Title (Units): **GFQR1035 Life is a Game; How to Win? (3,2,1)**

Course Aims: Games seem to be not very serious, but in fact, we can learn how to make smart decisions through playing games. This course adopts an experiential learning approach to learn Game Theory! In every lecture, students will first play some games, explore different strategies in the games and see how well their strategies work. After that, they will be explained how different real life situations, including serious situations in economics, politics, business and even wars can be analyzed similarly. Students will be exposed to a glimpse of Game Theory where they will learn how to analyze real life situations, make decisions, find the best response, and deal with dilemmas, etc. Further analysis includes studying greedy strategies, fairness, and efficiency, etc. After completing this course, students will be able to model simple real life situations, perform STEM-related quantitative analysis and make rational decisions using Game Theory.

Prerequisite: Nil

Course Intended Learning Outcomes (CILOs):
Upon successful completion of this course, students should be able to:

No.	Course Intended Learning Outcomes (CILOs)
	Knowledge
1	Utilize Game Theory basics.
2	Apply Game Theory to model and make rational decision on real life situations.
	Skill
3	Perform quantitative analysis on real life situations using Game Theory.

Calendar Description: We can learn how to make smart decisions through playing games. In every lecture, students will first play some games, explore different strategies in the games and see how well their strategies work. After that, they will be explained how different real life situations, including serious situations in economics, politics, business and even wars can be analyzed similarly. Students will be exposed to a glimpse of Game Theory where they will learn how to analyze real life situations, make decisions, find the best response, and deal with dilemmas, etc. Further analysis includes studying greedy strategies, fairness, and efficiency, etc. After completing this course, students will be able to model simple real life situations, perform quantitative analysis and make rational decisions using Game Theory.

Teaching and Learning Activities (TLAs):

CILOs	Type of TLA
2	Decision-making Workshops will allow students to experience decision making in games that are modelling real life situations, explore different strategies and see how well their strategies work.
1-3	Lectures will be used to introduce Game Theory concepts for modelling and analysing real life situations and making rational decisions.
1	Tutorial exercises will be arranged for students to practice the Game Theory concepts learnt in the lectures.
2-3	Case study is used to help students to integrate the concepts and skills that they have learnt in the courses, and apply them on real life situations.

Assessment:

No.	Assessment Methods	Weighting	CILOs to be addressed	Description of Assessment Tasks
1	Class Exercises	30%	1	Written class exercises are used to test how well students understand Game Theory concepts.

2	Decision-making Workshops	30%	2	This will reward students for their participation and performance in the decision-making workshops. In decision-making workshops, students will play some games like auction, dividing items, voting, etc. Students decide their own strategies to play and try to win the game. The winners will be invited to share their strategies to the class. The decision-making workshops are used to motivate students and allow students to experience decision-making.
3	Case Study	40%	2-3	This is used to evaluate how well students can apply Game Theory concepts to analyze real life situations. The assessment items include a report, a reflective essay, and a presentation. The student will pick a real life problem, model it as a mathematical game, apply appropriate game theory to analyze the situation and come up with a rational decision.

Assessment Rubrics:

Excellent (A)
- Demonstrate thorough knowledge and understanding of Game Theory basics.
- Demonstrate thorough ability to model real life situations using Game Theory and make rational decisions.
- Able to perform quantitative analysis on real life situations using Game Theory with a high degree of effectiveness.

Good (B)
- Demonstrate sufficient knowledge and understanding of Game Theory basics.
- Demonstrate sufficient ability to model real life situations using Game Theory and make rational decisions.
- Able to perform quantitative analysis on real life situations using Game Theory with a considerable degree of effectiveness.

Satisfactory (C)
- Demonstrate some knowledge and understanding of Game Theory basics.
- Demonstrate some ability to model real life situations using Game Theory and make rational decisions.
- Able to perform quantitative analysis on real life situations using Game Theory with some degree of effectiveness.

Marginal Pass (D)
- Demonstrate limited knowledge and understanding of Game Theory basics.
- Demonstrate limited ability to model real life situations using Game Theory and make rational decisions.
- Able to perform quantitative analysis on real life situations using Game Theory with a moderate degree of effectiveness.

Fail (F)
- Demonstrate little or no knowledge and understanding of Game Theory basics.
- Demonstrate little or no ability to model real life situations using Game Theory and make rational decisions.
- Unable to perform quantitative analysis on real life situations using Game Theory.

Course Content and CILOs Mapping:

Content		**CILO No.**
I	Decision-making Workshops	2
II	Game Theory concepts	1
III	Real life example analysis	3

References:

- Erich Prisner, Game Theory Through Examples, Mathematical Association of America, 2014.
- Steven Tadelis, Game Theory: An Introduction, Princeton University Press, 2013.
- Akio Matsumoto and Ferenc Szidarovszky, Game Theory and Its Applications, Springer, 2016.
- Vladimir Mazalov, Mathematical Game Theory and Applications, Wiley, 2014.

• Avinash K. Dixit, Barry J. Nalebuff, The Art of Strategy: A Game Theorist's Guide to Success in Business and Life, W. W. Norton & Company, 2010.
• Martin J. Osborne: An Introduction to Game Theory, Oxford, 2003
• Giacomo Bonanno, Game Theory (3rd ed.), 2024

Course Content:

Topic

I. Decision-making Workshops
   A. Voting Game
   B. Two Bars setting Prices
   C. Prisoner's Dilemma
   D. Doctor Location Game
   E. Wait for more? Or get the money?
   F. Waiting for Mr./Miss Right

II. Game Theory concepts
   A. Game Theory Basics
   B. Modeling real life examples as games and making decisions
   C. Dominated moves and best response
   D. What to do in a dilemma?
   E. Making decision backward
   F. Something out of control

III. Real life example analysis
   A. Selecting a class
   B. Where to open a shop?
   C. Waiting for Mr./Miss Right
   D. Are there guaranteed payoffs?
   E. Does greedy strategy work?
   F. Fairness and efficiency