



# Classync - Virtual Classroom Platform

Mutation Testing Report  
Group - 33

**Course:** Software Engineering

**Professor:** Prof. Saurabh Tiwari

**Mentor:** Shyam Patel

## Team Members:

Role	Name (ID)
Team Leader	ATIK VOHRA - 202301447
Member	KANANI TANUJ - 202301474
Member	SANAGADHIYA RADHIKA - 202301184
Member	PATEL JAY - 202301430
Member	CHOVATIYA AYUSH - 202301461
Member	OM PATEL - 202301163
Member	BADRESIYA ANSH - 202301477
Member	PREM KUKADIYA - 202301452
Member	RAMOLIYA SHUBHAM - 202301442
Member	GAJERA MANTHON - 202301488

# Introduction

Mutation testing evaluates test suite effectiveness by introducing deliberate code modifications (mutants) and measuring whether tests detect these faults. A mutation score represents the percentage of mutants killed (detected) by tests:

$$\text{Mutation Score} = \frac{\text{Killed Mutants}}{\text{Killed Mutants} + \text{Survived Mutants}} \times 100\% \quad (1)$$

This report presents mutation testing results for 102 files (36 backend, 66 frontend) across a full-stack application using Jest and Stryker.

## Backend Results

Table 1: Backend - Executive Summary

Metric	Value
Total Mutants	3,803
Killed	2,559
Survived	985
No Coverage	259
Mutation Score	72.21%
Files	36
Modules	14

## Backend - Module Level

Table 2: Backend Modules

Module	Score	Killed	Survived	No Cov	Total
lib	96.14%	274	11	2	287
users	88.89%	256	32	1	289
groups	88.37%	76	10	10	96
courses	81.43%	193	44	65	302
classroom	72.73%	64	24	7	95
stream	71.23%	629	254	52	935
app/api	70.11%	2285	974	257	3516
announcements	68.49%	100	46	5	151
chat	67.86%	76	36	0	112
assignments	66.00%	295	152	55	502
auth	64.63%	190	104	30	324
notifications	64.32%	128	71	5	204
submissions	58.04%	278	201	27	506

## Backend - File Level

Table 3: Backend Files (Sorted by Score)

File	Score	Killed	Survived	Total
lib/assignment.js	100.00%	35	0	35
lib/classroom.js	100.00%	56	0	56
lib/client-utils.js	100.00%	23	0	23
lib/file-upload.js	98.00%	49	0	49
users/update-photo/route.js	97.14%	34	1	35
lib/mongodb.js	94.59%	35	2	37
users/route.js	92.06%	58	5	63
users/[uid]/route.js	91.67%	22	2	24
users/upload-photo/route.js	90.24%	37	4	41
auth/check-email-verified/route.js	89.29%	25	3	28
lib/google-drive.js	88.37%	76	9	85
users/update-username/route.js	84.44%	76	14	90
users/remove-photo/route.js	82.86%	29	6	35
notifications/route.js	82.11%	78	17	95
courses/unenroll/route.js	91.49%	43	4	47
groups/route.js	86.36%	57	9	66
courses/[id]/route.js	85.11%	40	7	47
courses/enroll/route.js	84.91%	45	8	53
groups/[groupId]/route.js	95.00%	19	1	20
auth/verify.js	86.96%	20	3	23
classroom/[id]/route.js	85.00%	34	6	40
stream/route.js	70.96%	562	230	792
chat/route.js	67.86%	76	36	112
announcements/route.js	68.49%	100	46	146
courses/route.js	73.77%	45	16	61
classroom/route.js	62.50%	30	18	48
assignments/[id]/route.js	70.54%	182	76	258
auth/send-verification-email/route.js	65.77%	73	38	111
courses/progress/route.js	68.97%	20	9	29
stream/vote/route.js	73.63%	67	24	91
assignments/route.js	59.79%	113	76	189
submissions/route.js	58.04%	278	201	479
auth/verify/route.js	63.24%	43	25	68
notifications/stream/route.js	48.08%	50	54	104
auth/send-verification-email.js	45.31%	29	35	64

## Frontend Results

Table 4: Frontend - Executive Summary

Metric	Value
Total Mutants	126,616
Killed	82,341
Survived	44,275
No Coverage	0
Mutation Score	65.03%
Files	66

## Frontend - File Level

Table 5: Frontend Files (Sorted by Score)

File	Score	Killed	Survived	Total
components/ui/avatar.tsx	100.00%	6	0	6
components/group-edit/GroupEditControls.jsx	100.00%	17	0	17
components/ui/use-toast.ts	92.66%	960	76	1036
components/ui/use-mobile.tsx	85.51%	962	163	1125
components/group-edit/GroupEditModal.jsx	84.96%	113	20	133
components/groups/GroupCard.jsx	83.33%	10	2	12
components/chat/ChatMessageList.jsx	77.50%	1946	565	2511
components/ui/sePARATOR.tsx	77.42%	1190	347	1537
components/ui/badge.tsx	77.25%	1511	445	1956
components/ui/dialog.tsx	77.20%	1266	374	1640
components/ui/slider.tsx	76.86%	983	296	1279
components/auth/Register.jsx	76.58%	2132	652	2784
components/ui/alert-dialog.tsx	75.69%	1519	488	2007
components/ui/resizable.tsx	75.42%	1215	396	1611
components/ui/command.tsx	74.71%	1273	431	1704
components/ui/menubar.tsx	74.29%	1231	426	1657
components/ui/collapsible.tsx	74.18%	1273	443	1716
components/ui/tooltip.tsx	73.77%	962	342	1304
components/ui/navigation-menu.tsx	73.47%	1227	443	1670
components/ui/textarea.tsx	73.24%	980	358	1338
components/ui/sheet.tsx	72.12%	1190	460	1650
components/CreateCourseForm.js	71.83%	51	20	71
components/ai-bubble/AIBubble.jsx	70.63%	2388	993	3381
components/ui/checkbox.tsx	69.75%	1273	552	1825
components/ui/select.tsx	69.10%	1210	541	1751
components/auth/Login.jsx	68.86%	2359	1067	3426
components/ui/dropdown-menu.tsx	68.20%	1259	587	1846

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Table 5 continued

File	Score	Killed	Survived	Total
components/ui/progress.tsx	67.69%	1215	580	1795
components/ui/skeleton.tsx	67.51%	983	473	1456
components/ui/pagination.tsx	67.14%	1222	598	1820
components/ui/context-menu.tsx	66.93%	1271	628	1899
components/ui/scroll-area.tsx	66.39%	1215	615	1830
components/ui/toggle-group.tsx	66.08%	980	503	1483
components/ui/input-otp.tsx	65.96%	1240	640	1880
components/ui/input.tsx	65.92%	1232	637	1869
components/ui/sidebar.tsx	65.47%	1187	626	1813
components/whiteboard/WhiteboardViewer.jsx	65.04%	519	279	798
components/ui/toggle.tsx	64.61%	962	527	1489
components/ui/aspect-ratio.tsx	64.06%	1517	851	2368
components/ui/toaster.tsx	63.93%	980	553	1533
components/ui/sonner.tsx	63.74%	981	558	1539
components/ui/button.tsx	63.02%	1510	886	2396
components/theme-provider.tsx	62.67%	1519	905	2424
components/navigation/notification-bell.jsx	62.49%	1661	997	2658
components/ui/alert.tsx	62.10%	1517	926	2443
components/auth/ResetPass.jsx	62.00%	1992	1221	3213
components/ui/calendar.tsx	61.49%	1506	943	2449
components/ui/form.tsx	60.64%	1254	814	2068
components/ui/popover.tsx	60.36%	1215	798	2013
components/navigation/navigation-bar.jsx	59.80%	1755	1180	2935
components/ui/breadcrumb.tsx	59.61%	1511	1024	2535
components/ui/label.tsx	59.18%	1231	849	2080
components/ui/chart.tsx	58.93%	1392	970	2362
components/ui-hover-card.tsx	58.05%	1240	896	2136
components/chat/ChatMessageItem.jsx	57.89%	1962	1427	3389
components/ui/table.tsx	57.40%	981	728	1709
components/ui/accordion.tsx	56.67%	1520	1162	2682
components/chat/ChatMessageInput.jsx	56.51%	1962	1510	3472
components/ui/tabs.tsx	56.15%	981	766	1747
components/ui/carousel.tsx	56.07%	1455	1140	2595
components/ui/switch.tsx	55.83%	981	776	1757
components/ui/drawer.tsx	55.60%	1260	1006	2266
components/ui/card.tsx	55.41%	1455	1171	2626
components/auth/MainNavbar.jsx	55.28%	2276	1841	4117
components/ui/radio-group.tsx	55.20%	1215	986	2201
components/ui/toast.tsx	55.12%	980	798	1778

## Combined Results

Table 6: Overall Project Summary

Component	Backend	Frontend	Combined
Total Mutants	3,803	126,616	130,419
Killed	2,559	82,341	84,900
Survived	985	44,275	45,260
No Coverage	259	0	259
Mutation Score	72.21%	65.03%	65.21%
Files	36	66	102