INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

MASTER OF BUSINESS ADMINISTRATION

COURSE INFORMATION SHEET

Course Title	**QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS**			
Course Code	CMB011			
Programme	MBA			
Semester	III			
Course Type	Core			
Regulation	R16			
Course Structure	**Lectures**	**Tutorials**	**Practicals**	**Credits**
	3	-	-	3
Course Coordinator	Mrs. I Shireesha, Assistant Professor, MBA			
Course Faculty	Mrs. I Shireesha, Assistant Professor			

I. COURSE OVERVIEW:

The primary objective of this course is to introduce the concept of operation research as a precise mathematical concept, and study how to assign jobs to workers, enhance the profit to companies by applying different methods of operation research. The course consists of Scheduling, Queuing and Decision trees to optimize the solutions.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
PG	CMB005	I	Statistics for Management	3

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Quantitative Analysis for Business Decisions	70 Marks	30 Marks	100

SEMESTER END EXAMINATION (SEE):

The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into FIVE units and each unit carries equal weight age in terms of marks distribution. The question paper pattern is as follows: Two full questions with 'either' 'or' choice will be drawn from each unit. Each question carries 14 marks.

CONTINUOUS INTERNAL ASSESSMENT (CIA):

CIA is conducted for a total of 30 marks, with 25 marks for Continuous Internal Examination (CIE) and 05 marks for Quiz / Alternative Assessment Tool (AAT).

CONTINUOUS INTERNAL EXAMINATION (CIE):

The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

QUIZ / ALTERNATIVE ASSESSMENT TOOL (AAT):

Two Quiz exams shall be online examination consisting of 20 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, micro projects, five minutes video and MOOCs.

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

√	CHALK & TALK	√	QUIZ	√	ASSIGNMENTS	X	MOOCs
√	LCD / PPT	√	SEMINARS	X	MINI PROJECT	X	VIDEOS
X	OPEN ENDED EXPERIMENTS						

V. ASSESSMENT METHODOLOGIES – DIRECT:

√	CIE EXAMS	√	SEE EXAMS	√	ASSIGNEMNTS	√	SEMINARS
X	LABORATORY PRACTICES	√	STUDENT VIVA	√	MINI PROJECT	X	CERTIFICATION
X	TERM PAPER						

VI. ASSESSMENT METHODOLOGIES – INDIRECT:

√	ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	√	STUDENT FEEDBACK ON FACULTY (TWICE)
X	ASSESSMENT OF MINI PROJECTS BY EXPERTS		

VII. COURSE OBJECTIVES:

The course should enable the students to:

I. **Apply** quantitative techniques to business decisions using Mathematical tools.
II. **Develop** fundamental applications of those tools in industry and public sector in contexts involving uncertainty and scarce or expensive resources.
III. **Demonstrate** with mathematical and computational modeling of real decision making problems including the use of modeling tools.
IV. **Illustrating** with the design implementation and analysis of computational experiments.
V. **Understand** the concept of operation research to optimize the solution.

VIII. COURSE LEARNING OUTCOMES:

Students, who complete the course, will have demonstrated the ability to do the following:

S. NO	Description
CCMB011.01	Introduce the basic knowledge of operations research and its application in managerial areas.
CCMB011.02	Describe a model and analyze the solving technique to propose recommendations for business decision-making.
CCMB011.03	Comprehend the topic of linear algebra and its use in practical problems.
CCMB011.04	Develop a linear programming model from problem description and Apply the Simplex method to solve linear programming problems.
CCMB011.05	Categorize and optimize resources to maximize profit and eliminate customers waiting period for service delivery.
CCMB011.06	Evaluate multiple optimal solution and unbalanced assignment problem techniques.
CCMB011.07	Summarize decisions made under different environmental conditions like certainty, uncertainty and risk.
CCMB011.08	Demonstrate and construct decision trees to determine possible consequences, resource costs, and utility in the projects.
CCMB011.09	Memorize basic structure and components of a queuing system in probabilistic and deterministic queuing models.
CCMB011.10	Classify queuing models with queue discipline in single and multi service stations with finite and infinite population.

IX. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes(POs)		Level	Proficiency assessed by
PO1	**Managerial skills:** Apply knowledge of management theories and practices to solve business problems.	H	Lectures and Assignments.
PO2	**Decision making skills:**: An ability to analyze a problem, identify, formulate and use the appropriate managerial skills for obtaining its	H	Lectures and Assignments.
PO3	**Ethics:** Ability to develop value based leadership ability.	N	---
PO4	**Communication skills**: Ability to understand, analyze and communicate global, economic, legal, and ethical aspects of business.	N	Lectures and Assignments.
PO5	**Leadership skills**: Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment.	S	---.
PO6	**Entrepreneurial and Innovation skills**: Demonstrate the skills in evaluating business opportunity and identifying sources of potential funding, and develop as successful entrepreneurs.	H	----
PO7	**Strategic skills**: Analyze and formulate managerial strategies to sustain in dynamic global business environment.	N	Lectures and Assignments.
PO8	**Technology skills**: Inculcate and develop technical skills to face the competitive world successfully.	N	---

N= None **S= Supportive** **H = Highly Related**

X. SYLLABUS:

UNIT I
Nature and Scope of Operation Research: Origins of operation research, applications of operation research in different managerial areas, defining a model, types of model, process for developing an operations research model, practices, opportunities and short comings of using an operation research model.
UNIT II
Linear Programming Method: Structure of LPP, assumptions of LPP, Application areas of LPP, guidelines for formulation of LPP, formulation of LPP For different areas**,** solving of LPP by graphical method: simplex method, two phase method, big-M method, converting primal LPP to dual LPP, limitations of LPP; Transportation problem: mathematical model of transportation problem, methods for finding initial feasible solution: northwest corner Method, least cost method, Vogel's approximation method, test of optimality by Modi Method, variation transportation, Problems like unbalanced supply and demand, degeneracy and its resolution.
UNIT-III
Assignment Model: Algorithm for solving assignment model, Hungarian's method for solving assignment problem, variations of assignment problem: multiple optimal solutions, Maximization case in assignment problem. Unbalanced assignment problem, travelling salesman problem, simplex method for solving assignment problem.
UNIT-IV
Decision Theory: Introduction, ingredients of decision problems, decision making under uncertainty, cost of uncertainty, under risk, under perfect information, decision tree, construction of decision tree.
UNIT-V
Queuing Theory: Queuing structure and basic components of a queuing model, distributions in queuing model, Differences in queuing model with FCFS, queue discipline, single and multiple service station with finite and infinite population.

TEXT BOOKS:

1	V.K.Kapoor, "Operations Research", Techniques for Management, 7th edition, Sultan Chand & Sons 2013
2	J.K. Sharma, "Operations Research", Theory and applications, 5th edition, Macmillian, 2013**.**
3	R. Pannerselvam, "Operations Research", PHI, 3rd revised edition,2012
4	Anand Sharma, "Quantitative Techniques for Decision Making", HPH, 2010.

REFERENCES:

1	K.L Schgel "Quantitative Techniques and Statistics", 2012.
2	Hillier / Lieberman, "Introduction to operations research", 9th edition, TMH, 2012.
3	Hamdy A Taha, "Operations Research: An Introduction", 9th edition, Pearson, 2013.
4	Prem Kumar Gupta "Introduction to Operations Research" S.Chand, 2012.

XI. COURSE PLAN:

The course plan is meant as a guideline. There may probably be changes.

Lecture No.	Topic Outcomes	Topic/s to be covered	Reference
1-3	**Analyze** and interpret results and present this in both oral and written form.	Origins of operation research, applications of operation research in different managerial areas.	T-1:1.1, 1.8, 1.10
4-7	**Define** model and Demonstrate examples	Defining a model and types of	T-1:1.9

	where Operation research can be applied.	model. Process for developing an operations research model and practices.	
8	**Understand** how to translate a real-world problem.	Opportunities and short comings of using an operation research model.	T-1:1.11, 1.12
9-10	**Understand** the topic of linear algebra and its use in practical problems.	Structure of LPP, assumptions of LPP and Application areas of LPP.	T-1:2.1, 2.3, 2.4, 2.7
11-12	**Identify** and develop operational research models from the verbal description of the real system.	Guidelines for formulation of LPP and formulation of LPP For different areas.	T-1:2.8
13-15	**Understand** the mathematical tools that are needed to solve optimization problems.	Solving of LPP by graphical method.	T-1:2.9
16-22	**Formulate** a Linear Program or translate into standard form, and use the Simplex Method to solve.	Simplex method and two phase method. Big-M method. Converting primal LPP to dual LPP.	T-1:3.3, 3.5,4.3
23	**Define** Transportation problem	Transportation problem: mathematical model of transportation problem.	T-1:5.1, 5.2
24-29	**Applied** to other statistical problems, such as raking and statistical disclosure for frequency count tabulations and microdata.	Methods for finding initial feasible solution: Northwest corner method, least cost method and Vogel's approximation method.	T-1:5.5
29-32	**Understand** the mathematical tools that are needed to solve optimization problems.	Test of optimality, Modi Method, Variation transportation.	T-1:5.6
33	**Determine** unbalanced transportation problems.	Problems like unbalanced supply and demand.	T-1:5.7
34	**Determine** degeneracy and find solution.	Degeneracy and its resolution.	T-1:5.9
35	**Understand** the algorithm for solving assignment model.	Algorithm for solving assignment model.	T-1:6.2
36	**Define** Hungarian's method	Hungarian's method for solving assignment problem.	T-1:6.3
37-41	**Illustrate** different assignment problem	Variations of assignment problem. Multiple optimal solutions, Maximization case in assignment problem, Unbalanced assignment problem.	T-1:6.4, 6.5
42-43	**Demonstrate** travelling salesman problem	Travelling salesman problem.	T-1:6.6
44	**Define** decision theory.	Introduction of decision problems.	T-1:10.1
45	**Demonstrate** decision theory	Ingredients of decision problems.	T-1:10.2,3
46-49	**Distinguish** modeling tools and computational tools, as well as analytic skills to evaluate the problems.	Decision making under uncertainty, Cost of uncertainty, under risk and under perfect information.	T-1:10.5
50-53	**Develop** a report that describes the model and the solving technique, analyse the results and propose recommendations in language understandable to the decision-	Decision tree and Construction of decision tree.	T-1:10.6, 10.7

	making processes in Management Engineering.		
54	**Define** Queuing theory.	Queuing structure.	T-1:9.1, 9.2
55	**Explain** components of a queuing model.	Basic components of a queuing model.	T-1:9.3
56-58	**Distinguish** queuing model with FCFS	Distributions in queuing model, differences in queuing model with FCFS	T-1:9.4
59-62	**Explaining** single service station with finite and infinite population.	Queue discipline, single service station with finite, single service station with infinite population.	T-1:9.6
63-66	**Distinguish** Multiple service stations with finite and infinite population.	Multiple service stations with finite and Multiple service stations with infinite population.	T-1:9.6

XII. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S. NO	DESCRIPTION	PROPOSED ACTIONS	RELEVANCE WITH POs	RELEVANCE WITH PSOs
1	Optimization Techniques	Seminars	PO 3, PO 5, PO11	PSO 3, PSO 4.
2	Decision trees and Queuing structure and its cost behavior	Seminars / Guest Lectures	PO 3, PO 5, PO11, PO 9	PSO 4
3	Encourage students to work on real time problems based on the taught concepts to optimize problems.	Assignments	PO 2, PO 3, PO 5, PO 9	PSO 1, PSO 3, PSO 4

XIII. MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Objectives	Program Outcomes(POs)							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
I	S	S		S			S	
II	S			S			S	
III		H		S			S	
IV	S	S						
V		S		S			H	
VI	H	S					S	

S = Supportive **H = Highly Related**

XIV. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Outcomes	Program Outcomes(POs)							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CCMB011.01	H			S				
CCMB011.02	S							
CCMB011.03		S		H				
CCMB011.04		H						
CCMB011.05	S			S			S	
CCMB011.06		S					S	
CCMB011.07	S							
CCMB011.08				H			S	
CCMB011.09	S			S				
CCMB011.10								

S = Supportive **H = Highly Related**

XV. DESIGN BASED PROBLEMS (DP) / OPEN ENDED PROBLEM:

1. Implement a statement which is showing the optimized solution for a given problem by applying operation research models.
2. Formulation and analysis of stochastic models with particular emphasis on applications in industrial engineering.
3. Implement transportation problem to determine the minimum cost and minimum distance to be travelled by salesmen.

Prepared by:
I Shireesha
Associate Professor, Department of MBA

HOD, MBA