Project Title:-	Arms Race		
Course Code:-	MTH124B	**Course Name: -**	Differential Equations
Professor:-	Ahmed G. Radwan		
Team Name:-	Bio Partial		
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Problem summary (150 words)	Wars are one of the most dangers threats to the humanity. Science like Mathematics works on making world more safe progressive. An arms race, in its original usage, is a competition between two or more states to have the best armed forces. Each party competes to produce more weapons, larger military, superior military technology, etc. in a technological escalation. Back in the days of the cold war between the United States of America and the Soviet Union, the greatest interest was in the "ARM RACE" between the two countries. And since the end of the war, most of the scientists had focused on the regional antagonisms to analyze it. Lewis Richardson was an English mathematician, meteorologist, pacifist, physicist and psychologist and of course the pioneer in mathematical techniques and its relation in wars. He made a model for Arms Race to make relation between mathematics and war.		
Methodology (200 words)	The model was constructed to be a system of differential equations that can be used to analyze the conflict between two nations or more. The basic system is: $\frac{dx}{dt} = ay - mx + r$ & $\frac{dy}{dt} = bx - ny + s$ The system can also be expanded to describe the state of a conflict between more than two nations for ex. For a three nation conflict the system will be: $\frac{dx}{dt} = ay + bz - mx + r$ & $\frac{dy}{dt} = cx + hz - ny + s$ & $\frac{dz}{dt} = ex + fy - oz + s$ Each differential equation simulates the rate of change of arms buildup for a certain country. Also, X and Y are functions of time that represent the amounts of arms that nation (1) and (2) respectively have at a certain time (t). As for (a) and (b) they are constants that are known as “Fear Constants”, they represent the desire of a nation to increase the amount of arms. Moving to the constants (m) and (n) that are known as the “Fatigue Factors” and they represent the desire of the country to decrease the amount of the arms stockpiles it has at a rate that is proportional to what it possesses Finally, we get to the (r) and (s) which are known for the “Grievance Constants” which represent every other factor like the revenge motive, external pressure etc.		
Achievements and skills gained	1- Ability to make scientific report in IEEE format 2- Ability to make poster and presentation by using Microsoft power point		

(cont.)

Arms Race		
Main Results (High Quality Figures)		
Discussion &Conclusion	**Discussion** The model and analysis here are largely consistent with the Roman adage "if you want peace, prepare for war." The reason states build is to deter attack by other states that would like to expand or otherwise change the status quo away from what the state likes. Arms build ups are costly and inefficient. The states could do better if they could commit themselves not to arm, or not to use arms for attack or coercion. Either possibility would enable a stable outcome at zero or lower levels of arms. **Conclusion** We really have seen how Mathematics and it's principles can introduce to us a group of differential equations that can help us to understand our political world better, we may also say from what we have learned that: This world is so cruel and have no mercy or pity in it, and despite that every country is inviting people to promote for world peace they really only care about being on the top of the others even if it means to consume all the income to go on an "Arms Race".	
References	[1] Dunne, Paul; Nikolaidou, Eftychia; and Smith, Ron. Arms Race Models and Econometric Applications. 1999. Available: http://mubs.mdx.ac.uk/research/Discussion Papers/Economics/dpap %20econ no74.pdf [2] Fox, William P. Arms Control and Warfare. 1999. Available: http://www.dean.usma.edu/math/pubs/mmm99/DDS1.HTM [3] G, Georgiou. (1990) is there an Arms Race between Greece and Turkey? Some Preliminary Econometric Results, Cyprus Journal of Economics, 3(1), 58-73 [4] Granger C.W.J. (1969) Investigating Causal Relations by Econometric Models and Cross-Spectral Methods, econometric, July, 424-38.	
Future work and suggestions	We made a new model for arms race. We take into consideration the faults that others had. We hope that model can be established one day to make the world safer.	
Group Photo		