployment, Students interpret or develop partial artifacts for the given system

**TEXTBOOKS**


1. Software Engineering: A Practitioner's Approach, Roger S. Pressman, VII Edition, McGraw Hill, 2009
2. Software Engineering. Ian Sommerville, VII edition, Addison-Wesley, 2004.
3. Fundamentals of Software Engineering Rajib Mall, V Edition, PHI, 2009.


**REFERENCE BOOKS**


1. Software Engineering Fundamentals, Ali Behforooz and Frederick J. Hudson, Oxford University Press, 1996
2. An Integrated Approach to Software Engineering, Pankaj Jalote, III Edition, Narosa Publishing House, 2000
3. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, VIII Edition, John Wiley.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| M24PC303CS | DATABASE MANAGEMENT SYSTEM | | | | | | PC |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| | 3 | - | - | - | 40 | 60 | 3 |

**COURSE OBJECTIVES:**

**The objective of this course is to make the student**

1. To get familiar with fundamental concepts of database management which includes database design, database languages, and database-system implementation.
2. To get familiar with data storage techniques and indexing.
3. To impart knowledge in transaction Management, concurrency control techniques and recovery techniques.
4. To master the basics of SQL and construct queries using SQL.
5. To become familiar with database storage structures and access techniques

**COURSE OUTCOMES:**

**After the completion of course the students will be able to:**

1. Explain fundamental database concepts including data models, ER design, relational algebra, normalization, and transaction management principles.
2. Apply SQL commands including DDL, DML, joins, nested queries and integrity constraints to solve data manipulation problems.
3. Implement normalization techniques (up to BCNF) to optimize relational database schemas.
4. Analyze concurrency control protocols and recovery techniques for maintaining transaction integrity.
5. Compare indexing structures (tree-based vs hash-based) for efficient data retrieval in database systems.

| PO/CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | | 1 | | 1 | | 1 | | 2 | 2 | | 2 |
| CO2 | 3 | 3 | 1 | | 2 | | | | | | 2 | 3 | 2 | 3 |
| CO3 | 3 | 3 | 2 | 1 | 1 | | | | | | 2 | 3 | 1 | 3 |
| CO4 | 3 | 3 | 1 | 3 | | | 1 | | | | 2 | 3 | | 2 |
| CO5 | 3 | 3 | 1 | 3 | | | | | | | 2 | 3 | | 2 |

## UNIT I

**Introduction to Database and System Architecture**: Database Systems and their Applications, Database Vs File System, View of Data, Data Models, Database Languages-DDL and DML, Transaction Management, Database users and Administrators, Database System Structure.

**Introduction to Database Design:** ER Diagrams, Entities, Attributes and Entity sets, Relationships and Relationship set, Extended ER Features, Conceptual Design with the ER Model, Logical database Design.

## UNIT II

**SQL Queries and Constraints:** SQL Data Definition, Types of SQL Commands, Form of Basic SQL Query, SQL Operators, Set Operators, Aggregate Operators, NULL values, Functions, Integrity Constraints Over Relations, Joins, Nested Queries, Introduction to Views,

Destroying/Altering Tables and Views, PL/SQL Functions and Stored procedures, Cursors, Triggers and Active Databases.

## UNIT III

**Relational Model:** Introduction to Relational Model, Basic Structure, Database Schema, Keys, Relational Algebra and Relational Calculus.

**Schema Refinement and Normal Forms:** Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD

**Normal Forms and Normalization:** INF,2NF,3NF, BCNF,4NF,5NF, Properties of Decomposition

## UNIT IV

**Transaction Management:** Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability.

## UNIT V

**Concurrency Control:** Lock based Protocols, Timestamp based protocols, Recovery System: Recovery and Atomicity, Log based recovery, Shadow Paging, Recovery with concurrent Transactions, Buffer Management.

**Storage and Indexing**: File Organizations and Indexing-Overview of Indexes, Types of Indexes, Index Data Structures, Tree structured Indexing, Hash based Indexing.

## TEXTBOOKS


1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, III Edition, TATA McGraw Hill.
2. Data base System Concepts, Silberschatz, Korth, V Edition, McGraw Hill.
3. Introduction to Database Systems, C.J.Date , VIII Edition, Pearson Education.
4. Database Systems design, Implementation, and Management, Rob & Coronel, IX Edition, Cengage Learning, Inc


## REFERENCE BOOKS


1. Fundamentals of Database System, Elmasri Navate, VII Edition, Pearson Education.
2. Database Management System, Mathew Leon, Leo, I Edition, Tata McGraw Hill Education

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| M24PC351CS | DATABASE MANAGEMENT SYSTEMS LAB | | | | | | PC |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| | - | - | - | 2 | 40 | 60 | 1 |

**COURSE OBJECTIVES:**

**The objective of this course is to make the student**

1. To practice various DDL, DML commands in SQL
2. To write simple and Complex queries in SQL
3. To practice various Functions, Joins &sub queries in SQL
4. To write PL/SQLusing cursors and collections
5. To write PL/SQL using Stored Procedures

**COURSE OUTCOMES:**

**After the completion of course the students will be able to:**

1. Design and implement a database schema for a given problem
2. Develop the query statements with the help of structured query language.
3. Populate and query a database using SQL and PL/SQL
4. Develop multi-user database application
5. Design and implement E-R model for the given requirements

| PO/CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 1 | 3 | | | 2 | 1 | 1 | 2 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 2 | | 3 | | | 1 | | | 2 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 2 | 1 | 3 | | | 1 | | | 2 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 2 | 3 | | 1 | 2 | 1 | 2 | 2 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 1 | 3 | | | 1 | | | 2 | 3 | 2 | 3 |

**List of Programs:**

1. Creation of database Tables (exercising the all SQL commands)
2. Simple and complex condition query creation using SQL Plus
3. Creation of database Tables using Integrity constraints and Functions
4. Simple and complex condition query creation using Joins
5. Simple and complex condition query creation using Sub queries and set operators
6. Creation of Views (exercising the all types of views)
7. Writing PL/SQL function and cursors
8. Writing PL/SQL stored procedure and triggers
9. Creation of Forms and reports for student Information, library information, Pay roll etc.
10. Case Study: Design Database for Bank
    => Collect the information Related with Bank organization
    => Draw E-R Diagrams for Bank
    => Reduce E-R Diagrams to tables
    => Normalize your Database up to 3rd Normal form
    => Retrieve Bank information using SQL commands

**TEXTBOOKS**

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, III Edition, TATA McGraw Hill.
2. Data base System Concepts, Silberschatz, Korth, V Edition, McGraw Hill.

**REFERENCE BOOKS**

1. Database Management System, Elmasri Navate, Pearson Education.
2. Database Management System, Mathew Leon, Leo

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| M24PC352CS | JAVA PROGRAMMING LAB | | | | | | PC |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| Programming and Problem Solving | - | - | - | 2*2 | 40 | 60 | 2 |

**COURSE OBJECTIVES:**

**The objective of this course is to make the student**

1. To implement various java concepts.
2. To write java programs to solve mathematics, science and engineering problems.
3. To identify compile time and runtime errors, syntax and logical errors
4. To import the essentials of java class library and user defined packages.
5. To develop skills in internet programming using applets and swings

**COURSE OUTCOMES:**

**After the completion of course the students will be able to:**

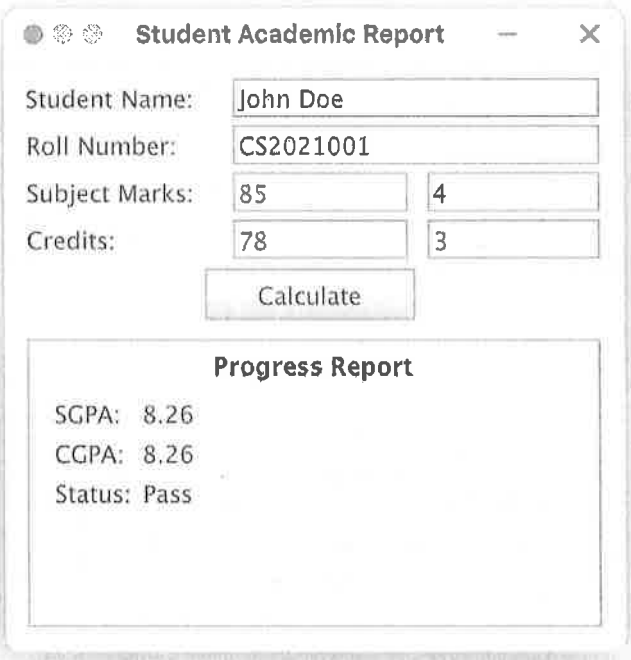
1. To understand the use of OOPs concepts.
2. Develop Java program using packages, inheritance and interface.
3. Develop java programs to implement error handling techniques using exception handling.
4. Develop graphical user interface using AWT.
5. Demonstrate event handling mechanism

| PO/CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | | 3 | | | 1 | 1 | | 2 | 2 | 3 | 2 |
| CO2 | 3 | 3 | 3 | | 3 | | | 2 | | | 2 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 1 | 3 | | | 1 | | | 2 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | | 3 | | | 2 | 1 | | 2 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | | 3 | | | 2 | 1 | | 2 | 3 | 3 | 3 |

## List of Programs

1. Implement the concept of classes and objects.
2. Implement Arrays to a given application.
3. Use String and String Tokenizer classes and develop a java programs.
4. Develop a java programs Using interfaces and packages.
5. Develop Java Programs using inheritance.
6. Develop Java programs using Method overloading and method overriding.
7. Develop java programs using Exception handling (using try, catch, throw, throws and finally).
8. Develop java programs using Multithreading (using Thread class and Runnable interface, synchronization).
9. Develop java programs using collections (using list, set, Map and generics).
10. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. [Use Adapter classes]
11. Write a program to perform CRUD operations on the student table in a database using JDBC.
12. CASE STUDY: Design and develop a Java application to calculate and display the SGPA and CGPA of a student. The application should provide a graphical user interface (GUI) using Java Swings for inputting student details and marks. The calculated SGPA

and CGPA, along with the student's progress report, should be displayed using an Applet interface. Additionally, the application should establish a connection with a backend database using JDBC to store and retrieve student academic records.



## SKILL ENHANCENMENT COURSE

**Guidelines for Evaluation of Skill Enhancement Course**

1. Continuous Evaluation method is adopted for skill enhancement courses of all semesters and 40 marks are allocated for CIE.
   At the end of each module, the student is evaluated by allocating marks as given under.

   | | |
   |---|---|
   | Observation | : 10 marks |
   | Continuous Performance and Execution | : 20 marks |
   | Viva-Voce | : 10marks |

   Average of marks obtained in all experiments is considered as the marks obtained in CIE

2. The Semester End Examination shall be conducted with an external examiner and the internal examiner for 60 marks. The external examiner shall be appointed by the Principal from the panel of examiners recommended by Controller of Evaluation and Board of Studies.

   | | |
   |---|---|
   | Quiz/ Skill Test/Assignment/ Mini Project | : 40 marks |
   | Viva-Voce | : 20 marks |

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| M24SE351CS | SKILL ENHANCENMENT COURSE-IOT | | | | | | SE |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| | - | - | - | 2 | 40 | 60 | 1 |

**COURSE OBJECTIVES:**

**The objective of this course is to make the student to**

1. Learn how digital transformation turns information into action, creating unprecedented economic opportunity.
2. Understand how the IoT brings together operational technology and information technology systems.
3. Discover how business processes for evaluating and solving problems are being transformed.
4. Learn the security concerns that must be considered when implementing IoT solutions.
5. Practice what you learn using Cisco Packet Tracer, a network configuration simulation tool.

**COURSE OUTCOMES:**

**After the completion of course the students will be able to:**

1.Explain the meaning and impact of Digital Transformation.
2.Apply basic programming to support IoT devices.
3.Explain how data provides value to Digital Business and Society.
4.Explain the benefits of automation in the digitized world.
5.Explain the need for enhanced security in the digitized world and discover opportunities provided by digital transformation.

| PO/CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 1 | 2 | | | | | | | | 2 | | |
| CO2 | 3 | 2 | 1 | | | | | | | | | 3 | | |
| CO3 | 3 | 2 | 3 | 2 | 2 | | | | | | | 3 | | |
| CO4 | 3 | 2 | 1 | 1 | | | | | | | | 3 | 1 | 1 |
| CO5 | 3 | 2 | 3 | 2 | 2 | | | | | | | 3 | 3 | 3 |

## MODULE 1: Everything is Connected

**Digital Transformation:** Explain how digital transformation affects business, industry, and our daily lives, explain how digital transformation enables innovation, explain how networks provide the platform for Digital Business and society.

**Devices that Connect to the IoT:** Configure an IoT device to connect to the network, describe the exponential growth of connected IoT devices, configure devices to communicate in the IoT

## MODULE 2: Everything Becomes Programmable

**Apply Basic Programming to Support IoT Devices**: Use Python to create programs that accept user input and read and write to external files, Describe basic programming variables and fundamentals. Apply basic programming variables and fundamentals in Blockly. Apply basic programming variables and fundamentals using Python

**Prototyping Your Idea**: Explain prototyping and its purpose,Describe Prototyping, Describe the various tools and materials to use to prototype.

**MODULE 3: Everything Generates Data**

**Big Data:** Explain the concept of Big Data, Describe the sources of Big Data, Explain the challenges and solutions to Big Data storage, Explain how Big Data analytics are used to support Business.

**MODULE 4: Everything Can be Automated**

**What Can be Automated?:** Explain how digitization allows business processes to embrace automation, Describe automation Explain how artificial intelligence and machine learning impact automation. Explain how intent-based networking adapts to changing business needs.

**MODULE 5: Everything Needs to be Secured**

**Security in the Digitized World:** Explain why security is important in the digitized world. Explain the need for security in the digitized world, explain how to help secure the corporate world, and explain how to secure personal data and devices.

## REFERENCES

1. Introduction to IoT by CISCO Network Academy, Version 2.0,July 2018

# IV SEMESTER SYLLABUS

| CSE Semester - IV | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. No. | Course Code | Course Title | Scheme of Instruction | | | | Scheme of Examination | | Credits |
| | | | L | T | P / D | Contact Hours / week | CIE | SEE | |
| **Theory Courses** | | | | | | | | | |
| 1 | M24PC404CS | Discrete Structures | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 2 | M24PC405CS | Data Mining and Data Analytics | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 3 | M24PC406CS | Operating Systems | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 4 | M24PC407CS | Computer Networks | 3 | 0 | 0 | 3 | 40 | 60 | 3 |
| 5 | M24HS402HS | Human Values Professional Ethics | 2 | 0 | 0 | 2 | 40 | 60 | 2 |
| 6 | M24PC408CS | MOOCS | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| **Practical / Laboratory Courses** | | | | | | | | | |
| 7 | M24PC453CS | Operating Systems Lab | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| 8 | M24PC454CS | Computer Networks Lab | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| 9 | M24PC455CS | Python Programming Lab | 0 | 0 | 2*2 | 4 | 40 | 60 | 2 |
| 10 | M24SE452CS | Skill Enhancement Course – CISCO CCNA Module I | 0 | 0 | 2 | 2 | 40 | 60 | 1 |
| | | **Total Credits** | | | | **24** | **360** | **540** | **22** |

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| M24PC404CS | DISCRETE STRUCTURES | | | | | | PC |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| | 3 | - | - | - | 40 | 60 | 3 |

**COURSE OBJECTIVES:**

**The objective of this course is to make the student**

1. To understand the concepts of Logic, Rules of inference and Quantifiers
2. To explain with examples, the basic terminology of functions, relations, and sets.
3. To understand the basic concept of combinatorics.
4. To relate the ideas of mathematical induction to recursion and recursively defined structures.
5. To develop Graph Algorithms by using the concepts of Graphs and Trees

**COURSE OUTCOMES:**

**After the completion of course the students will be able to:**

1. Understand the fundamental concepts of mathematical logic, set theory, algebraic structures, recurrence relations, and graph theory.
2. Apply logical connectives, truth tables, and rules of inference to construct formal proofs and demonstrate set operations, relations, and functions to solve discrete structures problems.
3. Formulate algebraic systems (groups, rings) and combinatorial principles (inclusion-exclusion, pigeonhole) to solve counting problems.
4. Analyze recurrence relations and generating functions to model divide-and-conquer algorithms.
5. Compare graph models (Euler/Hamilton paths) and tree structures (spanning trees) for real-world applications.

| PO/CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | | | 1 | | | | 1 | | 2 | 2 | | 1 |
| CO2 | 3 | 3 | 1 | | 1 | | | | | | 2 | 3 | 1 | 1 |
| CO3 | 3 | 3 | 1 | 1 | 1 | | | | | | 2 | 3 | | 1 |
| CO4 | 3 | 3 | | 2 | | | | | | | 2 | 3 | | 1 |
| CO5 | 3 | 3 | 1 | 3 | | | | | 1 | | 2 | 3 | | 1 |

## UNIT I

**Mathematical Logic:** Statements and notations, Connectives, Well-formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, Quantifiers, universal quantifiers.

**Predicates:** Predicative logic, Free & Bound variables, Rules of inference, Consistency, proof of contradiction, Automatic Theorem Proving

## UNIT II

**Set Theory and Relations:** Basic Concepts of Set Theory, Relations and Ordering, Properties of Binary Relations, equivalence, transitive closure, compatibility and partial ordering relations, Hasse Diagram.

**Functions:** Composition of functions, Inverse Functions, Recursive Functions, Lattice and its Properties

Head of the Department
Department of CSE
Methodist College of Engg. & Tech
Abids, Hyderabad.

## UNIT III

**Elementary Combinatorics:** Basis of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial Multinomial theorems, the principles of Inclusion – Exclusion. Pigeon hole principles and its application.

## UNIT IV

**Recurrence Relations:** Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.

## UNIT V

**Graphs:** Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Subgraphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Euler Circuits, Planar Graphs, Graph Coloring, Chromatic Numbers

**Trees:** Introduction to Trees, Properties, Applications of Trees, Tree Traversal, Spanning Trees, Directed Trees, Binary Trees.

## TEXTBOOKS


1. Discrete Mathematics and its Applications, Kenneth H. Rosen, V Edition, McGraw Hill Education, 2017.
2. Elements of Discrete Mathematics- A Computer Oriented Approach- C L Liu, D PMohapatra,III Edition, Tata McGrawHill, 2017.
3. Discrete Mathematics for Computer Scientists & Mathematicians, J.L. Mott, A. Kandel,T.P Baker, II Edition, PHI, 2015.


## REFERENCE BOOKS


1. Discrete Mathematical Structures Theory and Application- Malik & Sen, I Edition, Cengage Learning, 2012.
2. Discrete Mathematics with Applications, Thomas Koshy, I Edition, Elsevier, 2005.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| M24PC405CS | DATA MINING AND DATA ANALYTICS | | | | | | PC |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| | 3 | - | - | - | 40 | 60 | 3 |

**COURSE OBJECTIVES:**

**The objective of this course is to make the student to**

1. Introduce the basic concepts of Data Warehouse and Data Mining
2. Introduce current trends in data mining
3. Write association rules for a given data pattern. Choose between classification and clustering solution.
4. To understand the fundamental concepts of data analytics.
5. To explore data preprocessing, visualization, and statistical analysis techniques.

**COURSE OUTCOMES:**

**After the completion of course the students will be able to:**

1. Explain fundamental concepts of data warehousing architectures, OLAP operations, and data mining processes including preprocessing and similarity measures.
2. Apply association rule mining techniques (Apriori, FP-Growth) to discover frequent patterns in transactional datasets.
3. Implement classification algorithms (decision trees, Bayesian, SVM) for predictive modeling tasks.
4. Analyze clustering techniques (partitioning, hierarchical, density-based) for customer segmentation problems.
5. Evaluate the effectiveness of different data mining approaches (association, classification, clustering) for given business scenarios.

| PO/CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | | 1 | | | | 1 | | 2 | 3 | | 1 |
| CO2 | 3 | 3 | 2 | 1 | 2 | | | | | | 2 | 3 | 1 | 2 |
| CO3 | 3 | 3 | 2 | 1 | 2 | | | | | | 2 | 3 | 1 | 2 |
| CO4 | 3 | 3 | 1 | 3 | 1 | | | | | | 2 | 3 | | 2 |
| CO5 | 3 | 3 | 2 | 3 | | 1 | 1 | | 1 | 1 | 2 | 3 | | 2 |

## UNIT I

**Data Warehouse:** A Brief History, Characteristics, Architecture for a Data Warehouse. Fact and Dimension Tables

**Data Mining:** Introduction, Motivation, Knowledge Discovery Process, Data Mining Functionalities, Major issues, Data Pre-processing

**Association Analysis**: Problem Definition, Frequent Item set Generation, Rule generation. Alternative Methods for Generating Frequent Item sets, FP-Growth Algorithm.

## UNIT II

**Classification and Prediction:** Issues Regarding Classification and Prediction, Classification by Decision, Tree Introduction, Bayesian Classification, Rule Based Classification, Classification by Back propagation, Support Vector Machines, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor.

**Case Study**: Loan Default Prediction – Using decision trees to predict whether a customer will default on a loan.

## UNIT III

**Cluster Analysis:** Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

## UNIT IV

**Data Analytics:** Ways of Thinking About Data, Qualitative and Quantitative Data, And Data Strategies, Conceptualizing Data Analysis as a Process, Managing Data Analysis Process, **Exploratory Data Analysis**: Exploring a New Dataset, Summarizing Numeric Data, Anomalies in Numeric Data, Visualizing Relations between Variables. Working with External Data: Manual Data Entry, CSV Files, Other Files, Merging Data from Different Sources.

## UNIT V

**Basic Analysis Techniques:** Statistical hypothesis generation and testing, Chi-Square test, t-Test, Analysis of variance, Correlation analysis, Maximum likelihood test, Practice and analysis with R.

## TEXTBOOKS


1.Introduction to Data Mining,Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Pearson, I impression,2014.

2.Data Mining-Concepts and Techniques Jiawei Han, Micheline Kamber, Jian Pei, III Edition, Morgan Kaufmann Publisher, 2012.

3.Introduction to Data Science: Data Analysis and Prediction Algorithms with R", Rafael A.Irizarry, I Edition,, Chapman and Hall/CRC, 2019.


## REFERENCE BOOKS


1.Data Warehousing in the Real World, Sam Anahory, Dennis Murray, Pearson, X Impression, 2012.

2.Mastering Data Mining, Michael.J.Berry, Gordon. S. Linoff: Wiley Edition, II edtion,2012.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| M24PC406CS | OPERATING SYSTEMS | | | | | | PC |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| | 3 | - | - | - | 40 | 60 | 3 |

**COURSE OBJECTIVES:**

**The objective of this course is to make the student**

1. To provide a comprehensive understanding of the fundamental principles, functions, and services of operating systems in managing hardware and software resources.
2. To enable students to learn various concepts of process management, thread handling, synchronization techniques, and inter-process communication.
3. To impart knowledge on memory management strategies, virtual memory concepts, and page replacement policies to optimize system performance.
4. To develop an understanding of file systems, I/O device management, and storage techniques for efficient data handling and system operations.
5. To expose students to modern operating system features such as virtualization, security mechanisms, and system architectures through real-world case studies like Windows 11.

**COURSE OUTCOMES:**

**After the completion of course the students will be able to:**

1. Demonstrate familiarity with fundamental concepts, terminologies, and principles of operating systems and their role in managing system resources.
2. Explain and summarize system structures, process and memory management, file systems, I/O handling, virtualization, and security features as applied in modern systems.
3. Apply suitable algorithms, techniques, and tools to address problems related to process management, memory allocation, file operations, I/O management, and system-level resource utilization.
4. Analyze and differentiate operating system strategies and architectures to assess their efficiency, reliability, and security, referring to practical implementations.
5. Evaluate and justify the selection of various operating system approaches for optimal system performance, resource management, and security, drawing insights from real-world platforms.

| PO/CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | | | 1 | | | | 1 | | 2 | 2 | | 1 |
| CO2 | 3 | 3 | 2 | 2 | 2 | | | | | | 2 | 3 | 1 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 2 | | | 1 | | | 2 | 3 | 2 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 2 | | | | | | 2 | 2 | 1 | 2 |
| CO5 | 3 | 3 | | 3 | 2 | 1 | 1 | | 2 | | 3 | 3 | | 2 |

## UNIT I

**Introduction:** Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine.

**Processes:** Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching

## UNIT II

**Thread:** Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads,

**Process Scheduling:** Foundation and Scheduling objectives, Types of Schedulers, Scheduling Criteria, Scheduling algorithms, multiprocessor scheduling

## UNIT III

**Process Synchronization:** Inter-process Communication, Critical Section, Race Conditions, Mutual Exclusion, Peterson's Solution, Classical problems of synchronization: The Bounded buffer problem, Producer\Consumer Problem, reader's & writer problem, Dinning philosopher's problem. Semaphores, Event Counters, Monitors, Message Passing,

**Deadlocks:** Definition, Necessary and sufficient conditions for Deadlock, Methods for Handling: Deadlocks: Deadlock prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

## UNIT IV

**Memory Management:** Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation, fragmentation and Compaction; Paging: Principle of operation, Page allocation, Hardware support for paging, structure of page table,Protection and sharing, Disadvantages of paging.

**Virtual Memory**: Basics of Virtual Memory, Hardware and control structures, Locality of reference, Page fault, Working Set, Dirty page/Dirty bit, Demand paging, Page Replacement algorithms, Trashing

## UNIT V

**File Management:** Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods, Free-space management, directory implementation, efficiency and performance.

**Secondary-Storage Structure:** Disk structure, Disk scheduling algorithms, Disk Management, RAID structure.

**Case Study**: "Operating System Case Study – Windows 11: Process and Memory Management, File Systems, I/O Management, Security Features, Virtualization, and System Architecture."

## TEXTBOOKS


1. Operating System Concepts Essentials, Abraham Silberschatz, Peter B Galvin, Greg Gagne, IX Edition, Wiley Asia Student Edition, 2017.
2. Operating Systems: Internals and Design Principles, William Stallings, V Edition, Prentice Hall of India, 2016.
3. Modern Operating Systems, Andrew S. Tanenbaum (2007), II edition, Prentice Hall of India, India.


## REFERENCE BOOKS


1. Design of the Unix Operating Systems, Maurice Bach, VIII Edition, Prentice-Hall of India, 2009.
2. Understanding the Linux Kernel, Daniel P. Bovet, Marco Cesati, III Edition, O'Reilly and Associates.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| M24PC407CS | COMPUTER NETWORKS | | | | | | PC |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| | 3 | - | - | - | 40 | 60 | 3 |

**COURSE OBJECTIVES:**

**The objective of this course is to make the student**

1. To provide a conceptual foundation for the study of data communications using the open Systems interconnect (OSI) model for layered architecture.
2. To study the principles of network protocols and internetworking
3. To understand the Network security and Internet applications.
4. To understand the performance of data link layer protocols for error and flow control.
5. To understand various routing protocols and network security.

**COURSE OUTCOMES:**

**After the completion of course the students will be able to:**

1. Describe the fundamental concepts of data communication, network models, transmission media, switching techniques, and application layer protocols.
2. Apply framing, error detection (and flow control protocols to ensure reliable data transmission.
3. Implement IP addressing, subnetting, and congestion control algorithms for efficient network resource management.
4. Analyze routing algorithms and multiple access protocols to optimize network performance.
5. Evaluate the role of transport layer protocols and QoS techniques in ensuring end-to-end communication reliability.

| PO/CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | | | 1 | | | | 1 | | 2 | 2 | | 1 |
| CO2 | 3 | 3 | 2 | 2 | 2 | | | | | | 2 | 3 | 1 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 2 | | | 1 | | | 2 | 3 | 2 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 2 | | | | | | 2 | 3 | 1 | 2 |
| CO5 | 3 | 3 | | 3 | 2 | 1 | 1 | | 2 | | 3 | 3 | | 2 |

## UNIT I

**Introduction to Data communication:** Representation of data communication, flow of networks, Network Types: LAN, WAN, MAN. Network Topologies: Bus, Star, Ring, Hybrid. Line configurations. Reference Models: OSI, TCP/IP, Transmission media

**Techniques for Bandwidth utilization:** Multiplexing –Frequency division, time division and wave division, Asynchronous and synchronous transmission.

## UNIT II

**Data Link Layer**: Framing, Error Detection and Correction: Fundamentals, Block coding, Hamming Distance, CRC

**Flow Control and Error Control Protocols:** Stop and Wait, go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, HDLC

**Multiple Access Protocols:** ALOHA, CSMA, CSMA/CD, CSMA/CA.

## UNIT III

**The Network Layer in Internet:** IPV4, IPV6, IP Addressing, NAT.

**Internet Networking:** Tunnelling, Fragmentation, Congestion Control (Leaky Bucket and Token Bucket Algorithm), and Internet control protocols: ARP, RARP and DHCP

## UNIT IV

**Network Layer:** Switching Techniques (Circuit and Packet) concept, Network layer Services, Sub-netting concepts

**Routing algorithms:** Shortest Path Routing, Flooding, Hierarchical routing, Broadcast, Multicast, Distance Vector Routing

## UNIT V

**Transport Layer:** Transport Services, Elements of Transport Layer, Connection management, TCP and UDP protocols, QoS improving techniques.

**Application Layer:** Domain Name System, SNMP, SMTP, HTTP, Bluetooth

## TEXTBOOKS

1. Computer Networks, Andrew S Tanenbaum, V Edition, Pearson Education, 2011.
2. Data Communication and Networking, Behrouz A. Forouzan, IV Edition, TMH, 2008.
3. Data and Computer Communications, William Stallings, VIII Edition, PHI, 2004.

## REFERENCE BOOKS

1. Computer Networks and Internet, Douglas EComer, Pearson Education Asia, 2000.
2. Data Communications and Computer Networks, PrakashC. Gupta, PHI learning, 2013.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| M24PC453CS | OPERATING SYSTEMS LAB | | | | | | PC |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| | - | - | - | 2 | 40 | 60 | 1 |

**COURSE OBJECTIVES:**

**The objective of this course is to make the student**

1. To Learn various system calls in Linux
2. To Learn different types of CPU scheduling algorithms.
3. To Demonstrate the usage of semaphores for solving synchronization problem
4. To Understand memory management techniques and different types of fragmentation.
5. To Learn various disk scheduling algorithms

**COURSE OUTCOMES:**

**After the completion of course the students will be able to:**

1. Use different system calls for writing application programs
2. Evaluate the performance of different types of CPU scheduling algorithms.
3. Implement producer-consumer problem, reader-writer's problem, Dining philosopher's problem.
4. Simulate Banker's algorithm for deadlock avoidance.
5. Implement paging replacement and disk scheduling techniques

| PO/CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | | 1 | 3 | | | | 2 | | 2 | 2 | 1 | 2 |
| CO2 | 3 | 3 | 2 | 2 | 3 | | | | 1 | | 2 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 2 | 3 | | | 1 | 1 | | 2 | 2 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 1 | | | | | 2 | 2 | 2 | 3 |
| CO5 | 3 | 3 | | 3 | 3 | | 1 | 2 | 2 | | 3 | 2 | 1 | 2 |

**List of Programs (preferred programming language is C)**

**Perform a case study by installing and exploring various types of operating systems on a physical or logical (virtual) machine**

1. Write C programs to implement UNIX system calls and file management system calls.
2. Write C programs to demonstrate various process related concepts.
3. Write C programs to demonstrate various thread related concepts.
4. Write C programs to simulate CPU scheduling algorithms: FCFS, SJF, Round Robin
5. Write C programs to simulate Intra & Inter-Process Communication (IPC) techniques: Pipes, Messages Queues, Shared Memory.
6. Write C programs to simulate solutions to Classical Process Synchronization Problems: Dining Philosophers, Producer-Consumer, Readers-Writers
7. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.
8. Write C programs to simulate Page Replacement Algorithms: FIFO, LRU
9. Write C programs to simulate implementation of Disk Scheduling Algorithms: FCFS, SSTF.
10. Shell programming: creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, and commands).

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| M24PC454CS | COMPUTER NETWORKS LAB | | | | | | PC |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| | - | - | - | 2 | 40 | 60 | 1 |

**COURSE OBJECTIVES:**

The objective of this course is to make the student to

1. Learn to communicate between two desktops
2. Learn to implement different protocols
3. Be familiar with socket programming
4. Be familiar with various routing algorithms
5. Be familiar with different simulation tools

**COURSE OUTCOMES:**

**After the completion of course the students will be able to:**

1. Demonstrate a broad knowledge of the area of computer networking and its terminology
2. Understand to configure intermediary network devices
3. Program using sockets
4. Use simulation tools to analyze the performance of various network protocols
5. Implement and analyze various routing algorithms.

| PO/CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | | 1 | 3 | | | | 2 | | 2 | 2 | 1 | 2 |
| CO2 | 3 | 3 | 2 | 2 | 3 | | | | 1 | | 2 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 2 | 3 | | | 1 | 1 | | 2 | 2 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 1 | | | | | 2 | 2 | 2 | 3 |
| CO5 | 3 | 3 | | 3 | 3 | | 1 | 2 | 2 | | 3 | 2 | 1 | 2 |

**List of Programs**

1. Running and using services/commands like tcpdump, netstat, ifconfig, nslookup, FTP, TELNET and trace route. Capture ping and trace route PDUs using network protocol analyzer and examine
2. Implement the data link layer framing methods such as character-stuffing and bit stuffing
3. Implement on a dataset of characters using CRC polynomials CRC 12 and CRC 16
4. Initial Configuration of router and switch (using real devices or simulators)
5. Design and implement the following experiments using packet tracer software
6. Simulation of network topologies
7. Configuration of network using different routing protocols
8. Do the following using NS2/NS3/NetSim or any other equivalent tool
    a. Simulation of Congestion Control Algorithms
    b. Simulation of Routing Algorithms
9. Socket programming using UDP and TCP (e.g simple DNS, date & time client/server, echo client/server, iterative & concurrent servers)
10. Programming using RPC

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| M24PC455CS | PYTHON PROGRAMMING LAB | | | | | | PC |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| | - | - | - | 2*2 | 40 | 60 | 2 |

**COURSE OBJECTIVES:**

**The objective of this course is to make the student**

1.To learn how to design and program using lists, tuples, and dictionaries.
2.To learn how to use indexing and slicing to access data in Python programs.
3.To learn structure and components of a Python and to read and write files.
4.To learn how to design object-oriented programs with Python classes and Exception handling techniques.
5.To learn how to design and build the GUI applications using python

**COURSE OUTCOMES:**

**After the completion of course the students will be able to:**

1.Develop solutions to simple computational problems using Python programs.
2.Solve problems using conditionals and loops in Python.
3.Develop Python programs by defining functions and calling them.
4.Use Python lists, tuples and dictionaries for representing compound data.
5.Develop Python programs for GUI applications

| PO/CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | | 1 | 3 | | | | 2 | | 2 | 2 | 1 | 2 |
| CO2 | 3 | 3 | 2 | 2 | 3 | | | | 1 | | 2 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 2 | 3 | | | 1 | 1 | | 2 | 2 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 1 | | | | | 2 | 2 | 2 | 3 |
| CO5 | 3 | 3 | | 3 | 3 | | 1 | 2 | 2 | | 3 | 2 | 1 | 2 |

**List of Programs:**

1. Develop program to demonstrate different number datatypes in python
2. Develop program to understand the control structures of python
3. Develop program on String manipulation
4. Develop program to perform various operations on files
5. Develop programs to learn different types of structures (list, dictionary, tuples) in python
6. Develop programs to learn concept of functions scoping, recursion and list mutability
7. Develop program to demonstrate classes and OOP principles
8. Develop programs to understand working of exception handling and assertions
9. Develop event driven GUI programs
10. Explore different debugging methods in Python: A Case Study

**TEXTBOOKS**


1. The Fundamentals of Python: First Programs, Kenneth A. Lambert, II Edition, 2017, Cengage Learning
2. Introduction to Computation and Programming Using Python , John V Guttag, Prentice Hall of India

**REFERENCE BOOKS / LINKS**


1. Mark Summerfield. —Programming in Python 3: A Complete introduction to the Python Language, Addison-Wesley Professional, 2009.
2. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist, II edition, Updated for Python 3, Shroff/O,,Reilly Publishers, 2016
3. NPTEL Course, Programming, Data Structures and Algorithms using Python, Link: https://nptel.ac.in/courses/106106145
4. NPTEL Course, The Joy of Computing using Python, Link: https://nptel.ac.in/courses/106106182
5. FOSSEE, Python, Link: https://python.fossee.in/

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| M24SE452CS | SKILL ENHANCEMENT COURSE – CISCO CCNA MODULE I | | | | | | PW |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| | - | - | - | 2 | 40 | 60 | 1 |

**COURSE OBJECTIVES:**

**The objective of this course is to make the student to**

1. Explain the advances in modern network technologies, configure IP address, passwords etc
2. Explain how network protocols enable devices to access local and remote network resources
3. Explain how routers use network layer protocols and services to enable end-to-end connectivity
4. Implement IPv4 and IPv6 addressing scheme
5. Configure a switch port to be assigned to a VLAN based on requirements.

**COURSE OUTCOMES:**

**After the completion of course the students will be able to:**

1. Build simple LANs, perform basic configurations for routers and switches,
2. Implement IPv4 and IPv6 addressing schemes.
3. Implement VLANs and trunking in a switched network
4. Implement DHCPv4 to operate across multiple LANs and explain how WLANs enable network connectivity.
5. 'Develop critical thinking and problem-solving skills using real equipment and Cisco Packet Tracer.

| PO/CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | | | 2 | | | | | | | 3 | | |
| CO2 | 3 | 2 | | | 2 | | | | | | | 3 | | |
| CO3 | 3 | 2 | | | 3 | | | | | | | 3 | | |
| CO4 | 3 | 2 | | | 3 | | | | | | | 3 | | |
| CO5 | 3 | 2 | 2 | | 3 | | | | | | | 3 | | |

**MODULE I**

**Networking today:** Network Affect our Lives, Network Components, Network topologies, Types of Networks

**Basic Switch and End Device Configuration:** IOS Access, Command Structure, basic device configuration, Ports and addresses, configuring IP address, protocols and models

**MODULE II**

**Physical Layer:** Introduction to cables, Number Systems

**Data Link Layer:** Topologies, Data Link frame

**Ethernet Switching:** Ethernet Frame, MAC Address Table

**MODULE III:**

**Network layer:** IPv4 and IPv6 packet, addressing of IPv4 and IPv6

**Address Resolution:** MAC & IP, ARP, IPv6 Neighbour Discovery

**MODULE IV:**
**ICMP, Transport layer:** TCP & UDP
**Application Layer:** Web and email protocols, IP Addressing Services

**MODULE V:**
**Network Security Fundamentals:** Network Attacks, Device Security

**REFERENCES**
CCNA ROUTING & SWITCHING BY CISCO PRESS