

**BITS PILANI, DUBAI CAMPUS**  
**ACADEMIC-UNDERGRADUATE STUDIES DIVISION**  
**First Semester 2025 – 2026**  
**Course Handout (Part – II)**

**Date: 22.08.2025**

In addition to part I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

**Course No.** : MATH F212 (3 0 3)  
**Course Title** : Optimization  
**Instructors** : Dr. S.Baskaran ([baskaran@dubai.bits-pilani.ac.in](mailto:baskaran@dubai.bits-pilani.ac.in), Room No:135)  
**Course coordinator** : Dr. S.Baskaran

**1. Course Pre/Co- requisite (if any) & Catalogue / Bulletin Description:** Introduction to optimization; linear programming; simplex methods; duality and sensitivity analysis; transportation model and its variants; integer linear programming nonlinear programming; multi-objective optimization; evolutionary computation techniques.

**2. Scope and Objective of the Course:**

An optimization problem in its simple form is one in which some entity with or without being subjected to certain constraints is minimized or maximized. The entity to be optimized may be profit, cost, time, product efficiency, consumer utility, etc. The constraints may involve manpower, availability of space, raw materials, funds, machine capabilities, governmental controls, etc. The subject of optimization is multidisciplinary in nature. Optimization Problems are encountered in physical sciences, engineering, economics, industry, planning, and many other areas of human activity. Background needed for undertaking this course is acquaintance with Calculus, Set Theory and Linear Algebra. Objective of the Course is to familiarize the student with standard methods of solving optimization problems.

**3. Course learning outcomes:**

Upon successful completion of this course, students should be able to:

- **CLO1** Understand modelling of LPP and graphical & simplex methods of solving them. Understand how to form the Dual of a primal and then solve the LPP.
- **CLO2** Understand Economic Interpretation of Duality. Understand Dual Simplex Algorithm and Post-Optimal Analysis. To understand Dual Simplex Algorithm and Post-Optimal Analysis. Understand how to solve Transportation Problems. Apply the concept to Assignment Problems.
- **CLO3** Understand CPM and PERT models and to identify critical path of the network with all the time computations. Understand how to solve problems where solution set is required to be integers
- **CLO4** Understand simplex method fundamentals and to learn revised simplex method. Analyze problems with Multiple Goal and Goals with priorities. Understand how to solve problems using Principle of Optimality. Understand how to solve zero sum two-person game of strategies. Understand how to solve non-linear programming problems
- **CLO5** Develop different models for various types of optimization problems and understand the required problem-solving skill.

**4. Course Pre / Co- requisite:** *Given in the Bulletin 2025– 2026*

Knowledge of Advanced Calculus (MATH F111, Mathematics I), Complex Variables and Linear Algebra (MATH F112, Mathematics II)

**5. Text Book(TB):**

T1: H.A.Taha, **Operations Research: An Introduction**, Pearson Education, 10th.edn, 2019.

**Reference Books (RB):**

R1: Pant J.C. **Introduction to Optimization: Operations Research**, Jain Brothers, New Delhi, 5th.edn, 2000.

R2: Hillier and Lieberman, **Introduction to Operations Research**, T M H, 7th.edn; 2001.

**6. Course Format & Weekly Workflow:** Schedule for 14 weeks with 3 lectorials per week

**7. Course Plan / Schedule:**

Wk no.	Module no./Topics	Lect No.	Ref/Chap./Sec. # (Book)	Learning Outcome
1	Modelling with Linear Programming	01-03	Ch. 2(T1) 2.1, 2.2.1, 2.2.2	To understand how to model an LPP, solve and analyze Linear programming problems of two variables by graphical method
2	The Simplex Method	04-06	Ch.3(T1) 3.1, 3.2, 3.3	To understand to move from graphical solution to algebraic solution of LPP involving more than 2 variables
3	The Simplex Method (Special Cases)	07-09	Ch.3(T1) 3.4, 3.5	To understand to use artificial starting variables and special cases of LPP
4	Duality and Post-Optimal Analysis.	10-12	Ch. 4 T1 4.1 - 4.3	To understand how to form the Dual of a primal and then solve the LPP. To understand Economic Interpretation of Duality
5	Duality and Post-Optimal Analysis.	13-15	Ch. 4 T1 4.4 - 4.5	To understand Dual Simplex Algorithm and Post-Optimal Analysis
6	Transportation and Assignment Problems	16-18	Ch. 5 T1 5.1,5.3,	To understand how to solve Transportation Problems
7	Transportation and Assignment Problems	19-21	Ch. 5 T1 5.4	To learn how to solve Assignment Problems
8	Network Model	22-24	Ch. 6 T1 6.5	To understand CPM and PERT models and to identify critical path of the network with all the time computations.
9	Advanced Linear Programming	25-27	Ch 7 T1 7.1, 7.2	To understand simplex method fundamentals and to learn revised simplex method.
10	Goal Programming	28-30	Ch 8 T1 8.1, 8.2	To study problems with Multiple Goal and Goals with priorities
11	Integer Programming	31-33	Ch 9 T1 9.2.1	To understand how to solve problems where solution set is required to be integers
12	Dynamic Programming	34-36	Ch10 T1 10.1, 10.2	To understand how to solve problems using Principle of Optimality
13	Game Theory	37-39	Ch 13 T1 13.4	To understand how to solve zero sum two person game of strategies
14	Non-linear Programming	40-42	Ch 20 T1 20.2.2, 21.2.2	To understand how to solve non linear programming problems
Total number of Lectures planned: 42				

## 8. Evaluation scheme:

Component	Weight age	Duration	Date and Time	Comments
Quiz	15%	25 minutes	07.10.2025(T6)	CLOSED BOOK
Mid Semester	30%	90 minutes	29.10.2025 FN	OPEN BOOK
Software Based Assignment	15%	NA	05.12.2025	OPEN BOOK
Comprehensive Exam	40%	3 hours	05.01.2026 AN	CLOSED BOOK

## 9. Mapping of CLOs, PLOs, and ECs

CLOs	PLOs	Evaluation Components (ECs) weightage distribution			
		EC1	EC2	EC3	EC4
CLO1	1	50	25		25
CLO2	2		80		20
CLO3	2, 8			33	67
CLO4	2, 8			25	75
CLO5	2, 8	25	25	25	25

\* Please refer the [link](#) for the PLOs of the B.E. Computer Science programme

### 10. Mid-semester Grading:

Mid-semester grading will be displayed after the Mid-semester examination

**11 Criterion for NC:** A student will likely to get “NC”, if he / she doesn’t appear / appear for the sake of appearing for the evaluation components / scoring zero in pre-compre total / scoring zero in Comprehensive examination.

**12 Chamber consultation hours:** Th7

### 13 Makeup and Attendance policies:

**Make-ups** are not given as a routine. It is solely dependent upon the genuineness of the circumstances under which a student fails to appear in a scheduled evaluation component. In such circumstances, prior permission should be obtained from the Instructor-in-Charge (I/C). The decision of the I/C in the above matter will be final.

**Attendance:** Every student is expected to be responsible for regularity of his/her attendance in the classes to appear in scheduled tests and examinations and fulfill all other tasks assigned to him/her in every class. A student should have a minimum of **60%** of attendance in a course to be eligible to appear for the Comprehensive Examination. For the students under the purview of Academic Counseling Board (ACB), the Board shall prescribe the minimum attendance requirement on a case-to-case basis. Attendance in the course will be a deciding factor in judging the seriousness of a student which may be directly / indirectly related to grading.

### 14 General instructions:

Students should come prepared for classes and carry the text book(s) or material(s) as prescribed by the Course Faculty to the class.

### 15. Notices:

All notices concerning the course will be displayed through LMS.

*S. Baskaran*  
Instructor-in-Charge