Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Civil Engineering

BCE094 Optimization Techniques

Seventh Semester, 2017-18 (Odd Semester)

Course (cataloge) description

The purpose of this course is to develop a knowledge in the field of optimization techniques their basic concepts, ,principles. linear programming and queuing theory

Compulsory/Elective course : Compulsory for ECE students

Credit & Contact hours : 3 credits & 45 hours

Course Coordinator : Dr.Krishnakumar

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Dr.Krishnakumar	Final year Civil	Civil Block			9.00 - 9.50 AM

Relationship to other courses:

Pre –requisites **:** Fundamentals of Computing and Programming

Assumed knowledge : Basic knowledge in optimization techniques

Following courses : BCE702 COMPUTER AIDED DESIGN OF STRUCTURES

Syllabus Contents

UNIT I INTRODUCTION **8**

Concept of optimization – classification of optimization – problems.

UNIT II LINEAR PROGRAMMING **10**

Examples of linear programming problems – formulation simplex methods variable with upper bounds – principle-duality -dual simplex method - sensitivity analysis – revised simplex procedure – solution of the transportation problem – assignment – network minimization – shortest route problem – maximal two problem – L.P. representation of networks.

UNIT III QUEUING THEORY **9**

Queuing Model, poison and exponential distributions -Queues with combined arrivals and departures-random and series queues.

UNIT IV UNCONSTRAINED OPTIMIZATION **9**

Maximization and minimization of convex functions. Necessary and sufficient conditions for local minima – speed and order of convegence – unibariate search – steepest and desent methods- metcher reeves method -conjugate gradient method.

UNIT V CONSTRAINED OPTIMIZATION **9**

Necessary and sufficient condition – equality constraints, inequality constraints -kuhu – tucker conditions – gradient projection method – penalty function methods – cutting plane methods of sibel directions.

Total : 45 HOURS

TEXT BOOK(S)

1. Rao S.S,"Optimization – Theory and applications", Wiley Easter Ltd., 1979.

REFERENCE BOOKS:

1. David G.Luerbeggan, "Introduction to Linear and Non Linear Programming", Addison Wesley Publishing Co. 1973.
2. Hadley G. "Nonlinear and – dynamic programming" Addison Wesley Publishing Co. 1964.
3. Cordan C.C. Beveridge and Robert S. Schedther, "Optimization, Theory and Practice" McGraw Hill Co.1970.
4. HarndyA.Tahh. "operations Research, An Introduction", Macmillan Publishers Co.NewYork,1982.
5. Beightferand S. others, "Foundations of Optimization Pill", New Delhi, 1979.

Professional component

General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	0%
Professional subject	-	100%

Broad area : Communication| applying new techniques| understanding concepts of optimization

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1st week	Session 1 to 14	2 Periods
2	Cycle Test-2	September 2nd week	Session 15 to 28	2 Periods
3	Model Test	October 2nd week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

H: high correlation, M: medium correlation, L: low correlation

This course is to develop a strong foundation in understanding the basic concepts of optimization techniques,linear programming and queing theory	Correlates to program outcome		
	H	**M**	**L**
1. Understanding the Concept of optimization and classification of optimization problems.	h	g	
2. Formulation simplex methods variable with upper bounds	h	g	

3. Study the Queuing Model, poison and exponential distributions	h	g. d	a
4. Understand the maximization and minimization of convex functions	h	g	
5. To study equality constraints, inequality constraints	h	g	

Draft Lecture Schedule

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I	**INTRODUCTION**		
1.	Concept of Optimization	No	[T1] ,[R1]
2.	Concept of Optimization	No	
3.	Classification of optimization	No	
4.	Classification of optimization	No	
5.	Optimization Problems	Yes	
6.	Optimization Problems	Yes	
7.	Optimization Problems	Yes	
8.	Optimization Problems	Yes	
UNIT II	**LINEAR PROGRAMMING**		
9.	Examples of linear programming problems	Yes	[T1] ,[R1]
10.	Formulation simplex methods variable with upper bounds - principle	No	
11.	Sensitivity analysis	No	
12.	Revised simplex procedure	No	
13.	Solution of the transportation problem - assignment	Yes	
14.	Network minimization	Yes	
15.	Shortest route problem	Yes	[T1] ,[R1]
16.	Maximal two problem	Yes	
17.	L.P. Representation of networks	No	
18.	L.P. Representation of networks	No	
UNIT III	**QUEING THEORY**		
19.	Queuing Model	No	[T1] ,[R2]
20.	Queuing Model	No	
21.	Poison And Exponential Distributions	No	

22.	Poison And Exponential Distributions	No	
23.	Queues With Combined Arrivals And Departures	No	
24.	Queues With Combined Arrivals And Departures	No	
25.	Random And Series Queues	No	
26.	Random And Series Queues	No	
27.	Random And Series Queues	No	
UNIT IV UNCONSTRAINED OPTIMIZATION			
28.	Maximization and minimization of convex functions.	No	
29.	Maximization and minimization of convex functions.	No	
30.	Necessary and sufficient conditions for local minima	No	
31.	Necessary and sufficient conditions for local minima	No	
32.	speed and order of convegence	No	[T1] ,[R3]
33.	unibariate search	No	
34.	steepest and desent methods	No	
35.	metcher reeves method	No	
36.	conjugate gradient method	No	
UNIT V CONSTRAINED OPTIMIZATION			
37.	Necessary and sufficient condition	No	
38.	Necessary and sufficient condition	No	
39.	Equality constraints, inequality constraints	No	
40.	Equality constraints, inequality constraints	No	[T1] ,[R4]
41.	kuhu – tucker conditions	No	
42.	gradient projection method	No	
43.	penalty function methods	No	
44.	cutting plane methods of sibel directions	No	
45.	cutting plane methods of sibel directions	No	

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	5%
Attendance	-	5%
Assignment	-	10%
Final exam	-	50%

Prepared by: Dr.Krishnakumar, Professor , Department of civil **Dated :**

Addendum

ABET Outcomes expected of graduates of B.Tech / CIVIL / program by the time that they graduate:

a. An ability to apply knowledge of mathematics, science, and engineering
b. An ability to design and conduct experiments, as well as to analyze and interpret data
c. An ability to design a hardware and software system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d. An ability to function on multidisciplinary teams
e. An ability to identify, formulate, and solve engineering problems
f. An understanding of professional and ethical responsibility
g. An ability to communicate effectively
h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i. A recognition of the need for, and an ability to engage in life-long learning
j. A knowledge of contemporary issues
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Educational Objectives

PEO1: PREPARATION

Civil Engineering graduates will have knowledge to apply the fundamental principles for a successful profession and/or for higher education in Civil Engineering based on mathematical, scientific and engineering principles, to solve realistic and field problems that arise in engineering and non engineering sectors

PEO2: CORE COMPETENCE

Civil Engineering graduates will adapt to the modern engineering tools and construction methods for planning, design, execution and maintenance of works with sustainable development in their profession.

PEO3: PROFESSIONALISM

Civil Engineering Graduates will exhibit professionalism, ethical attitude, communication and managerial skills, successful team work in various private and government organizations both at the national and international level in their profession and adapt to current trends with lifelong learning.

PEO4: SKILL

Civil Engineering graduates will be trained for developing soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional.

PEO5: ETHICS

Civil Engineering graduates will be installed with ethical feeling, encouraged to make decisions that are safe and environmentally-responsible and also innovative for societal improvement.

Course Teacher	Signature
Dr.Krishnakumar	

Course Coordinator **HOD/CIVIL**