

## OPTIMIZATION TECHNIQUES

### III Semester: CSE

| Course Code                | Category                    | Hours / Week                        |   |   | Credits                  | Maximum Marks |     |       |
|----------------------------|-----------------------------|-------------------------------------|---|---|--------------------------|---------------|-----|-------|
| BCSB24                     | Elective                    | L                                   | T | P | C                        | CIA           | SEE | Total |
|                            |                             | 3                                   | 0 | 0 | 3                        | 30            | 70  | 100   |
| <b>Contact Classes: 45</b> | <b>Total Tutorials: Nil</b> | <b>Total Practical Classes: Nil</b> |   |   | <b>Total Classes: 45</b> |               |     |       |

### I. COURSE OVERVIEW:

The course provide students to possess a strong foundation in optimization theory, algorithms, and their applications in engineering. They develop critical thinking skills to identify optimization opportunities in various engineering domains and formulate effective mathematical models to address them. This equips them with the knowledge and tools necessary to optimize processes, improve system performance, and make data-driven decisions in engineering applications.

### II. OBJECTIVES:

**The students will try to learn:**

- I. The objective of this course is to provide insight to the mathematical formulation of real world problems.
- II. How to optimize these mathematical problems using nature based algorithms. And the solution is useful specially for NP-Hard problems

### III. COURSE OUTCOMES:

**After successful completion of the course, students should be able to:**

|      |  |            |
|------|--|------------|
| CO 1 | <b>Make</b> use of recursive algorithm design technique in appropriate contexts. | Remember   |
| CO 2 | <b>Calculate</b> and implement linked lists, stacks and queues in Python         | Apply      |
| CO 3 | <b>Choose</b> linear programming using Approximation and Randomized algorithm    | Evaluate   |
| CO 4 | <b>Design</b> flow-networks and matrix computation using Strassen's algorithm    | Apply      |
| CO 5 | <b>Describe</b> the variable metric methods for constrained optimization.        | understand |

### IV. SYLLABUS

|   |  |                    |
|---|--|--------------------|
| <b>UNIT-I</b>   | <b>ENGINEERING APPLICATION OF OPTIMIZATION</b> | <b>Classes: 09</b> |
| Engineering application of Optimization, Formulation of design problems as mathematical programming problems.   |  |                    |
| <b>UNIT-II</b>  | <b>GENERAL STRUCTURE OF OPTIMIZATION</b>       | <b>Classes: 09</b> |
| General Structure of Optimization Algorithms, Constraints, The Feasible Region  |  |                    |
| <b>UNIT-III</b>   | <b>BRANCHES OF MATHEMATICAL PROGRAMMING</b>    | <b>Classes: 09</b> |
| <b>Branches of Mathematical Programming:</b> Optimization using calculus, Graphical Optimization, Linear Programming, Quadratic Programming, Integer Programming, Semi Definite Programming |  |                    |

|  |                                |                    |
|--|--------------------------------|--------------------|
| <b>UNIT-IV</b>   | <b>OPTIMIZATION ALGORITHMS</b> | <b>Classes: 09</b> |
| Optimization Algorithms like Genetic Optimization, Particle Swarm Optimization, Ant Colony Optimization etc.   |                                |                    |
| <b>UNIT-V</b>  | <b>REAL LIFE PROBLEMS</b>      | <b>Classes: 09</b> |
| Real life Problems and their mathematical formulation as standard programming problems.  |                                |                    |
| <b>Text Books:</b>   |                                |                    |
| <ol style="list-style-type: none"> <li>1. Laurence A. Wolsey (1998). Integer programming. Wiley. ISBN 978-0-471-28366-9.</li> <li>2. Practical Optimization Algorithms and Engineering Applications Andreas Antoniou.</li> <li>3. An Introduction to Optimization Edwin K., P. Chong &amp; Stanislaw h. Zak.</li> </ol>  |                                |                    |
| <b>Reference Books:</b>  |                                |                    |
| <ol style="list-style-type: none"> <li>1. Dimitris Bertsimas; Robert Weismantel (2005).” Optimization over integers”. Dynamic Ideas. ISBN 978-0-9759146-2-5.</li> <li>2. John K. Karlof (2006). “Integer programming: theory and practice”.CRC Press. ISBN 978-0-8493- 1914-3.</li> <li>3. H. Paul Williams,” Logic and Integer Programming”. Springer. ISBN 978-0-387-92279-9.</li> </ol>   |                                |                    |
| <b>Web References:</b>   |                                |                    |
| <ol style="list-style-type: none"> <li>1. <a href="http://www.sctie.iitkgp.ernet.in/">http://www.sctie.iitkgp.ernet.in/</a></li> <li>2. <a href="http://www.rkala.in/softcomputingvideos.php">http://www.rkala.in/softcomputingvideos.php</a></li> <li>3. <a href="http://www.sharbani.org/home2/soft-computing-1">http://www.sharbani.org/home2/soft-computing-1</a></li> <li>4. <a href="http://www.myreaders.info/html/soft_computing.html">http://www.myreaders.info/html/soft_computing.html</a></li> </ol>                         |                                |                    |
| <b>E-Text Books:</b>   |                                |                    |
| <ol style="list-style-type: none"> <li>1. <a href="https://www.books.google.co.in/books?id=bVbj9nhvHd4C">https://www.books.google.co.in/books?id=bVbj9nhvHd4C</a></li> <li>2. <a href="https://www.books.google.co.in/books?id=GrZHPgAACAAJ&amp;dq=1.+J.S.R.Jang,+C.T.Sun+and+E.Mizutani,+Neuro,+Fuzzy+and+Soft+Computing,+PHI,+2004,Pearson+Education.">https://www.books.google.co.in/books?id=GrZHPgAACAAJ&amp;dq=1.+J.S.R.Jang,+C.T.Sun+and+E.Mizutani,+Neuro,+Fuzzy+and+Soft+Computing,+PHI,+2004,Pearson+Education.</a></li> </ol> |                                |                    |