South Indian Education Society's
GRADUATE SCHOOL OF TECHNOLOGY, Navi
Mumbai.
DEPARTMENT OF MECHANICAL ENGINEERING

Optimization Techniques for Engineers
June 26 to June 30, 2023

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Optimization techniques are powerful tools for finding the optimal solution to a problem within given constraints. Understanding and applying these techniques can help engineer to improve the efficiency and effectiveness of your processes, products, and systems.Optimization techniques can be used to optimize a wide range of systemsincluding engineering designs, financial portfolios, supply chain management, and energy systems.There are several optimization techniques that can be used to find the optimal solution for a given problem.

This workshop will help students understand the different optimisation techniques like choosing an optimization technique, solve the optimization problem, evaluate the solution and finally implementation of the solution: The solution obtained is evaluated based on its feasibility, optimality, and robustness. The solution may need to be revised or refined based on the evaluation.

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About Instructors:

This course will be taught by the Internal faculty of SIES GST and the Industry experts from domain of optimisation.

Course Objectives:
- To learn about defining the problem
- To formulate the objective function
- To choose the correct optimization techniques.
- To find the correct decision.

Course Outcomes:
After this Course the students should be able to:
- Design a problem from available resources.
- Decide the proper implementation technique.
- Evaluate the solution
- Implement the solution.

Course Content:
Prerequisite: Basics of mathematics.

Module	Contents	Hours
1.	**Linear Programming**: Introduction, Linear Programming Problem, Mathematical Formulation of LPP, Graphical method, Simplex Method, Big M-method, Two Phase Method,	8 hrs
2.	**Transportation Problem**: Formulation of Transportation problem.Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel'sapproximation method. **Assignment Problem**: Introduction, Mathematical Formulation of the Problem,Hungarian Method Algorithm,	8 hrs
3.	**Simulation**: Introduction, Methodology of Simulation, Basic Concepts, SimulationProcedure, Application of Simulation Monte-Carlo Method: Introduction, Monte-CarloSimulation, Numerical	8 hrs
4.	**Inventory Models**: Classical EOQ Models, EOQ Model with Price Breaks, EOQ withShortage, Probabilistic EOQ Model,	8 hrs
5.	**Case Study and Industry Awareness:** Software simulation of the above topics.	8 hrs

Assessment:

1. The course includes minimum two assignment and two quiz.
2. The students should form a group of three to four members and implement mini-project as a part of the course.

Course Coordinator:

Dr. Lokpriya Gaikwad, Assistant Professor
Dr. Prashant Ambadekar, Assistant Professor

SIES GRADUATE SCHOOL OF TECHNOLOGY, NERUL
DEPARTMENT OF MECHANICAL ENGINEERING
Two-week Value-Added Course (Student Development Program)
on
Optimisation Techniques for Engineers
(26/06/2023 to 30/06/2023)
Program Schedule

S.N.	Session 1 (10:00 – 12:30)		Session 2 (01:30 – 04:00)
MONDAY (26/06/2023)	Introduction to Linear Programming and problem formulation, Numerical on graphical method and simplex method *(Prof. Lokpriya Gaikwad)*	LUNCH BREAK	Numerical on Big M and Two-phase method *(Prof. Lokpriya Gaikwad)*
TUESDAY (27/06/2023)	Formulation of Transportation problem. Finding basic feasible solutions. *(Prof. Lokpriya Gaikwad)*		Mathematical Formulation of Assignment Problem, Hungarian Method Algorithm. *(ProfLokpriya Gaikwad)*
WEDNESDAY (28/06/2023)	Introduction to Simulation, Numerical on Monte-Carlo Simulation *(Prof. Prashant Ambadekar)*		Numerical on Monte-Carlo Simulation *(Prof. Prashant Ambadekar)*
THURSDAY (29/06/2023)	Classical EOQ Models, EOQ Model with Price Breaks *(Prof. Prashant Ambadekar)*		EOQ with Shortage, Probabilistic EOQ Model *(Prof. Prashant Ambadekar)*
FRIDAY (30/06/2023)	Hands-on training on optimisation software *(Prof. Prashant Ambadekar)*		Hands-on training on optimisation software *(Prof. Lokpriya Gaikwad)*

Report

Optimization Techniques for Engineers

Date: 26th June to 30th June 2023
Venue: Mechanical Engineering Department, SIES Graduate School of Technology, Nerul

Introduction

The Student Development Program on "Optimization Techniques for Engineers" was conducted by the Mechanical Engineering Department at SIES Graduate School of Technology, Nerul, between 26th June and 30th June 2023. The program aimed to equip SE/TE/BE Mechanical Engineering students with the necessary skills and knowledge in optimization techniques to enhance their problem-solving abilities in engineering applications.

Course Coordinators

1. Prof. Lokpriya Gaikwad (Assistant Professor, Mechanical Engineering Department)
2. Prof. Prashant Ambadekar (Assistant Professor, Mechanical Engineering Department)

Objectives

The key objectives of the Student Development Program were as follows:

1. To introduce students to various optimization techniques commonly used in engineering applications.
2. To enhance students' understanding of mathematical modeling and its role in optimization.
3. To provide hands-on experience with optimization software and tools.
4. To enable students to apply optimization techniques to real-world engineering problems.

Program Highlights

Day 1: Introduction to Optimization and Mathematical Foundations

- Overview of optimization and its significance in engineering design.
- Introduction to mathematical modeling for optimization problems.
- Formulation of linear and nonlinear optimization problems.

Day 2: Unconstrained Optimization Techniques

- Review of unconstrained optimization methods: Gradient Descent, Newton-Raphson, and Quasi-Newton methods.
- Application of unconstrained optimization to engineering problems.

Day 3: Constrained Optimization Techniques

- Introduction to constrained optimization problems.
- Constrained optimization algorithms: Lagrange multipliers, Sequential Quadratic Programming (SQP).
- Practical implementation of constrained optimization in engineering scenarios.

Day 4: Metaheuristic Optimization Techniques

- Understanding metaheuristic algorithms: Genetic Algorithms, Particle Swarm Optimization, Simulated Annealing.
- Hands-on exercises using metaheuristic optimization tools.

Day 5: Application of Optimization in Engineering

- Case studies and real-world applications of optimization in mechanical engineering.
- Group projects and presentations by the participants.
- Closing ceremony and distribution of certificates.

Outcomes from SDP

The Student Development Program on "Optimization Techniques for Engineers" was a resounding success in equipping the students with valuable knowledge and skills. The Mechanical Engineering Department at SIESGST is committed to conducting such programs regularly to foster the holistic development of its students and to keep them updated with the latest advancements in engineering.

We extend our heartfelt gratitude to Prof. Lokpriya Gaikwad and Prof. Prashant Ambadekar, the course coordinators, for their exemplary guidance and efforts in making the program a triumph. Their dedication and expertise played a pivotal role in inspiring the participants and ensuring the program's success.

Acknowledgments

The Mechanical Engineering Department at SIESGST would like to thank the management, faculty, and staff for their unwavering support in organizing this Student Development Program. We also express our gratitude to all the resource persons and industry experts who shared their knowledge and experience with the students.

Finally, we extend our gratitude to the participants for their active involvement, enthusiasm, and eagerness to learn throughout the program.

This SDP report stands as a testament to the commitment of SIES Graduate School of Technology to academic excellence and nurturing well-rounded engineers equipped to address real-world challenges.

Participation and Feedback

The Student Development Program witnessed active participation from SE/TE/BE Mechanical Engineering students. The participants found the program to be highly informative and relevant to their academic and professional pursuits. The interactive nature of the sessions and hands-on exercises allowed the students to grasp the concepts effectively.

Participants provided positive feedback on the course content, delivery, and the faculty members' dedication. They appreciated the practical approach of the program, which helped them gain confidence in applying optimization techniques to real-world engineering problems.

List of participants:

Sr. Nos.	Student name	Class-Department
1	Sonu Singh	S.E. Mechanical
2	Sumit Sharma	S.E. Mechanical
3	Divyal Gawand	S.E. Mechanical
4	Prachi Tambe	S.E. Mechanical
5	Sooryakant Nadar	S.E. Mechanical
6	Venurachan	S.E. Mechanical
7	Anish Jadhav	S.E. Mechanical
8	Prashant Pengonda	S.E. Mechanical
9	Rahul Kambli	S.E. Mechanical
10	Himanshu Patil	S.E. Mechanical
11	Prasenjeet Salvi	S.E. Mechanical
12	Esakkimuthu Konar	S.E. Mechanical
13	Om Pawar	S.E. Mechanical
14	Ashwini Jambale	S.E. Mechanical
15	Suraj Gawade	S.E. Mechanical
16	Tejashree Narkhede	S.E. Mechanical
17	Siddhant Bhandakar	S.E. Mechanical
18	Pranay Kadam	T.E. Mechanical

Photos:

Dr. Prashant Ambadekar   Dr. Rupendra Nehete
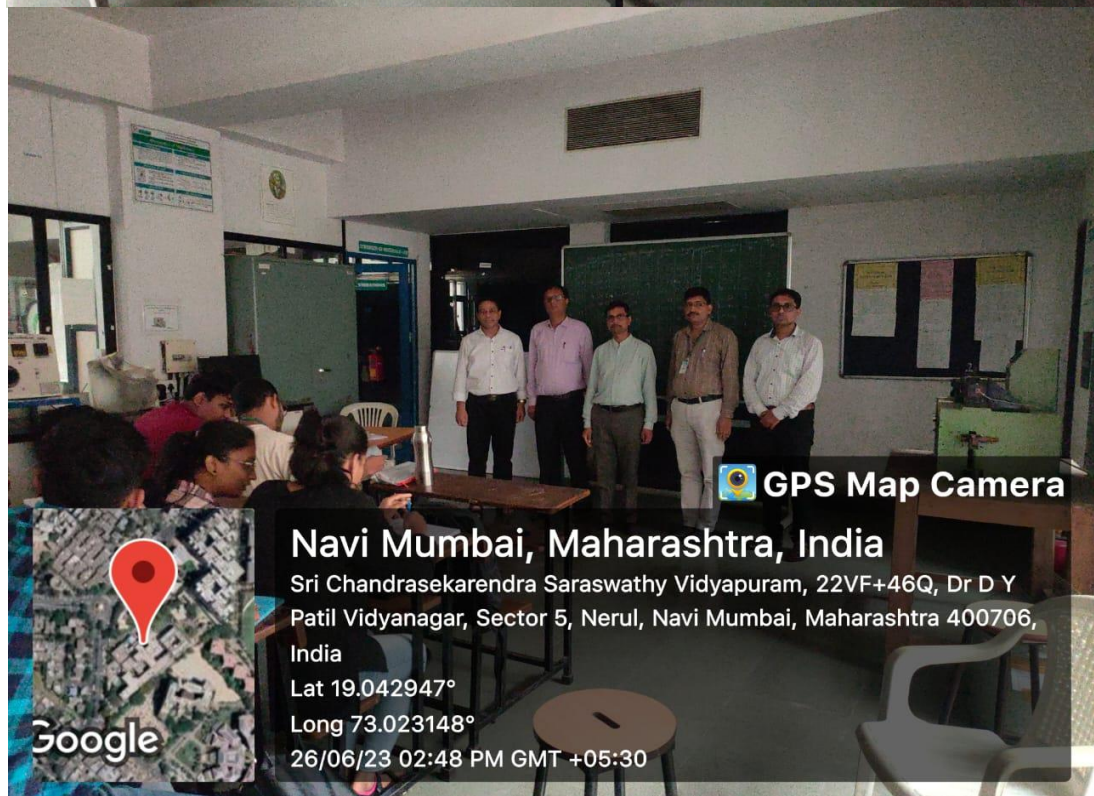
CERTIFICATE
OF COMPLETION

CR. NO : ME/SDP/0723/18

presented to

Himanshu Patil

has successfully completed the value-added course on
Optimization Techniques for Engineers
from 26TH June, 2023 to 3RD July, 2023
organised by **Mechanical Engineering** Department, SIES GST.

Dr. Lokpriya Gaikwad
(Course Co-ordinator)

Dr. R.S. Nehete
(HOD, ME, SIESGST)

Dr. Laxmi Sudha
(Principal, SIESGST)