

Department of Mechanical Engineering

Individual Research Project (MENG35000)

Project Plan (2022-23)

Name	Darian <u>Irani</u>
Project title	Measuring the mechanical properties of medicated chewing gum and evaluating chewing efficiency for oral drug delivery.
Aims	<ul style="list-style-type: none"> Design and fabricate a set of different shapes of maxillary and mandibular teeth to fit onto the (already-available) fabricated set of adaptors. Investigate mechanical properties of medicated chewing gum in vitro using the 'two-bite test'. Investigate chewing efficiency and mechanics of mastication for a fabricated set of different teeth shapes. Compare results and conduct an analysis of data gathered from 'two-bite test' with an available replica of human maxillary and mandibular teeth from 'humanoid chewing robot'. Explore research question: "Could the chewing efficiency and mechanism of mastication sequence, shearing, crushing, and grinding be related to overbite and occlusal contacts, teeth shapes, or optimising the crush/shear ratio?".
Methodology	<ul style="list-style-type: none"> Find optimal maxillary and mandibular jaw angle and conduct assembly modelling of teeth to adaptors on Siemens NX. Produce engineering drawings for fabrication via Siemens NX after a finalized design of maxillary and mandibular teeth that attach to the adaptors. Design of Experiments (DOE) for 'two-bite test' using the Instron machine to simulate mastication. Write a MATLAB script to simulate 1 Hz mastication. Data analysis via MATLAB to evaluate chewing efficiency with real life results and experimental results. Conduct literature survey and analyse 'two-bite test' for medicated chewing gums.

Planning

Task	Week number															
	13	14	15	16	17	18	19	20	21	22	23	24	25	26		
Background reading & project planning																
Assembly modelling of teeth and adaptors																
DOE relating to finding optimal jaw angle and appropriate tolerancing																
Production of engineering drawings via Siemens NX																
Write MATLAB code to simulate 1 Hz mastication for Instron machine																
Conduct experiments for 'two-bite' test with MCG and Instron machine																
Plot graphical results via MATLAB and conduct data analysis																
Research and evaluate chewing efficiency with real-life data and experimental data																
Conduct literature survey and analyze 'two-bite test' for MCGs																
Explore proposed research questions and draw appropriate conclusions																
Conduct further reading into topic and explore deeper areas of research																
Report writing																
Presentation planning for vivas																
Project plan and risk register submission							Report submission							Viva		
							Mid-session review									