SYLLABUS
(With effect from 2022 -23)

Bachelor Degree
In
Information Science & Engineering

III & IV Semester

Out Come Based Education
With
Choice Based Credit System

[National Education Policy Scheme]

P.E.S. College of Engineering, Mandya - 571 401, Karnataka
[An Autonomous Institution affiliated to VTU, Belagavi,
Grant – in – Aid Institution (Government of Karnataka),
Accredited by NBA (All UG Programs), NAAC and Approved by AICTE, New Delhi]

Ph : 08232- 220043, Fax : 08232 – 222075, Web : www.pescemandya.org
VISION

“PESCE shall be a leading institution imparting quality Engineering and Management education developing creative and socially responsible professionals.”

MISSION

- Provide state of the art infrastructure, motivate the faculty to be proficient in their field of specialization and adopt best teaching-learning practices.
- Impart engineering and managerial skills through competent and committed faculty using outcome based educational curriculum.
- Inculcate professional ethics, leadership qualities and entrepreneurial skills to meet the societal needs.
- Promote research, product development and industry-institution interaction.

QUALITY POLICY

Highly committed in providing quality, concurrent technical education and continuously striving to meet expectations of stake holders.

CORE VALUES

Professionalism
Empathy
Synergy
Commitment
Ethics
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

About the Department
The Department of Information science and Engineering takes pride in producing quality engineers over the past 18 years. The credit for all the flowery results goes to the highly motivating staff, from whom all students draw inspiration. The Department was started in the year 2000. The present intake of the undergraduate program is 60. The department has well equipped classrooms, computer laboratories with high-end systems, department library. We are proud to produce the first PhD student in our college. Faculty members of the department are involved in research activities in different fields such as Medical Image Processing, Pattern Recognition, and Data Mining etc. The department is using Outcome-based education (OBE), which is a recurring education reform model, and it is affiliated to Visvesvaraya Technological University (VTU). The department has achieved good Placement, conducted International Conferences and other sponsored short-term courses, workshops, National seminars and symposia. The laboratory facilities and the Internet access are available to the staff and students of the Information Science and Engineering

Vision
“The department strives to equip our graduates with Knowledge and Skills to contribute significantly to Information Science & Engineering and enhance quality research for the benefit of society”.

Mission
M1: To provide students with state of art facilities and tools of Information Science & Engineering to become productive, global citizens and life-long learners.
M2: To prepare students for careers in IT industry, Higher education and Research.
M3: To inculcate leadership qualities among students to make them competent Information Science & Engineering professionals or entrepreneurs.

1.2. State the Program Educational Objectives (PEOs)
Graduates of the program will be able to
PEO1: Establish a productive Information Science & Engineering career in industry, government or academia.
PEO2: Interact with their peers in other disciplines by exhibiting professionalism and team work to contribute to the economic growth of the country.
PEO3: Promote the development of solutions to the problems in Information Science using hardware and software integration.
PEO4: Pursue higher studies in Engineering, Management or Research.

A. List of Program Outcomes (POs)
Engineering Graduates will be able to:

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
B. List of Program Specific Outcomes (PSOs)

Information Science & Engineering Graduates will have

**PSO1** - The Knowledge to excel in IT profession by utilizing mathematical concepts, programming paradigms and software development practices for successful career.

**PSO2** - The ability to continuously learn and develop solutions in IT world by applying the emerging technologies in multidisciplinary environment
### Bachelor of Engineering (III –Semester)

<table>
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<tr>
<th>Sl. No.</th>
<th>Course Code</th>
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**Total** 21

### Bachelor of Engineering (IV –Semester)

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**Total** 21

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TRANSPORT AND NUMERICAL ANALYSIS
[As per Choice Based Credit System (CBCS) & OBE Scheme]
SEMESTER – III

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Course Learning Objectives:

- Adequate exposure to basics of engineering mathematics so as to enable them to visualize the applications to engineering problems
- Analyze periodic phenomena using concept of Fourier series, series solution of Engineering problems
- Understand Fourier transforms of functions and use it to solve initial value, boundary value problems.
- Apply Z-Transform technique to Solve difference equations and Numerical Technique to estimate interpolation, Extrapolation and area - (All formulae without proof)-problems only
- Use mathematical IT tools to analyze and visualize the above concepts.

UNIT – I | 8 Hours

**Fourier Series:** Introduction, periodic function, even and odd functions, properties. Special waveforms - square wave, half wave rectifier, saw-toothwave and triangular wave. Dirichlet’s conditions, Euler’s formula for Fourier series (no proof). Fourier series for functions of period 2L (all particular cases) – problems, Half Range Fourier series- Construction of Half range cosine and sine series and problems Practical harmonic analysis- Illustrative examples from engineering field.

**Self-study component:** Derive Euler’s formula, Fourier series in complex form.

UNIT – II | 8 Hours

**Partial differential equations (PDE’s):**
Formation of PDE’s. Solution of non-homogeneous PDE by direct integration. Solutions of homogeneous PDE involving derivative with respect to one independent variable only, Method of separation of variables(first and second order equations).

**Applications of PDE’s:** Various Possible solution of PDE’s
Classification of second order PDE, various possible solutions for One- dimensional wave and heat equations, by the method of separation of variables. Solution of all these equations with specified boundary conditions (Boundary value problems). Illustrative examples from engineering field.

**Self-study component:** Charpit’s Method -simple problem. Various possible solutions of Two dimensional Laplace equation.
<table>
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<tr>
<th>UNIT – III</th>
<th>8 Hours</th>
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<tbody>
<tr>
<td><strong>Finite Differences and Interpolation:</strong> Forward and backward differences, Interpolation, Newton-Gregory forward and backward interpolation formulae, Lagrange’s interpolation formula and Newton’s divided difference interpolation formula (All formulae without proof)-problems only.</td>
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<tr>
<td><strong>Numerical Differentiation:</strong> Derivatives using Newton-Gregory forward and backward interpolation formulae, Applications to Maxima and Minima of tabulated function.</td>
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<tr>
<td><strong>Numerical Integration:</strong> Newton-Cotes quadrature formula, Simpson’s 1/3rd rule and Simpson’s 3/8th rule. Weddle’s rule (All rules without proof)-</td>
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<tr>
<td><strong>Self-study component:</strong></td>
<td>Inverse Lagrange’s Interpolation formula, Central differences.</td>
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<tr>
<th>UNIT – IV</th>
<th>8 Hours</th>
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<tr>
<td><strong>Fourier Transforms:</strong> Infinite Fourier transforms. Properties- linearity, scaling, shifting and modulation (no proof), Fourier sine and cosine transforms. Inverse Fourier Transforms, Inverse Fourier cosine and sine transforms. Problems. Convolution theorem and Parseval’s Identity (noproof)-problems.</td>
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<td><strong>Self-study component:</strong></td>
<td>Finite Fourier transform, Fourier transform of derivatives of functions</td>
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<th>UNIT – V</th>
<th>8 Hours</th>
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<tbody>
<tr>
<td><strong>Z - Transforms:</strong> Definition. Z-transforms of basic sequences and standard functions. Properties-linearity, scaling, Damping rule, first and second shifting, multiplication by (n), initial and final value theorem (statement only)-problems. Inverse Z-transforms-problems.</td>
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<tr>
<td><strong>Difference Equations:</strong> Definition. Formation of Difference equations, Linear &amp; simultaneous linear difference equations with constant coefficients-problems, Solutions of difference equations using Z-transforms.</td>
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<tr>
<td><strong>Self-study component:</strong></td>
<td>Convolution theorem and problems, Application to deflection of a loaded string.</td>
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</table>

**Course Outcomes:** On completion of the course, student should be able to:

| CO1 | Analyze engineering problems using the fundamental concepts in Fourier series, Fourier Transforms and Basics ideas of PDE’s. |
| CO2 | Explain various methods to find the Fourier constants, solution of PDE’s, Estimation of interpolation and find the area, solution of difference equations. |
| CO3 | Apply the acquired knowledge to construct the Half-range Fourier series, Finding Fourier transforms and Inverse Laplace transforms for some standard functions. |
| CO4 | Evaluate Z-transform of various functions, solutions of differential equations with initial and boundary conditions. |
TEXT BOOKS

REFERENCE BOOKS

ONLINE RESOURCES
1. http://www.nptel.ac.in

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Strength of correlation: Low-1, Medium- 2, High-3
DATA STRUCTURES
[As per Choice Based Credit System (CBCS) & OBE Scheme]
SEMESTER - III

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Course Learning Objectives:
- To become familiar with the concept of pointers and its usage in data structure.
- To study and understand the representation and implementation of linear & non-linear data structures.
- To identify the appropriate data structure while solving real-time applications.

UNIT – I

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<tr>
<td>Pointers: Review of pointers, Pointers and arrays, Arrays of pointers.</td>
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<tr>
<td>Structures: Arrays of Structures, Structures and Functions- Passing Individual Members, Passing the Entire Structure, Passing Structures through Pointers, Self-referential Structures.</td>
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<tr>
<td>Introduction: Basic Terminology-Elementary Data Structure Organization, Classification of Data Structures, Operations on Data Structures, Abstract Data Type.</td>
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<tr>
<td>Dynamic memory Allocation</td>
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<td>Self-study component:</td>
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UNIT – II

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<td>Linked Lists: Introduction, Operations on lists, Singly linked lists, Circular linked lists, Doubly linked lists, Applications of linked lists - Polynomial Representation, Evaluation of polynomials</td>
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<td>Self-study component:</td>
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UNIT – III

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UNIT – IV

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<td>Recursion: Introduction, Factorial of a number, Fibonacci series, Tower of Hanoi, GCD of two numbers.</td>
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<tr>
<td>Queues: Introduction to Queues, Operations on Queue (Using Arrays &amp; Linked list).</td>
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<tr>
<td>Types of Queues: Circular queue, DeQues , Priority Queue, Multiple Queues</td>
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</table>
Self-study component: Types of recursion with examples (Linear Search, Binary Search) Applications of Queues: Josephus Problem

UNIT – V

8 Hours


Self-study component: Huffman tree, Expression Trees.

COs | Course Outcomes with Action verb for the Course topics
--- | ---
CO1 | Apply the concepts of pointers in data structures.
CO2 | Analyze and represent various data structures and its operations.
CO3 | Design algorithms using different data structures like List, Stack, Queue and Trees.
CO4 | Develop programs with suitable data structure based on the requirements of the real-time applications.

Text Book(s):

Reference Book(s):
2. Seymour Lipschutz, ”Data Structures with C (Schaum's Outline Series)”, July 2017, McGraw Hill Education

Web and Video link(s):
- Data Structures and algorithms offered by NPTEL: [https://nptel.ac.in/courses/106102064/](https://nptel.ac.in/courses/106102064/)

E-Books/Resources: [https://www.academia.edu/28758384/](https://www.academia.edu/28758384/)

**CO-PO Mapping**

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<td>Apply the concepts of pointers in data structures.</td>
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<td>Design algorithms using different data structures like List, Stack, Queue and Trees.</td>
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<tr>
<td>CO4</td>
<td>Develop programs with suitable data structure based on the requirements of the real-time applications.</td>
<td>1</td>
<td>1</td>
<td>2</td>
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P21 Scheme - III & IV Semester Syllabus

Page | 11
### COMPUTER ORGANIZATION
[As per Choice Based Credit System (CBCS) & OBE Scheme]

#### SEMESTER – III

<table>
<thead>
<tr>
<th>Course Code:</th>
<th>P21IS303</th>
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<tr>
<td>Total Number of Teaching Hours:</td>
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<td>SEE Marks:</td>
<td>50</td>
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</table>

Course Learning Objectives:
- Conceptualize the basics of Organizational issues of a digital computer and compare the performance of machine instruction.
- Expose different ways of communication with I/O Devices.
- Notice how to perform computer arithmetic operation.
- Understand working of Processing unit using different bus structures.
- Illustrate different Types of memory devices with their principles.

<table>
<thead>
<tr>
<th>UNIT – I</th>
<th>8 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BASIC STRUCTURE OF COMPUTERS</strong>: Basic operational Concepts, Performance.</td>
<td></td>
</tr>
<tr>
<td><strong>INSTRUCTION SET ARCHITECTURE</strong>: Memory Location and Addresses, Memory Operations, Instruction and Instruction Sequencing, Addressing Modes, Assembly Language.</td>
<td></td>
</tr>
<tr>
<td><strong>Self-study component</strong>: Functional Units of Computer, Number Representation and Arithmetic Operations, Character representation.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT – II</th>
<th>8 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INSTRUCTION SET ARCHITECTURE (Continued)</strong>: Subroutines, Additional instructions.</td>
<td></td>
</tr>
<tr>
<td><strong>BASIC INPUT/OUTPUT</strong>: Accessing I/O Devices- I/O Device Interface, Program Controlled I/O, Interrupts-Enabling and Disabling Interrupts, Handling Multiple Devices, Exceptions.</td>
<td></td>
</tr>
<tr>
<td><strong>INPUT/OUTPUT ORGANIZATION</strong>: Bus Structure, Bus Operation -Synchronous Bus, Asynchronous Bus, Arbitration.</td>
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</tr>
<tr>
<td><strong>Self-study component</strong>: Stacks, Interface Circuits.</td>
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<table>
<thead>
<tr>
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<th>8 Hours</th>
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</thead>
<tbody>
<tr>
<td><strong>MEMORY SYSTEM</strong>: Basic Concepts, Semiconductor RAM Memories, Memory Hierarchy, and Cache Memories – Mapping Functions.</td>
<td></td>
</tr>
<tr>
<td><strong>Self-study component</strong>: Read Only Memories, Direct Memory Access</td>
<td></td>
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<table>
<thead>
<tr>
<th>UNIT – IV</th>
<th>8 Hours</th>
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<tr>
<td><strong>BASIC PROCESSING UNIT</strong>: Some Fundamental Concepts, Instruction Execution, Hardware Components, Instruction Fetch and Execution Steps, Control Signals, Hardwired Control</td>
<td></td>
</tr>
<tr>
<td><strong>Self-study component</strong>: CISC Style Processors.</td>
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</table>
### UNIT – V

<table>
<thead>
<tr>
<th>ARITHMETIC: Multiplication of Signed Numbers, Fast Multiplication-Bit Pair Recoding of Multipliers, Carry-Save Addition of Summands, Integer Division, Introduction to Floating point Numbers and Operations.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-study component:</strong></td>
</tr>
<tr>
<td><strong>Course Outcomes:</strong></td>
</tr>
<tr>
<td><strong>COs</strong></td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
<tr>
<td>CO4</td>
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### Text Book(s):

### Reference Book(s):

### Web and Video link(s):
1. [https://nptel.ac.in/courses/106/103/106103068/](https://nptel.ac.in/courses/106/103/106103068/)
2. [https://nptel.ac.in/content/storage2/courses/106103068/pdf/coa.pdf](https://nptel.ac.in/content/storage2/courses/106103068/pdf/coa.pdf)
3. [https://nptel.ac.in/courses/106/105/106105163/](https://nptel.ac.in/courses/106/105/106105163/)
4. [https://nptel.ac.in/courses/106/106/106106092/](https://nptel.ac.in/courses/106/106/106106092/)
5. [https://nptel.ac.in/courses/106/106/106106166/](https://nptel.ac.in/courses/106/106/106106166/)
6. [http://www.nptelvideos.in/2012/11/computer-organization.html](http://www.nptelvideos.in/2012/11/computer-organization.html)

### CO-PO mapping

<table>
<thead>
<tr>
<th>CO</th>
<th>Statement</th>
<th>PO 1</th>
<th>PO 2</th>
<th>PO 3</th>
<th>PO 4</th>
<th>PO 5</th>
<th>PO 6</th>
<th>PO 7</th>
<th>PO 8</th>
<th>PO 9</th>
<th>PO 10</th>
<th>PO 11</th>
<th>PO 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>Understand the operation and organization of a digital computer system.</td>
<td>2</td>
<td></td>
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</tr>
<tr>
<td>CO2</td>
<td>Apply the knowledge of assembly language / algorithmic techniques to solve the given problem.</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>CO3</td>
<td>Analyze the given assembly language code snippet.</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
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<tr>
<td>CO4</td>
<td>Design memory modules.</td>
<td>2</td>
<td>2</td>
<td>2</td>
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</table>
# DIGITAL LOGIC DESIGN

[As per Choice Based Credit System (CBCS) & OBE Scheme]

## SEMESTER – III

<table>
<thead>
<tr>
<th>Course Code:</th>
<th>P21IS304</th>
<th>Credits:</th>
<th>04</th>
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<td>Teaching Hours/Week (L:T:P):</td>
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<tr>
<td>Total Theory Teaching Hours:</td>
<td>40</td>
<td>SEE Marks:</td>
<td>50</td>
</tr>
<tr>
<td>Total Laboratory Hours:</td>
<td>24</td>
<td></td>
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</tr>
</tbody>
</table>

**Course Learning Objectives:** This course will enable the students to:

- Understand Boolean laws and minimization techniques and fundamental gates
- Design of combinational logic circuits using minimum number of gates, Decoders and Multiplexers
- Understand the Sequential logic components and Design of sequential circuits
- Understand and use high-level hardware description languages (VHDL) to design combinational / sequential circuits
- Conduct and Simulate practical experiments of combinational and sequential circuit

## UNIT – I

**Boolean Algebra:** Introduction, Logic gates, Boolean Laws, Duality, Boolean expression in standard SOP and POS, Realization using basic gates and universal gates.

**Minimization Of Switching Functions:** Introduction, K-Map: Two-variable, Three-variable and Four-variable K-map, Don’t care combinations, Map entered variable (VEM), Limitation of K-map, Code converters: Binary to gray, BCD to Excess 3, Quine-Mc-Clusky method- 3 variable

**Self-study component:** Quine-Mc-Clusky method- 4,5 variable

**Practical Topics:**

- Verify the truth table for different logic gates using IC’s (For practice only)

  1. A committee of three individuals decides issues for an organization. Each individual votes either yes or no for each proposal that arises. A proposal is passed if it receives at least two yes votes. Design a circuit using minimum number of NAND gates only that determines whether a proposal passes.
  2. Design Logic circuit to convert 3 bit binary to gray code using basic gates.

## UNIT – II

**Combinational Logic Design:** Introduction to combinational circuits, Adders, Subtractors, ripple carry adder, Look ahead carry adder, Comparators: 1-bit and 2bit magnitude comparator, Encoders: octal to Binary and Decimal to BCD encoder, Priority encoders, Decoders: 2 to 4, 3 to 8 line decoder, Multiplexers: 2:1,4:1, 8:1,16:1, Design combinational circuits using Decoders and Multiplexers
<table>
<thead>
<tr>
<th>Self-study component:</th>
<th>7 Segment Decoder, Demultiplexer</th>
</tr>
</thead>
</table>
| **Practical Topics:** | 1. Design Full adder using suitable Decoder  
2. A lawn sprinkling system is controlled automatically by certain combinations of the following variables.  
   Season(S=1, if summer; 0, otherwise)  
   Moisture content of soil(M=1, if high; 0 if low)  
   Outside temperature(T=1, if high; 0 if low)  
   Outside humidity(H=1, if high; 0 if low)  
   The sprinkler is turned on under any of the following circumstances:  
   i. The moisture content is low in winter.  
   ii. The temperature is high and the moisture content is low in summer.  
   iii. The temperature is high and the humidity is high in summer.  
   iv. The temperature is low and the moisture content is low in summer.  
   v. The temperature is high and the humidity is low.  
   Implement using suitable multiplexer.(use 8x1 mux) |

<table>
<thead>
<tr>
<th>UNIT – III</th>
<th>8 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flip flops</strong></td>
<td>Introduction, Classification of sequential circuits: Asynchronous and Synchronous, NAND and NOR latches and flip flops: Excitation tables, State diagram and Characteristic equation of SR, JK, Race around condition, Master slave JK flip flops, , Excitation tables, State diagram and Characteristic equation of D and T flip flops, Conversion of SR to JK, JK to D, T to D Flip flops</td>
</tr>
<tr>
<td>Self-study component:</td>
<td>Conversion of JK to SR, D to JK and D to T Flip flops</td>
</tr>
</tbody>
</table>
| **Practical Topics:** | Verify the truth table of JK and D Flip Flops (For practice only)  
1. Implement Master slave D Flip Flop using only NAND Gates  
2. Design and demonstrate the conversion of JK flip flop to T Flip Flop |

<table>
<thead>
<tr>
<th>UNIT – IV</th>
<th>8 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shift Registers and Counters</strong></td>
<td>Introduction, Data Transmission In Shift Registers, Serial In Serial Out Shift Register, Serial In Parallel Out Shift Register, Parallel In Serial Out Shift Register, Parallel In Parallel Out Shift Register, <strong>Design of</strong> shift registers using JK and D flip Flop’s, Application Of Shift Registers: Ring Counter, Johnson Counter, Up/Down Synchronous and Asynchronous Introduction, Design counters using JK and T Flip flop</td>
</tr>
<tr>
<td>Self-study component:</td>
<td>Effects of propagation delay in ripple counters, Sequence detector design</td>
</tr>
</tbody>
</table>
| **Practical Topics:** | 1. Design and demonstrate 3-bit serial in serial out shift register using D Flip Flop’s  
2. Design and demonstrate 2-bit synchronous counter for the given sequence using JK Flip Flop. |
### UNIT – V

<table>
<thead>
<tr>
<th>8 Hours</th>
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<tbody>
<tr>
<td><strong>Introduction to VHDL</strong> : Hardware description languages, VHDL description of combinational circuits, VHDL models for multiplexers, VHDL modules, Sequential statements and VHDL processes, Modeling Flip-flops using VHDL Processes, VHDL Modeling registers and counters using VHDL processes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Self-study component:</th>
<th>Compilation, simulation and synthesis of VHDL code, Simple synthesis examples.</th>
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<table>
<thead>
<tr>
<th>Practical Topics: (4 Hours)</th>
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<tbody>
<tr>
<td>Write the VHDL code for basic gates and verify its working (For practice only)</td>
</tr>
<tr>
<td>1. Write the VHDL code for 8:1 Mux. Simulate and verify it's working.</td>
</tr>
<tr>
<td>2. Write the VHDL code for JK and D flip-flop. Simulate and verify it’s working.</td>
</tr>
<tr>
<td>3. Write the VHDL code for 3-bit synchronous down counter. Simulate and verify it's working.</td>
</tr>
</tbody>
</table>

**NOTE**

Practical Topics will be changed every academic year

**Course Outcomes:** On completion of this course, students are able to:

<table>
<thead>
<tr>
<th>COs</th>
<th>Course Outcomes with <strong>Action verbs</strong> for the Course topics.</th>
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<tbody>
<tr>
<td>CO1</td>
<td>Understand the operation and organization of a digital computer system.</td>
</tr>
<tr>
<td>CO2</td>
<td>Analyze Combinational and Sequential circuits</td>
</tr>
<tr>
<td>CO3</td>
<td>Design Combinational /Sequential logic circuit for the given problem</td>
</tr>
<tr>
<td>CO4</td>
<td>Develop VHDL code for Combinational / Sequential logic circuit</td>
</tr>
<tr>
<td>CO5</td>
<td>Conduct and Simulate practical experiments for demonstrating the working of Combinational and Sequential circuit both with component realization and VHDL code</td>
</tr>
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**Text Book(s):**


**Reference Book(s):**

Web and Video link(s):

1. [https://nesoacademy.org/ec/05-digital-electronics](https://nesoacademy.org/ec/05-digital-electronics)

E-Books/Resources:

2. [https://drive.google.com/file/d/1lw9LhePHIhwBljiWSXrmEJgXj5RE05j4/view?usp=sharing](https://drive.google.com/file/d/1lw9LhePHIhwBljiWSXrmEJgXj5RE05j4/view?usp=sharing)

### CO-PO Mapping

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<th>PO 9</th>
<th>PO 10</th>
<th>PO 11</th>
<th>PO 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td><strong>Apply</strong> Boolean Algebra / K Map and knowledge of fundamental gates in minimizing Logic function</td>
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<tr>
<td>CO2</td>
<td><strong>Analyze</strong> Combinational and Sequential circuits</td>
<td>1</td>
<td>3</td>
<td>1</td>
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<tr>
<td>CO3</td>
<td><strong>Design</strong> combinational /sequential logic circuit for the given problem</td>
<td>1</td>
<td>2</td>
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<tr>
<td>CO4</td>
<td><strong>Implement</strong> Combinational/ Sequential logic circuit using VHDL code</td>
<td>1</td>
<td>1</td>
<td>2</td>
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<tr>
<td>CO5</td>
<td><strong>Conduct</strong> and Simulate practical experiments for demonstrating the working of combinational and sequential circuit both with component realization and VHDL code</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
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# OBJECT ORIENTED PROGRAMMING WITH JAVA

[As per Choice Based Credit System (CBCS) & OBE Scheme]

## SEMESTER – III

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<td>Total Theory Teaching Hours:</td>
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</tr>
<tr>
<td>Total Laboratory Hours:</td>
<td>24</td>
<td></td>
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</tr>
</tbody>
</table>

## Course Learning Objectives:
The students will be able to
- Understand fundamentals of Object Oriented Concepts.
- Explore the features of Object-oriented Programming in Java for defining classes, methods and invoking methods.
- Write program in Java to solve specified problems.

## UNIT – I

### 8 Hours

### Object Oriented Concepts:
Fundamentals of Object Oriented programming - Object oriented paradigm, basics concepts of object oriented programming, benefits of object oriented programming, applications of object oriented programming.

### JAVA Basics:
JVM architecture. The scope and life time of variables, control statements, type conversion and casting, simple java programs.

### Self-study component:
Data types and operators

### Practical Topics:
1. Write a program to find the sum of the series \(1 + \frac{1}{(2*2)} + \frac{1}{(3*3)} + \frac{1}{(4*4)} + \ldots + \frac{1}{(n*n)}\).
2. Write a Java program for printing Pascals's Triangle (5 rows) using nested loops.
3. Write a program that accepts three numbers from the user and prints "increasing" if the numbers are in increasing order, "decreasing" if the numbers are in decreasing order, and "Neither increasing or decreasing order" otherwise.

## UNIT – II

### 8 Hours

### Classes, Objects and Methods:
Class Fundamentals, How objects are created, Reference variables, methods, Returning from a method returning, Returning a value, Constructors, Parameterized constructors, this keyword.

Java access modifiers, Passing objects to methods, How augment are passed, Returning Objects, Method overloading, Overloading constructors, Static- variables, methods and blocks, Nested and Inner class, Variable length arguments basics.

### Self-study component:
Arrays

### Practical Topics:
1. Create a Java class called Complex with the following details and variables within it as (i) Real (ii) Imaginary.
   - Develop a Java program to perform addition and subtraction of two complex numbers by using the method add() and subtract( )
respectively by passing object as parameter and display result using method display(). Initialize the real and imaginary values of the complex number using parameterized constructor.

2. A class called MyTime, which models a time instance with private instance variables: hour: between 0 to 23, minute: between 0 to 59, constructor shall invoke the setTime() method to set the instance variable (setTime(int hour, int minute): It shall check if the given hour and minute are valid before setting the instance variables). Define methods - getHour(), getMinute(),nextMinute() Update this instance to the next minute and return this instance. Take note that the nextMinute() of 23:59 is 00:00 nextHour() is similar to the above. Write the code for the MyTime class. Also write a test program (called TestMyTime) to test all the methods defined in the MyTime class.

UNIT – III

Inheritance: Inheritance basics, Member access and inheritance, Constructors and Inheritance, Using super to call super class constructor, Using super to access super class members, Creating a multilevel hierarchy, Execution of constructors, Super class reference and Subclass objects, Method overriding, Abstract class.

Self-study component: Using final

Practical Topics:

1. Assume that a bank maintains two kinds of accounts for customers, one called as savings account and the other as current account. Create a class Account that stores customer name, account number and type of account. From this derive the classes Curr-acct and Sav-acct to make them more specific to their requirements. The savings account provides compound interest and withdrawal facilities. The current account does not provide interest. Current account holders should also maintain a minimum balance (Rs 5000) and if the balance falls below this level, a service charge (Rs 100) is imposed. Include the necessary methods in order to achieve the following tasks:

☐ Accept deposit from customer and update the balance.
☐ Display the balance.
☐ Compute and deposit interest
☐ Permit withdrawal and update the balance
☐ Check for the minimum balance(only for Current account), impose penalty if necessary and update the balance.

2. Design a base class Circle with member variables (radius of type double and color of type character), methods (getRadius(), getArea()) and constructors (Circle(radius), Circle(radius, color)). Derive subclass called Cylinder from the super class Circle with
member variable (height) of type double, public methods (getHeight(),
getVolume(),
getArea()) and
constructors(Cylinder(height),Cylinder(height,radius),Cylinder(height,
radius, color)). Create the two instances of cylinder and print similar
cylinders if the area, volume and color of cylinders are same.
Demonstrate the code reuse and polymorphism properties of Object
oriented programming by inheriting the constructors and methods of
the base class.

Derive subclass called Cylinder from the superclass Circle with
member variable (height) of type double, public methods (getHeight(),
getVolume(), getArea()) and its constructors(Cylinder(height, radius),
Cylinder(height, radius,color)). Create the two instances of cylinder
and print similar cylinders if the area, volume and color of cylinders
are same. Demonstrate the code reuse and polymorphism properties of
Object oriented programming by inheriting the constructors and
methods of the base class.

UNIT – IV  8 Hours

Interface: Interface fundamentals, Creating an interface, Implementing an interface, Using interface
references
Packages: Fundamentals of packages, Packages and member access, Importing packages.
Multiprocess Programming: The Java thread model, Creating a thread, Creating multiple threads,
Using isalive() and Join(), Thread priorities.
Self-study component: Constants in Interfaces, Nested Interfaces

Practical Topics:

1. Create two classes called HDFCAccount and StateBankAccount that
implements all the methods defined in interface Account. Declare the
methods getBalance, deposit and withdraw in Account interface.
HDFCAccount uses member variables deposits and withdrawals for
maintaining the balance, where as State BankAccount uses
only balance to maintain the balance. In the main method create
objects of HDFCAccount and StateBankAccount, but assigned them to
the reference of the interface Account. Also write an method to print
balance in main which prints the balance amount.

2. Create a package CIE which has two classes- Student and Internals.
The class Student has members like usn, name, sem. The class
internals has an array that stores the internal marks scored in six
courses of the current semester of the student. Create another package
SEE which has the class External which is a derived class of Student.
This class has an array that stores the SEE marks scored in six courses
of the current semester of the student. Import the two packages in a
file that declares the final marks of N students in all six courses.

3. Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number

<table>
<thead>
<tr>
<th>UNIT – V</th>
<th>8 Hours</th>
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</thead>
</table>

**Exception handling:** Fundamentals, Exception hierarchy, uncaught exceptions, using try and catch, multiple catch clauses, throw, finally, Java’s built-in exceptions.

**Generics:** generic fundamentals, bounded types, generic methods, generic constructors, generic class hierarchies.

<table>
<thead>
<tr>
<th>Self-study component:</th>
<th>Generic interfaces, throws</th>
</tr>
</thead>
</table>

**Practical Topics:**

1. Write a java program to handle the following exceptions based on choice made by the user by writing suitable try and catch block.
   i) ArithmeticException
   ii) ArrayIndexOutOfBoundsException
   iii) NumberFormatException
   iv) StringIndexOutOfBoundsException
   v) NullPointerException

2. Define a class Sort with generic method by name Arrange(T[]) and Display(T[]). Write a program to sort array elements of different data types.

**Course Outcomes:** On completion of this course, students are able to:

<table>
<thead>
<tr>
<th>COs</th>
<th>Course Outcomes with Action verbs for the Course topics.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>Understand and explore the fundamental concepts of object oriented programming language.</td>
</tr>
<tr>
<td>CO2</td>
<td>Apply the syntax and semantics of java for solving a given problem.</td>
</tr>
<tr>
<td>CO4</td>
<td>Analyze the given Java code snippet to identify the bugs and correct the code.</td>
</tr>
<tr>
<td>CO3</td>
<td>Conduct experiments using IDE to demonstrate the features of Java programming language.</td>
</tr>
</tbody>
</table>

**Text Book(s):**


**Reference Book(s):**

Publications

E-Books/Resources:
   URL: https://upload.wikimedia.org/wikipedia/commons/e/e7/Java_Programming.pdf
https://upload.wikimedia.org/wikipedia/commons/e/e7/Java_Programming.pdf

CO-PO Mapping

<table>
<thead>
<tr>
<th>CO</th>
<th>Statement</th>
<th>PO 1</th>
<th>PO 2</th>
<th>PO 3</th>
<th>PO 4</th>
<th>PO 5</th>
<th>PO 6</th>
<th>PO 7</th>
<th>PO 8</th>
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<th>PO 10</th>
<th>PO 11</th>
<th>PO 12</th>
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<td>CO1</td>
<td>Understand and explore the fundamental concepts of object oriented programming language.</td>
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<tr>
<td>CO2</td>
<td>Apply the syntax and semantics of java for solving a given problem.</td>
<td>2</td>
<td>2</td>
<td>2</td>
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<tr>
<td>CO3</td>
<td>Analyze the given Java code snippet to identify the bugs and write correct code.</td>
<td>2</td>
<td>2</td>
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<tr>
<td>CO4</td>
<td>Conduct experiments using IDE to demonstrate the features of Java programming language.</td>
<td>2</td>
<td>2</td>
<td>2</td>
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# DATA STRUCTURES LABORATORY

[As per Choice Based Credit System (CBCS) & OBE Scheme]

## SEMESTER – III

<table>
<thead>
<tr>
<th>Course Code:</th>
<th>P21ISL306</th>
<th>Credits:</th>
<th>01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching Hours/Week (L:T:P):</td>
<td>0:0:2</td>
<td>CIE Marks:</td>
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</tr>
<tr>
<td>Total Number of Lab Hours:</td>
<td>24</td>
<td>SEE Marks:</td>
<td>50</td>
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</tbody>
</table>

**Note:** All programs are to be implemented using C Language

1. Create a structure **DISTANCE** with data members *kms* and *meters* of type integer. Implement a program to perform addition and subtraction on two distances by passing pointer to a structure to function.

2. Implement SLL which performs the following operations.
   1. Create SLL of ‘n’ integers(insert front/rear)
   2. Delete the specified integer from the list with appropriate message.
   3. Display the contents of the list.

3. Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Library Data with the fields: BOOK_ID, BOOK_TITLE, AUTHOR, EDITION
   1. Create an ordered DLL of N books.
   2. Count the number of nodes in the DLL.
   3. Delete a node at the specified position.
   4. Display the contents of DLL.

4. Implement a program to add two polynomials.

5. Implement a menu driven Program for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX)
   1. Push an Element on to Stack (Handle the situation of overflow)
   2. Pop an Element from Stack (Handle the situation of underflow)
   3. Display the status of Stack
   Support the program with appropriate functions for each of the above operations

6. Implement a Program to convert infix to postfix expression.

7. Implement the following using recursion:
   1. Tower_of_Hanoi
   2. GCD of two numbers
   3. Largest of ‘n’ numbers

8. Implement a menu driven Program for the following operations on QUEUES of Strings using Linked list
   1. Insert an Element into Queue
   2. Delete an Element from Queue
   3. Display the status of Queue

9. Implement a program to perform the operations on priority queue.
10. Implement a menu driven Program for the following operations on Binary Search Tree (BST) of Integers
   1. Create a BST of N Integers
   2. Traverse the BST in Inorder, Preorder and Postorder

<table>
<thead>
<tr>
<th>CO</th>
<th>Statement</th>
<th>PO 1</th>
<th>PO 2</th>
<th>PO 3</th>
<th>PO 4</th>
<th>PO 5</th>
<th>PO 6</th>
<th>PO 7</th>
<th>PO 8</th>
<th>PO 9</th>
<th>PO 10</th>
<th>PO 11</th>
<th>PO 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>Design algorithms using different data structures like List, Stack, Queue and Trees.</td>
<td>2</td>
<td>2</td>
<td>2</td>
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</tr>
<tr>
<td>CO2</td>
<td>Develop programs with suitable data structure based on the requirements of the real-time applications.</td>
<td>2</td>
<td>2</td>
<td>2</td>
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<td>1</td>
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</tbody>
</table>
# EMPLOYABILITY ENHANCEMENT SKILLS (EES) - III

[As per Choice Based Credit System (CBCS) & OBE Scheme]

## SEMESTER – III

<table>
<thead>
<tr>
<th>Course Code:</th>
<th>Credits:</th>
<th>CIE Marks:</th>
<th>SEE Marks:</th>
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<tbody>
<tr>
<td>P21HSMC308</td>
<td>01</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

## Course Learning Objectives:
This course will enable students to:
- Build Personal Branding, team binding.
- Present the data using presentation skills in a better manner.
- Understand the importance of stress management, Entrepreneurship & Business skills.
- Usage of various voices in a sentence and critical reasoning.
- Explain the basic concepts in boat and stream, geometry and trigonometry problems.
- Calculations involving Permutations and combinations, probability and logarithms.
- Explain concepts behind logical reasoning modules of analytic, syllogisms, venn diagrams and puzzles.

## UNIT – I

**8 Hours**

### Soft Skills:
Personal Branding, Synergy between Teams (Online and Offline), Interview skills, Stress Management, Entrepreneurship & Business skills.

### Verbal Ability:
Active voice and passive voice, critical reasoning.

### Self-Study:
Corporate ethics and Mannerism

## UNIT – II

**10 Hours**

### Quantitative Aptitude:
Boats and streams, Geometry & Trigonometry, Permutations and combinations, Probability & Logarithms.

### Self-Study:
Pipes and cisterns

## UNIT – III

**10 Hours**

### Logical Reasoning:
Analytical reasoning, Syllogisms, clocks and calendars, Venn diagram, puzzles.

### Self-Study:
Binary logic
### Course Outcomes:
On completion of this course, students are able to:

<table>
<thead>
<tr>
<th>CO – 1:</th>
<th>Exhibit amplified level of confidence to express themselves in English</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO – 2:</td>
<td>Develop the presentation skills, entrepreneurial skills by managing stress at various levels.</td>
</tr>
<tr>
<td>CO – 3:</td>
<td>Solve the problems based on Boats and streams, Geometry &amp; Trigonometry, Permutations and combinations, Probability &amp; Logarithms.</td>
</tr>
<tr>
<td>CO – 4:</td>
<td>Solve logical reasoning problems based on Analytical reasoning, Syllogisms, clocks and calendars, cases and Venn diagram, puzzles.</td>
</tr>
</tbody>
</table>

### Text Book(s):
2. Essential English Grammar by Raymond Murphy, Cambridge University Press, new edition
3. The 7 habits of Highly Effective People by Stephen R. Covey
4. Quantitative aptitude by Dr. R. S Agarwal, published by S.Chand private limited.
5. Verbal reasoning by Dr. R. S Agarwal, published by S. Chand private limited.

### Reference Book(s):
1. Quantitative Aptitude by Arun Sharma, McGraw Hill Education Pvt Ltd
2. CAT Mathematics by Abhijith Guha, PHI learning private limited.

### Web and Video link(s):
1. NPTEL Course: Soft skills by By Prof. Binod Mishra, IIT Roorkee
   [https://onlinecourses.nptel.ac.in/noc21_hs76/preview](https://onlinecourses.nptel.ac.in/noc21_hs76/preview)
# INNOVATION AND DESIGN THINKING

[As per Choice Based Credit System (CBCS) & OBE Scheme]

## SEMESTER – III

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>P21AEC309</td>
<td>01</td>
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<table>
<thead>
<tr>
<th>Teaching Hours/Week (L: T: P: S)</th>
<th>CIE Weightage</th>
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<tbody>
<tr>
<td>0:2:0</td>
<td>50%</td>
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</table>

<table>
<thead>
<tr>
<th>Total Hours of Pedagogy</th>
<th>SEE Weightage</th>
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</thead>
<tbody>
<tr>
<td>25</td>
<td>50%</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Exam Hour</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>100</td>
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</tbody>
</table>

**Course Category:** Foundation

**Preamble:** This course provides an introduction to the basic concepts and techniques of engineering and reverses engineering, the process of design, analytical thinking and ideas, basics and development of engineering drawing, application of engineering drawing with computer aide.

**Course objectives:**
- To explain the concept of design thinking for product and service development
- To explain the fundamental concept of design thinking
- To discuss the methods of implementing design thinking in the real world.

## Module-1

**Understanding Design Thinking**

## Module-2

**Features of Design Thinking**
Venn diagram of design thinking– Design thinking resources – Design thinking process Models – Design thinking methodologies

## Module-3

**Models to Do Design Thinking**

## Module-4

**Design thinking for Engineering** - Concept models for comparing design thinking and engineering systems thinking - The Distinctive Concept Model - The Comparative Concept Model - The Inclusive Concept Model - The Integrative Concept Model.

## Module-5

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

<table>
<thead>
<tr>
<th>CO Nos.</th>
<th>Course Outcomes</th>
<th>Knowledge Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>Understanding Design Thinking process</td>
<td>L2</td>
</tr>
<tr>
<td>CO2</td>
<td>Appreciate various design process procedure</td>
<td>L2</td>
</tr>
<tr>
<td>CO3</td>
<td>Generate and develop design ideas through different Technique.</td>
<td>L2</td>
</tr>
<tr>
<td>CO4</td>
<td>Identify the significance of reverse Engineering to Understand products</td>
<td>L3</td>
</tr>
<tr>
<td>CO5</td>
<td>Practice the methods, processes, and tools of Design Thinking</td>
<td>L2</td>
</tr>
</tbody>
</table>

Suggested Learning Resources:

Text Books:

References:
1. Jake knapp, John keratsky and Braden kowitz “Sprint how to solve big problems and test new ideas in just five days”
2. Tim Brown “Change by design”
3. Steve Krug “Don’t make me think; Revisited”
4. Roger martin “The design of Business”
### BASIC ENGINEERING MATHEMATICS - I

[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – III (Lateral Entry: Common to all branches)

<table>
<thead>
<tr>
<th>Course Code:</th>
<th>P21MDIP301</th>
<th>Credits:</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching Hours/Week (L:T:P):</td>
<td>2-2-0</td>
<td>CIE Marks:</td>
<td>100</td>
</tr>
<tr>
<td>Total Number of Teaching Hours:</td>
<td>40</td>
<td>SEE Marks:</td>
<td>-</td>
</tr>
</tbody>
</table>

**Course Learning Objectives:** The mandatory learning course P21MADIP301 viz., **Basic Engineering Mathematics-I** aims to provide basic concepts of complex trigonometry, vector algebra, differential & integral calculus, vector differentiation and various methods of solving first order differential equations.

#### UNIT – I

8 Hours

**Complex Trigonometry:** Complex Numbers: Definitions & properties. Modulus and amplitude of a complex number, Argand’s diagram, De- Moivre’s theorem (without proof).


**Self-study component:** De-Moivre’s theorem (without proof). Roots of complex number - Simple problems.

#### UNIT – II

8 Hours

**Differential Calculus:** Polar curves –angle between the radius vector and the tangent pedal equation- Problems. Taylor’s series and Maclaurin’s series expansions- Illustrative examples.

**Partial Differentiation:** Elementary problems. Euler’s theorem for homogeneous functions of two variables. Total derivatives-differentiation of composite and implicit function.

**Self-study component:** Review of successive differentiation. Formulae for \(^n\)th derivatives of standard functions- Liebnitz’s theorem (without proof). Application to Jacobians, errors & approximations.

#### UNIT – III

8 Hours

**Integral Calculus:** reduction formulae for \(\sin^nx, \cos^nx, \text{and } \sin^nxcos^nx\) and evaluation of these with standard limits-Examples. Applications of integration to area, length of a given curve, volume and surface area of solids of revolution.

**Self-study component:** Differentiation under integral sign (Integrals with constants limits)-Simple problems.

#### UNIT – IV

8 Hours

**Vector Differentiation:** Differentiation of vector functions. Velocity and acceleration of a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence, Curl and Laplacian (Definitions only).

**Self-study component:** Solenoidal and irrotational vector fields-Problems.
UNIT – V

Ordinary differential equations (ODE’s): Introduction-solutions of first order and first degree differential equations: homogeneous, exact, lineardifferential equations of order one and equations reducible to above types.

Self-study component: Applications of first order and first degree ODE’s - Orthogonal trajectories of Cartesian and polar curves. Newton’s law of cooling, R-L circuits- Simple illustrative examples from engineering field.

Course Outcomes: After the successful completion of the course, the students are able to

CO1 Explain the fundamental concepts –in complex numbers and vector algebra to analyze the problems arising in related area of engineering field.

CO2 Identify – partial derivatives to calculate rate of change of multivariate functions.

CO3 Apply - the acquired knowledge of integration and differentiation to evaluate double and triple integrals to compute length surface area and volume of solids of revolution and identify velocity, acceleration of a particle moving in a space.

CO4 Find analytical solutions by solving first order ODE’s which arising in different branches of engineering.

TEXT BOOKS

REFERENCE BOOKS
**Course Code:** P21HDIP308  
**Credits:** 01

**Teaching Hours/Week (L:T:P):** 0:2:0  
**CIE Marks:** 100

**Total Number of Teaching Hours:** 28  
**SEE Marks:** -

**Course Learning Objectives:** This course will enable students to:
- Get introduced to some of the concepts of soft skills and enhance communication skills
- Recognize common mistakes done by an individual in the course of his / her communication
- Write effective emails
- Identify their strengths, weakness, opportunities and threats
- Understand the basic rules of sentence structures
- Understand the correct usage of parts of speech, tenses and articles
- Explain divisibility roles, properties of various types of numbers
- Explain application of percentage in our daily life
- Describe the concepts of profit, loss, discounts
- Explain concepts behind logical reasoning modules of arrangements and blood relations

### UNIT – I  
10 Hours

**Soft Skills:** LSRW, Listening, communication skills (verbal and non-verbal skills), public speaking, Email writing, SWOT Analysis

**Self-Study:** Motivation and Time Management

### UNIT – II  
10 Hours

**Verbal Ability:** Parts of Speech - Prepositions, Adjectives and Adverbs; Tenses, Articles, Idioms and Phrasal verbs, Subject verb agreement, Synonyms and Antonyms

**Self-Study:** Para jumbles and one word substitution

### UNIT – III  
8 Hours

**Quantitative Aptitude:** Number system, Percentage, Profit & Loss

**Logical Reasoning:** Blood Relations and Arrangements

**Self-Study:** Speed Maths
**Course Outcomes:** On completion of this course, students are able to:

| CO – 1: | Exhibit amplified level of confidence to express themselves in English |
| CO – 2: | Understand the correct usage of tenses and articles |
| CO – 3: | Increase the number of words in his/her day to day |
| CO – 4: | Solve logical reasoning problems based on blood relations and arrangements |
| CO - 5: | Solve the problems based on number system, percentage and profit & loss |

**Text Book(s):**

2. Essential English Grammar by Raymond Murphy, Cambridge University Press, new edition
3. The 7 habits of Highly Effective People by Stephen R. Covey
4. Quantitative aptitude by Dr. R. S Agarwal, published by S.Chand private limited.
5. Verbal reasoning by Dr. R. S Agarwal, published by S. Chand private limited.

**Reference Book(s):**

1. Quantitative Aptitude by Arun Sharma, McGraw Hill Education Pvt Ltd
2. CAT Mathematics by Abhijith Guha, PHI learning private limited.

**Web and Video link(s):**

1. Improve Your English Communication Skills Specialization
   [https://www.coursera.org/specializations/improve-english](https://www.coursera.org/specializations/improve-english)

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**COURSE ARTICULATION MATRIX [Employability Enhancement Skills (EES) - I]**

<table>
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<th>PO2</th>
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</table>
P.E.S. College of Engineering, Mandya
Department of Information Science & Engineering

APPLIED MATHEMATICAL METHODS
[As per Choice Based Credit System (CBCS) & OBE Scheme]
SEMESTER – IV (Common to EC, EE, CS, IS)

<table>
<thead>
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<tr>
<td>Total Number of Teaching Hours:</td>
<td>40</td>
<td>SEE Marks:</td>
<td>50</td>
</tr>
</tbody>
</table>

Course Learning Objectives:
- Adequate exposure to basics of engineering mathematics so as to enable them to visualize the applications to engineering problems.
- Analyze the concept of complex variables in terms of real variables
- Understand the concept of statistical methods to fit curves of samples and correlation and regression analysis
- To have an insight into numerical techniques to find solution of equations having no analytic solutions
- Provide insight into the development of probability distribution of discrete and continuous random variables
- Testing hypothesis of sample distribution

UNIT – I
8 Hours


Conformal transformations: Introduction. Discussion of transformations \( u = \omega^2, v = \omega, \) \( \omega = z+1/z, (\omega \neq 0). \) Bilinear transformations- Problems.

Self-study component:
- Derivation of Cauchy- Riemann equation in Cartesian and polar forms, transformations of reflection, translation and Inversion.

UNIT – II
8 Hours

Complex integration: complex line integrals. Cauchy theorem, Cauchy integral formula. Taylor’s and Laurent’s series (Statements only) and illustrative examples. Singularities, poles and residues. (Statement only). Examples.

Curve Fitting: Curve fitting by the method of least squares, fitting the curves of the forms \( y = a x^2 + b x + c, b e^{by} = y, x = b + \frac{y}{b + c}. \)

Statistical Methods: Correlation and regression-Karl Pearson’s coefficient of correlation and rank correlation- problems, Regression analysis, lines of regression, problems.

Self-study component:
- Contour integration Type-I & Type-II.

UNIT – III
8 Hours

Solution of algebraic and transcendental equations: Introduction, Bisection method, Regula-Falsi & Newton-Raphson method:- Illustrative examples only.

Numerical solution of ordinary differential equations (ODE’s): Numerical solutions of
ODE’s of first order and first degree – Introduction. Taylor’s series method. Modified Euler’s method, Runge-Kutta method of fourth order (All formulae without proof). Illustrative examples only.


<table>
<thead>
<tr>
<th>Self-study component:</th>
<th>Solution of equations using secant method, Picards method.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>UNIT – IV</th>
<th>8 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-study component:</td>
<td>Geometric and Gamma distributions- problems.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT – V</th>
<th>8 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stochastic Processes and sampling theory:</strong> <strong>Markov Chains</strong>: Markov chains, Classification of Stochastic processes, Probability vector, Stochastic matrix, Regular stochastic matrix, Transition probabilities and Transition probability matrix. <strong>Testing of Hypothesis</strong> Sampling distributions-introduction. Standard error, Type-I and Type-II errors. Testing of hypothesis and confidence intervals for means. Student’s <em>t</em> – distribution and Chi-square distribution as a test of goodness of fit - Illustrative examples only.</td>
<td></td>
</tr>
<tr>
<td>Self-study component:</td>
<td>Classification of Stochastic process, Bernoulli Process, Poisson Process</td>
</tr>
</tbody>
</table>

| **Course Outcomes**: On completion of the course, student should be able to: |
|-----------------|------------------------------------------------------------------|
| **CO1** | **Apply** the concepts of an analytic function and their properties to solve the problems arising in engineering field |
| **CO2** | **Use** the concept of correlation and regression analysis to fit a suitable mathematical model for the statistical samples arise in engineering field |
| **CO3** | **Apply** the acquired knowledge of numerical technique to solve equations approximately having no analytical solutions. |
| **CO4** | **Explain** discrete and continuous probability distributions in analyzing the probability models and solve problems involving Markov chains. |
TEXT BOOKS

REFERENCE BOOKS

ONLINE RESOURCES
1. http://www.nptel.ac.in

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Strength of correlation: Low-1, Medium- 2, High-3
THEORY OF COMPUTATION
[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMIESTER - IV

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Course Learning Objectives:
- Design finite automata
- Design regular expression
- Design CFG
- Design push-down automata
- Design Turing machines

UNIT – I 8 Hours
FINITE AUTOMATA : Chomsky Hierarchy, Deterministic finite automata, Nondeterministic finite automata, Finite automata with Epsilon transitions, Application of finite automata

Self-study component: Extended transitions and languages for DFA, NFA and \( \epsilon \)-NFA

UNIT – II 8 Hours
REGULAR EXPRESSIONS, LANGUAGES AND PROPERTIES: Regular expressions, Finite Automata and Regular Expressions, Pumping Lemma for regular languages, Equivalence and minimization of automata, Applications.

Self-study component: Closure properties; Decision properties

UNIT – III 8 Hours
CONTEXT FREE GRAMMERS, LANGUAGES AND PROPERTIES: Context-free grammars, Parse trees, Ambiguity in CFG, The pumping lemma for CFLs, Normal forms: Chomsky’s Normal Forms, GNF, Applications.

Self-study component: Closure properties of CFLs.

UNIT – IV 8 Hours
PUSHDOWN AUTOMATA: Definition of the Pushdown automata, the languages of a PDA, Deterministic Pushdown Automata, Equivalence of PDA’s and CFG’s, CFG to PDA.

Self-study component: PDA to CFG

UNIT – V 8 Hours
TURING MACHINES The turning machine; Programming techniques for Turning Machines; Extensions to the basic Turning Machines, Undecidable problem that is RE, Post’s Correspondence problem.

## COs - Course Outcomes with action verbs for the course topics

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<tr>
<th>CO</th>
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<td>CO1</td>
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<td>CO2</td>
<td>Apply the knowledge of Automata Theory for formal Languages</td>
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<td>Analyze automata and their computational power to recognize languages</td>
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<tr>
<td>CO4</td>
<td>Design an automaton.</td>
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</table>

### Text Book(s):

### Reference Book(s):

### Web and Video link(s):

### E-Books/Resources:
1. [https://tinyurl.com/bdfst7kn](https://tinyurl.com/bdfst7kn)

## CO-PO Mapping

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DESIGN AND ANALYSIS OF ALGORITHMS
[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – IV

Course Code: P21IS403
Credits: 03
Teaching Hours/Week (L:T:P): 3:0:0
CIE Marks: 50
Total Number of Teaching Hours: 40
SEE Marks: 50

Prerequisites: Students should have knowledge of Programming language and Data structures.

Course Learning Objectives: This course will enable students to:

- Explain various computational problem-solving techniques.
- Apply appropriate method to solve a given problem.
- Describe various methods of algorithm analysis.

UNIT - I


Self-study component: Additional Examples of Mathematical analysis of Non-Recursive & Recursive Algorithms.

UNIT - II


Self-study component: Bubble Sort and Sequential Search.

UNIT - III

Divide and Conquer: Merge sort, Quick Sort, Multiplication of Large integers and Strassen’s Matrix Multiplication. Transform and Conquer: Presorting, Balanced Search Trees, Heaps and Heap sort.

Self-study component: Binary Tree Traversals and Related Properties.

UNIT - IV


**UNIT - V**

<table>
<thead>
<tr>
<th>8 Hours</th>
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<tbody>
<tr>
<td>Greedy Technique: Kruskal’s Algorithm, Prim’s Algorithm, Dijkstra’s Algorithm. Limitations of Algorithm Power: P, NP and NP- Complete Problems. Coping with the Limitations of Algorithm Power: Backtracking: n-Queens Problem, Subset-Sum Problem, Branch and Bound: Knapsack Problem.</td>
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<td>Self-study component:</td>
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**Course Outcomes:** On completion of this course, students are able to:

- **CO1** Understand the basic concepts of various algorithmic techniques
- **CO2** Analyze the asymptotic performance of algorithms
- **CO3** Design solutions for the given problem using algorithmic technique.

**Text Book(s):**


**Reference Book(s):**


**Web and Video link(s):**

1. Algorithms: Design and Analysis, Part 1 (Coursera) | MOOC List (mooc-list.com)
2. https://onlinecourses.nptel.ac.in/noc15_cs02/preview

**CO-PO Mapping**

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# DATABASE MANAGEMENT SYSTEM
[As per Choice Based Credit System (CBCS) & OBE Scheme]

## SEMESTER – IV

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### Course Learning Objectives:
1. To learn the basic knowledge of Database Management System and various types of data models.
2. To learn the concept and syntax of ER Diagram, relational data model and relational algebra.
3. To learn and write various SQL queries.
4. To learn the concept of Normalization.
5. To learn the various issues in Transaction processing.

## UNIT – I

### 8 Hours

### Introduction to Databases:
Introduction, Characteristics of the database approach, Advantages of using the DBMS Approach.

### Database System Concepts and Architecture:
Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence.

### Introduction to ER model:
Entity Types, Entity Sets, attributes and keys, Relation Types, Relationship Sets, roles, and structural constraints, Weak Entity Types, ER Diagrams.

### Self-study component:
Actors on the scene, Workers behind the scene, Database Languages and Interfaces, Relationship Types of Degree Higher Than Two

### Practical Topics:
(6 Hours)
1. Introduction to ER diagram tool. (Draw.io)
2. Create an ER diagrams Company Database system and Banking database System using tool.

## UNIT – II

### 8 Hours

### Relational Model:
Relational Model Concepts, Relational Model Constraints, update operations dealing with constraint violations, Relational Database Design using ER-to-Relational mapping.

### Relational Algebra:
Unary and Binary relational operations, Examples of simple queries in relational algebra.

### Creation of table in SQL:
SQL DataDefinition and Data types.

### Self-study component:
Additional relational operations,

### Practical Topics:
(6 Hours)
1. **Consider the company database and create the below tables by properly specifying the primary keys and the foreign keys**
   - **Employee** (Fname: varchar, Minit: Char, Lname: varchar, ssn:int, Bdate: Date, Address: varchar, Sex: char, salary: decimal, Super_ssn:int, DNO:int)
### Department (Dname: varchar, Dnumber: int, mgr_ssn: int, mgr_start_date: date)

### Dept_location (Dnumber: int, Dlocation: varchar)

### Project (pname: varchar, pnumber: int, plocation: varchar, dnum:int)

### Works_on (Essn: int, pno:int, hours: decimal)

### Dependent (Essn: char, dependent_name: varchar, sex: char, Bdate: date, relationship: varchar)

1. Insert at least five tuples in each relation.

---

#### UNIT – III

8 Hours

**SQL:** Specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, More Complex SQL Retrieval Queries.

**Self-study component:** Schema change statements in SQL.

**Practical Topics:** (4 Hours)

1. Retrieve the name and address of all employees who work for the ‘Research’ department.
2. For every project located in ‘Stafford’, list the project number, the controlling department number, and the department manager’s last name, address, and birth date.
3. For each employee, retrieve the employee’s first and last name and the first and last name of his or her immediate supervisor.
4. Make a list of all project numbers for projects that involve an employee whose last name is ‘Smith’, either as a worker or as a manager of the department that controls the project.
5. Retrieve all employees whose address is in Houston, Texas.
6. Retrieve all employees in department 5 whose salary is between $30,000 and $40,000.
   
   Execute above quires for the Company database defined in Unit-II.

#### UNIT – IV

8 Hours

**Specifying Constraints as Assertions and Triggers, Views in SQL.**


**Self-study component:** Nested Queries

**Practical Topics:** (4 Hours)

1. Retrieve the names of all employees who do not have supervisors.
2. Retrieve the name of each employee who has a dependent with the same first name and is the same gender as the employee.
3. Retrieve the names of employees who have no dependents.
4. List the names of managers who have at least one dependent.
5. Retrieve the Social Security numbers of all employees who work on project numbers 1, 2, or 3.
6. Find the sum of the salaries of all employees of the ‘Research’
department, as well as the maximum salary, the minimum salary, and
the average salary in this department.
7. For each department, retrieve the department number, the number of
employees in the department, and their average salary.
Execute above queries for the Company database defined in Unit-II.

UNIT – V

Database Design: Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.


Self-study component: Characterizing schedules based on recoverability

Practical Topics: (4 Hours)
Consider the following database for a Banking enterprise:
BRANCH (branch-name: string,branch-city: string,assets: real)
ACCOUNT (acco:int,branch-name: string,balance: real)
DEPOSITOR (customer-name: string,acco:int)
CUSTOMER (customer-name: string,customer-street: string,city: string)
LOAN (loan-number:int,branch-name: string,loan-number-int)
BORROWER (customer-name: string,customer-street: string,city: string)

1) Create the above tables by properly specifying the primary and
foreign keys
2) Enter 5 tuples for each relation
3) Find all the customers who have atleast two accounts at the main
branch
4) Find all the customers who have an account at all the branches
located in a specified city
3. Demonstrate how you delete all account tuples at every branch
located in a specified city

Course Outcomes: On completion of this course, students are able to:

<table>
<thead>
<tr>
<th>COs</th>
<th>Course Outcomes with Action verbs for the Course topics.</th>
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</thead>
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<td>CO1</td>
<td>Apply the database concepts to create the relations by specifying various constraints.</td>
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<td>Design ER diagrams for given scenario.</td>
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<td>Apply suitable normalization technique to improve database design.</td>
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<td>CO4</td>
<td>Conduct experiments on given database using modern tools: Draw io,MySQL.</td>
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Text Book(s):

Reference Book(s):

Web and Video link(s):
1. https://onlinecourses.nptel.ac.in/noc22_cs91/
2. https://youtu.be/c5HAwKX-suM

NPTEL Web Course:
1. https://onlinecourses.nptel.ac.in/noc18_cs15/preview
2. http://nptel.ac.in/courses/106106093/
3. http://nptel.ac.in/courses/106106095/

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<td>Design ER diagrams for given scenario.</td>
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## OPERATING SYSTEM
[As per Choice Based Credit System (CBCS) & OBE Scheme]

### SEMESTER – IV

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### Course Learning Objectives:

- To familiarize the operations performed by OS as a resource Manager.
- To impart various scheduling policies of OS.
- To teach different memory management techniques.

### UNIT – I 8 Hours

**Introduction:** Purpose of Operating System, Computer System Architecture, Operating System Structure, Operating System Operations

**System Structures:** Operating System Services, User and Operating system interface, System Calls, Types of System calls, System programs.

**Processes:** Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication.

**Self-study component:** Computer system Organization, Computing Environments, Operating System Structure (chapter 2)

**Practical Topics:**

- 1. Program to implement the Process system calls.
- 2. Program to create a Process using API.

### UNIT – II 8 Hours

**Threads:** Overview, Multicore Programming, Multithreading Models.

**File-system Implementation:** File-System Structure, File-System Implementation, Directory Implementation, Allocation methods.

**Self-study component:** Threading Issues, Free Space Management

**Practical Topics:**

- 1. Program to implement Sequential file allocation method.
- 2. Program to simulate Single level directory file organization technique.

### UNIT – III 8 Hours

**Process Synchronization:** Critical Section Problem, Peterson’s solution, Mutex locks, Semaphores, Classic Problems of Synchronization.

**CPU Scheduling:** Basic concepts, Scheduling Criteria, Scheduling Algorithms-FCFS, SJF, RR, priority.
## Self-study component:
- Synchronization Hardware, Multiple-Processor Scheduling

## Practical Topics:

### UNIT – IV
8 Hours

| Deadlocks: | System Model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock Detection. |
| Main Memory: | Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging. |

| Self-study component: | Recovery from deadlock, Structure of Page Table |
| Practical Topics: (4 Hours) | 1. Simulate Banker’s algorithm for Deadlock Avoidance.  
2. Program to implement and simulate the MFT algorithm. |

### UNIT – V
8 Hours

| Virtual Memory: | Background, Demand paging, Copy on write, Page replacement algorithms-. FIFO page replacement, Optimal page replacement, LRU page replacement |
| Mass-storage structure: | Disk Structure, Disk Scheduling. |

| Self-study component: | Thrashing, Disk Attachment. |
| Practical Topics: (4 Hours) | 1. Program to implement FIFO page replacement technique.  
2. Program to simulate FCFS Disk scheduling algorithm. |

### Course Outcomes:

On completion of this course, students are able to:

#### CO1
Apply Various Process Scheduling Algorithms, Disk Scheduling algorithms, Page replacement algorithms and Deadlock detection and avoidance techniques for providing Operating System functionalities.

#### CO2
Analyze and interpret operating system concepts to acquire a detailed understanding of the course.

#### CO3
Understand and explore the fundamental concepts of various operating system services.

#### CO4
Conduct experiments using Programming Language to demonstrate the Basic features of Operating System.

### Text Book(s):

Reference Book(s):

Web and Video link(s):
1. https://www.youtube.com/watch?v=vBURt97tEkA&list=PLBlnK6fEyqRiVhbXDGLXDrk_OQAeuVcp2O
2. https://www.youtube.com/watch?v=783KAB-tuE4&list=PLIemF3uozcAKTgscIj82voMK3TMR0YE_f

E-Books/Resources:

CO-PO Mapping

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<td>CO2</td>
<td>Analyze and interpret operating system concepts to acquire a detailed understanding of the course.</td>
<td>2</td>
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</tr>
<tr>
<td>CO3</td>
<td>Understand and explore the fundamental concepts of various operating system services.</td>
<td>2</td>
<td>1</td>
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</tr>
<tr>
<td>CO4</td>
<td>Conduct experiments using Programming Language to demonstrate the Basic features of Operating System.</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
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</tbody>
</table>
### EXPERIMENTS

1. Print all the nodes reachable from a given starting node in a digraph using BFS method.

2. Obtain the Topological ordering of vertices in a given digraph (DFS Based).

3. Sort a given set of elements using Merge sort method and determine the time taken to sort the elements. Repeat the experiment for different values of \( n \), the number of elements in the list to be sorted and plot a graph of the time taken versus \( n \).

4. Sort a given set of elements using Quick sort method and determine the time taken to sort the elements. Repeat the experiment for different values of \( n \), the number of elements in the list to be sorted and plot a graph of the time taken versus \( n \).

5. Find the Pattern string in a given Text string using Horspool’s String Matching Algorithm.

6. Sort a given set of elements using Heap Sort algorithm.

7. Implement 0/1 Knapsack problem using Dynamic Programming.

8. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra’s algorithm.

9. Find minimum cost spanning tree of a given undirected graph using Kruskal’s algorithm.

10. Implement Sum-of-Subset problem of a given set \( S = \{s_1, s_2, \ldots, s_n\} \) of \( n \) positive integers whose sum is equal to a given positive integer ‘d’.

### CO1

Implement the algorithms based on various algorithm design techniques.

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<thead>
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### CO2

Analyze the efficiency of various algorithms.

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</table>

P21 Scheme - III & IV Semester Syllabus
Employability Enhancement Skills (EES) - IV  
[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – IV

<table>
<thead>
<tr>
<th>Course Code:</th>
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<td>Total Number of Teaching Hours:</td>
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<td>SEE Marks:</td>
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**Course Learning Objectives:** This course will enable students to:
- Solve problems on ages, mixtures and alligations and progressions.
- Understand the concepts of Data interpretation, crypt arithmetic and data sufficiency.
- Understand the basic concepts of C programming language.
- Apply programming constructs of C language to solve the real-world problem.
- Explore user-defined data structures like arrays, structures and pointers in implementing solutions to the problems.
- Design and Develop solutions to problems using functions.

<table>
<thead>
<tr>
<th>UNIT – I</th>
<th>10 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quantitative Aptitude:</strong> Problems on Ages, Mixtures and Alligations, Progressions.</td>
<td></td>
</tr>
<tr>
<td><strong>Logical Reasoning:</strong> Data Interpretation, Cryptarithmetic, Data sufficiency.</td>
<td></td>
</tr>
<tr>
<td><strong>Self-Study:</strong> Sequential output tracing</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT – II</th>
<th>08 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C Programming:</strong> Data types and Operators, Control statements, Looping, Arrays and Strings</td>
<td></td>
</tr>
<tr>
<td><strong>Self-Study:</strong> Pre-processors</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT – III</th>
<th>10 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C Programming:</strong> Functions, Recursion, Structure, Pointers, Memory management.</td>
<td></td>
</tr>
<tr>
<td><strong>Self-Study:</strong> Enum and Union</td>
<td></td>
</tr>
</tbody>
</table>

**Course Outcomes:** On completion of this course, students are able to:

- **CO – 1:** Solve the problems based on ages, Mixtures, alligations and progressions.
- **CO – 2:** Apply suitable programming constructs of C language to solve the given problem.
- **CO – 3:** Design and Develop solutions to problems using functions and recursion.
Text Book(s):
1. Quantitative aptitude by Dr. R. S Agarwal, published by S.Chand private limited.

Reference Book(s):
1. Quantitative Aptitude by Arun Sharma, McGraw Hill Education Pvt Ltd

Web and Video link(s):
1. NPTEL Course: Problem Solving through Programming in C, Prof. Anupam Basu, IIT Kharagpur
   https://nptel.ac.in/courses/106/105/106105171/

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<tr>
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<th>PO7</th>
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COURSE ARTICULATION MATRIX [Employability Enhancement Skills (EES) - IV]
Internship - I
[As per Choice Based Credit System (CBCS) & OBE Scheme]

SEMESTER – IV

<table>
<thead>
<tr>
<th>Course Code:</th>
<th>P21INT409</th>
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<tr>
<td>Teaching Hours/Week (L:T:P):</td>
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<td>CIE Marks:</td>
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<tr>
<td>Internship duration</td>
<td>2 weeks</td>
<td>SEE Marks:</td>
<td>100</td>
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</table>

All the students registered to II year of BE shall have to undergo a mandatory internship of 02 weeks during the intervening vacation of II and III semesters or III and IV semester. Internship shall include Inter / Intra Institutional activities. A Semester End Examination (Presentation followed by question-answer session) shall be conducted during IV semester and the prescribed credit shall be included in IV semester. The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete during subsequent Semester End Examination after satisfying the internship requirements. (The faculty coordinator or mentor has to monitor the students’ internship progress and interact to guide them for the successful completion of the internship.)

List of Activities

1. Activities concerned with the works of Indian scholars like Charaka and Susruta, Aryabhata, Bhaskaracharya, Chanakya, Madhava, Patanjali, Panini and Thiruvalluvar, among numerous others. (Reference NEP 2020, page 04)
2. Activities such as training with higher Institutions or Soft skill training organized by Training and Placement Cell of the respective institutions.
3. Contribution at incubation/ innovation /entrepreneurship cell of the institute.
4. Participation in conferences/ workshops/ competitions etc.
5. Learning at Departmental Lab/Tinkering Lab/ Institutional workshop.
6. And working for consultancy/ research project with-in the institute. [Serial numbers 2 to 6, AICTE Internship Policy.pdf page 8]
7. Learning MS Word, Excel, Microsoft equations, MS drawing tools, MS Power point, etc.
8. Coding.
10. Debates, quizzes, and group discussions: On technica
11. Essay competitions: Both in Kannada and English on technical topics already studied.
15. Short film production: Contemporary aspects, Technical aspects etc.
16. Music Competition (Vocal and Instrumental): Classical – Indian and western, Sugama- Sangeetha (Bhava Geethegalu), Folk songs, film songs etc.
17. Internship in Disaster Management. [AICTE APH 2021-22 pdf page166]
18. Solar energy connected activities that help common man. [AICTE APH 2021-22 pdf page166]
19. Working with Smart City Administration.
20. Hackathon (it is a design sprint-like event in which computer programmers and others involved in software development, including graphic designers, interface designers, project managers, and others, often including domain experts, collaborate intensively on software projects).
22. Internship and project work in Indian Knowledge System related Areas / Topics.
23. Industrial visits / small scale Industries / Factories / Cottage Industries / substation visit / short project tour, etc., and submission of report.

**Documents to be submitted by Students for Internship Evaluation**

**I. Student’s Diary**
The main purpose of writing a daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students’ thought process and reasoning abilities. The students shall record in the daily training diary the day to day account of the observations, impressions, information gathered and suggestions given, if any, and activities carried out. It should contain the sketches and drawings related to the observations made by the students. The daily training diary should be signed after every day or at least twice a week by the Faculty/ in charge of the section (external expert) where the student has been working.
The student’s Diary should be submitted by the students along with attendance record. It shall be evaluated on the basis of the following criteria:

(i) Regularity in the maintenance of the diary.
(ii) Adequacy and quality of information recorded.
(iii) Drawings, sketches, and data recorded.
(iv) Thought process and recording techniques used.
(v) Organization of the information.

**II. Internship Report**
After completion of the Internship, the student shall prepare, with daily dairy as a reference, a comprehensive report in consultation with the evaluators to indicate what he has observed and learned in the training period along with the internship outcomes. The training report should be signed by the Evaluator.
The Internship report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed.

(i) Originality.
(ii) Adequacy and purposeful write-up.
(iii) Organization, format, drawings, sketches, style, language etc.
(iv) Variety and relevance of learning experience.

Practical applications relationships with basic theory and concepts taught in the course.
Table – 1: Intra and Inter Institute Activities and Assessment Rubrics

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Sub Activity Head</th>
<th>Performance/ Appraisal</th>
<th>Assessment Rubrics (Allotted marks decide the letter grade)</th>
<th>Proposed Document as Evidence</th>
<th>Evaluated by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inter/Intra Institutional Workshop/ Training.</td>
<td>Excellent</td>
<td>80 to 100</td>
<td>(i) Student’s Diary and (ii) Internship Report along with the certificate issued from relevant authorized Authority</td>
<td>i) Institute Faculty together with External Expert if any. (ii) Training and Placement Officer. (iii) Physical Education Officer or the concerned in charge Officer of the Activity</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>79 to 60</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>Satisfactory</td>
<td>59 to 40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unsatisfactory and fail</td>
<td>&lt;39</td>
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</table>
## Basic Engineering Mathematics - II

[As per Choice Based Credit System (CBCS) & OBE Scheme]

**SEMESTER – IV (Lateral Entry: Common to all branches)**

<table>
<thead>
<tr>
<th>Course Code:</th>
<th>Credits:</th>
<th>Teaching Hours/Week (L:T:P):</th>
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<th>SEE Marks:</th>
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<td>00</td>
<td>2-2-0</td>
<td>100</td>
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<tr>
<td>Total Number of Teaching Hours:</td>
<td>40</td>
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</table>

**Course objective:** The mandatory learning course P21MADIP401 viz., BASIC ENGINEERING MATHEMATICS-II aims to provide essential concepts of linear algebra, introductory concepts of second & higher order differential equations along with various techniques/methods to solve them, Laplace & inverse Laplace transforms and elementary probability theory.

<table>
<thead>
<tr>
<th>UNIT – I</th>
<th>8 Hours</th>
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<tbody>
<tr>
<td><strong>Self-study component:</strong> Application of Cayley-Hamilton theorem (without proof) to compute the inverse of a matrix-Examples.</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>UNIT – II</th>
<th>8 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Higher order ODE’s:</strong> Linear differential equations of second and higher order equations with constant coefficients. Homogeneous/non-homogeneous equations. Inverse differential operators. and variation of parameters. Solution of Cauchy’s homogeneous linear equation and Legendre’s linear differential equation.</td>
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<tr>
<td><strong>Self-study component:</strong> Method of undetermined coefficients</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT – III</th>
<th>8 Hours</th>
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</thead>
<tbody>
<tr>
<td><strong>Multiple Integrals:</strong> Double and triple integrals-region of integration. Evaluation of double integrals by change of order of integration.</td>
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</tr>
<tr>
<td><strong>Vector Integration:</strong> Vector Integration: Integration of vector functions. Concept of a line integrals, surface and volume integrals. Green’s, Stokes’s and Gauss theorems (without proof) problems.</td>
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<tr>
<td><strong>Self-study component:</strong> Orthogonal curvilinear coordinates.</td>
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<table>
<thead>
<tr>
<th>UNIT – IV</th>
<th>8 Hours</th>
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</thead>
<tbody>
<tr>
<td><strong>Laplace transforms:</strong> Laplace transforms of elementary functions. Transforms of derivatives and integrals, transforms of periodic function and unit step function-Problems only. Inverse Laplace transforms: Definition of inverse Laplace transforms. Evaluation of Inverse transforms by standard methods.</td>
<td></td>
</tr>
<tr>
<td><strong>Self-study component:</strong> Application to solutions of linear differential equations and simultaneous differential equations.</td>
<td></td>
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</tbody>
</table>
### UNIT – V

|---------------------------------------------------------------|

| Self-study component: | State and prove Bayes’s theorem. |

<table>
<thead>
<tr>
<th>Course Outcomes:</th>
<th>After the successful completion of the course, the students are able to</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>Apply matrix theory for solving systems of linear equations in the different areas of linear algebra.</td>
</tr>
<tr>
<td>CO2</td>
<td>Solve second and higher order differential equations occurring in electrical circuits, damped/un-damped vibrations.</td>
</tr>
<tr>
<td>CO3</td>
<td>Identify - the technique of integration to evaluate double and triple integrals by change of variables, and vector integration technique to compute line integral</td>
</tr>
<tr>
<td>CO4</td>
<td>Explore the basic concepts of elementary probability theory and, apply the same to the problems of decision theory.</td>
</tr>
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</table>

### TEXT BOOKS


### REFERENCE BOOKS


<table>
<thead>
<tr>
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</table>

**Strength of correlation:** Low-1, Medium- 2, High-3
Employability Enhancement Skills (EES) - II  
[As per Choice Based Credit System (CBCS) & OBE Scheme]  
SEMIESTER – IV  

Course Code: P21HDIP408  
Credits: 01  
Teaching Hours/Week (L:T:P): 0:2:0  
CIE Marks: 100  
Total Number of Teaching Hours: 28  
SEE Marks: -  

Course Learning Objectives: This course will enable students to:  
- Get introduced to the concepts of teamwork and leadership  
- Understand the importance of professional etiquettes  
- Describe the reading with comprehension  
- Explain the purpose, plan and ways to identify specific details in a paragraph for better comprehension  
- Form grammatically correct sentences  
- Explain the basic concepts in calculating simple interest and compound interest  
- Explain concepts behind logical reasoning modules of direction sense, coding & decoding, series and visual reasoning  

UNIT – I  
10 Hours  

Soft Skills: Etiquette, Presentation Skills, Introduction to Body Language, Interpersonal and Intrapersonal Skills, Team work, Leadership skills, Extempore  
Self-Study: Concepts of Sympathy and Empathy  

UNIT – II  
10 Hours  

Verbal Ability: Verbal Analogies, Sentence completion & correction, Reading comprehension  
Self-Study: Paragraph sequencing  

UNIT – III  
8 Hours  

Quantitative Aptitude: Simple & Compound Interest, Ratio & Proportion, Time & Work  
Logical Reasoning: Direction Sense, Coding and Decoding, Series, Visual reasoning  
Self-Study: Directions and Pythagoras Theorem, differences between mirror and water images
**Course Outcomes:** On completion of this course, students are able to:

CO – 1: Exhibit amplified level of confidence to express themselves in English

CO – 2: Critical awareness of the importance of teamwork and development of the skills for building effective teams

CO – 3: Solve the questions under reading comprehension confidently with higher accuracy

CO – 4: Solve the problems based on interest, ratio & proportion, time & work

CO – 5: Solve logical reasoning problems based on direction sense, coding & decoding and series

**Text Book(s):**
2. Essential English Grammar by Raymond Murphy, Cambridge University Press, new edition
3. The 7 habits of Highly Effective People by Stephen R. Covey
4. Quantitative Aptitude by Dr. R. S Agarwal, published by S.Chand private limited.
5. Verbal reasoning by Dr. R. S Agarwal, published by S. Chand private limited.

**Reference Book(s):**
1. Quantitative Aptitude by Arun Sharma, McGraw Hill Education Pvt Ltd
2. CAT Mathematics by Abhijith Guha, PHI learning private limited.

**Web and Video link(s):**
1. Teamwork Skills: Communicating Effectively in Groups
   https://www.coursera.org/learn/teamwork-skills-effective-communication

| COURSE ARTICULATION MATRIX [Employability Enhancement Skills (EES) - II] |
|---------------------|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| CO-1 | - | - | - | - | - | - | - | 2 | 3 | - | 2 |
| CO-2 | - | - | - | - | - | - | - | 3 | 1 | 2 | 2 |
| CO-3 | - | - | - | - | - | - | - | 2 | - | - | 1 |
| CO-4 | 2 | - | - | - | - | - | - | - | - | - | - |
| CO-5 | 2 | - | - | - | - | - | - | - | - | - | - |
# P.E.S. College of Engineering, Mandya
## Department of Information Science & Engineering

### P21 Scheme - III & IV Semester Syllabus

#### BE – III / IV Semester – Common to all

<table>
<thead>
<tr>
<th><strong>Course Code</strong></th>
<th><strong>Course Name</strong></th>
<th><strong>Teaching Hours / Week (L:T:P)</strong></th>
<th><strong>Credits</strong></th>
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<tbody>
<tr>
<td>P21KSK307/407</td>
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<tr>
<th><strong>Course Code</strong></th>
<th><strong>Course Name</strong></th>
<th><strong>Teaching Hours / Week (L:T:P)</strong></th>
<th><strong>Credits</strong></th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>25</td>
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**Teaching-Learning Process – General Instructions:**

These are sample Strategies, which teacher can use to accelerate the attainment of the course outcomes. These strategies can be adapted to suit the needs of the specific class and course.

1. **Strategies 1:**
   - Engage students in active learning through group discussions and problem-solving exercises.
   - Encourage students to present their solutions to problems and provide constructive feedback.

2. **Strategies 2:**
   - Utilize technology such as multimedia resources and interactive software to enhance student engagement.
   - Incorporate guest lectures from industry experts to provide real-world context.

3. **Strategies 3:**
   - Utilize formative assessments such as quizzes and self-assessments to monitor student progress.
   - Provide regular feedback to students on their performance and areas for improvement.

**Course Title:**

P21KSK307/407

**Course Description:**

This course focuses on the principles and techniques of teaching and learning in an engineering context. It aims to equip students with the skills necessary to effectively engage students, assess their understanding, and foster a learning environment that promotes critical thinking and problem-solving.

**Course Objectives:**

- Develop a deep understanding of teaching and learning processes in engineering education.
- Enhance students' ability to design and implement effective teaching strategies.
- Foster a collaborative and inclusive classroom environment.

**Course Outcomes:**

- Students will be able to design and deliver engaging lesson plans that cater to diverse learning styles.
- Students will be able to assess student understanding using a variety of methods and provide constructive feedback.
- Students will be able to create a positive and inclusive classroom culture that promotes active learning.

**Course Assessment:**

- **Continuous Assessment:**
  - Quizzes (20%) to evaluate understanding of course materials.
  - Group Projects (30%) to assess collaborative problem-solving skills.
- **End-Semester Exam:**
  - Written Exam (50%) to assess comprehensive understanding of course content.

**References:**

- [Engaging in engineering education](https://www.example.com)
- [Effective teaching strategies](https://www.example.com)
- [Assessment in engineering education](https://www.example.com)

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**Note:**

This syllabus is subject to change based on the evolving needs of the educational landscape and the specific requirements of the course.

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**P21 Scheme - III & IV Semester Syllabus**

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### Course Outcomes (Course Outcomes)

1. **Course Outcomes:** To enable students to:
   - Understand the basics of computer science and engineering.
   - Develop problem-solving skills using computer science and engineering principles.
   - Gain knowledge of various computing technologies.
   - Apply computer science and engineering concepts in real-world scenarios.

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**Table:**

<table>
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<tbody>
<tr>
<td><strong>Course Outcomes:</strong> To enable students to:</td>
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<tr>
<td>1.</td>
<td>To understand the basics of computer science and engineering.</td>
</tr>
<tr>
<td>2.</td>
<td>To develop problem-solving skills using computer science and engineering principles.</td>
</tr>
<tr>
<td>3.</td>
<td>To gain knowledge of various computing technologies.</td>
</tr>
<tr>
<td>4.</td>
<td>To apply computer science and engineering concepts in real-world scenarios.</td>
</tr>
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</table>
Assessment Details – both CIE and SEE
(methods of CIE – MCQ, Quizzes, Open book test, Seminar or micro project)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and 35% marks in SEE to pass. Theory Semester End Exam (SEE) is conducted for 50 marks (01 hour duration). Based on this grading will be awarded.

Continuous Internal Evaluation:
Two Tests each of 40 Marks (duration 01 hour)
Two assignments each of 10 Marks

CIE methods / question paper is designed to attain the different levels of Blomm’s taxonomy as per the outcome defined for the course.

Semester end Exam
SEE will be conducted as per the scheduled timetable, with common question papers for the subject,
1. The question paper will have 25 questions. Each question is set for 02 marks.
2. SEE Pattern will be in MCQ Model for 50 marks. Duration of the exam is 01 hour.
BE – III / IV Semester – Common to all

<table>
<thead>
<tr>
<th>P.E.S. College of Engineering, Mandya</th>
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<tbody>
<tr>
<td>Department of Information Science &amp; Engineering</td>
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</table>

P21 Scheme - III & IV Semester Syllabus

### Module - 1

1. **Introduction, Necessity of learning a local language. Methods to learn the Kannada language.**
2. **Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activities**
3. **Key to Transcription.**
4. **Vocabulary, Vowels & Consonants / संस्कृत विचारानुसार मान्य वर्णमाला शब्दमण्डल – Personal Pronouns, Possessive Forms, Interrogative words**
### Module - 2

| 1. | Possessive forms of nouns, dubitive question and Relative nouns |
| 2. | Qualitative and Colour Adjectives, Numerals |
| 3. | Predictive Forms, Locative Case |

### Module - 3

| 1. | Dative Cases, and Numerals |
| 2. | Ordinal numerals and Plural markers |
| 3. | Defective / Negative Verbs and Colour Adjectives |

### Module - 4

| 1. | Permission, Commands, encouraging and Urging words (Imperative words and sentences) |
| 2. | Accusative Cases and Potential Forms used in General Communication |
| 3. | Helping Verbs “iru and iralla”, Corresponding Future and Negation Verbs |
| 4. | Comparative, Relationship, Identification and Negation Words |

### Module - 5

| 1. | Different types of forms of Tense, Time and Verbs |
| 2. | Formation of past, Future and Present Tense Sentences with Verb Forms |
| 3. | Kannada Vocabulary List: Word list in Conversation |
Outcomes (Course Skill Set): At the end of the course, the students will be able
   1. To understand the necessity of learning of local language for comfortable life.
   2. To listen and understand the Kannada language properly.
   3. To speak, read and write Kannada language as per requirement.
   4. To communicate (converse) in Kannada language in their daily life with Kannada speakers.
   5. To speak in polite conversation.

(Assessment Details – both CIE and SEE)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is
50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student
shall be deemed to have satisfied the academic requirements and earn the credits allotted to each
subject/course if the student secures not less than 35% (18 marks out of 50) in the semester-end
examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE
(Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:
Two Tests each of 40 Marks (duration 01 hour)
Two assignments each of 10 Marks

CIE methods/question paper is designed to attain the different levels of Blomm’s taxonomy as
per the outcome defined for the course.

Semester End Exam (SEE)
SEE will be conducted as per the scheduled timetable, with common question papers for the subject,
   1. The question paper will have 25 questions. Each question is set for 02 marks.
   2. SEE Pattern will be in MCQ Model for 50 marks. Duration of the exam is 01 hour.

Text book:

BE – III / IV Semester – Common to all

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>CIE Marks</th>
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<tr>
<td>Total Hours of Pedagogy</td>
<td>25 Hours</td>
<td>Total Marks</td>
<td>100</td>
</tr>
<tr>
<td>Credits</td>
<td>1</td>
<td>Exam Hours</td>
<td>01 Hour</td>
</tr>
</tbody>
</table>

Course Objectives: This course will enable the students

a. To know the fundamental political structure & codes, procedures, powers, and duties of Indian government institutions, fundamental rights, directive principles, and the duties of citizens.

b. To understand engineering ethics and their responsibilities, identify their individual roles and ethical responsibilities towards society.

Teaching-Learning Process (General Instructions)
These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and software’s to meet the present requirements of the Global employment market.

(i) Direct instructional method (Low/Old Technology),
(ii) Flipped classrooms (High/advanced Technological tools),
(iii) Blended learning (combination of both),
(iv) Enquiry and evaluation based learning,
(v) Personalized learning,
(vi) Problems based learning through discussion,
(vii) Following the method of expeditionary learning Tools and techniques.

1. Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can enhance the students in theoretical applied and practical skills in teaching of 21CIP39/49 in general.

Module - 1


Teaching-Learning Process | Chalk and talk method, Videos, Power Point presentation to teach. Creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with administration real time situations).
### Module - 2

**Fundamental Rights (FR’s), Directive Principles of State Policy (DPSP’s) and Fundamental Duties (FD’s):** Fundamental Rights and its Restriction and limitations in different Complex Situations. DPSP’s and its present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation building.

| Teaching-Learning Process | Chalk and talk method, Videos, Power Point presentation to teach. Creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with administration real time situations). |

### Module - 3

**Union Executive:** Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.

| Teaching-Learning Process | Chalk and talk method, Videos, Power Point presentation to teach. Creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with administration real time situations). |

### Module - 4


| Teaching-Learning Process | Chalk and talk method, Videos, Power Point presentation to teach. Creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with administration real time situations). |

### Module - 5


| Teaching-Learning Process | Chalk and talk method, Videos, Power Point presentation to teach. Creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with administration real time situations). |
Course outcome (Course Skill Set)
At the end of the course the student should:

CO 1: Have constitutional knowledge and legal literacy.
CO 2: Understand Engineering and Professional ethics and responsibilities of Engineers.

Assessment Details (both CIE and SEE)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks that is 20 marks.
A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

Continuous Internal Evaluation:
Two Tests each of 40 Marks (duration 01 hour)
Two assignments each of 10 Marks
The average of two tests, two assignments, and quiz/seminar/group discussion will be out of 50 marks

CIE methods/question paper is designed to attain the different levels of Bloom’s taxonomy as per the outcome defined for the course.

Semester End Examination:
SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject.
- The question paper will have 25 questions. Each question is set for 02 marks.
- SEE Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks. Duration of the examination is 01 Hour.

Textbook:
1. “Constitution of India & Professional Ethics” Published by Prasaranga or published on VTU website with the consent of the university authorities VTU Belagavi.