

Mini Projects for Semester IV (2025)
Subject: Engineering Mathematics - IV

Dear students, welcome to the mini projects of
Engineering Mathematics - IV!

By completing these group projects, each student is expected to be able to

- Generate random numbers using one or more of the following:
 - (i) Random Experiment such as throwing coin/s, dice etc.
 - (ii) Table of Random Numbers
 - (iii) Softwares such as Excel, Python or R-Programming
 - (iv) Online resources such as www.random.org/integers
- Obtain the frequency distribution of the data obtained
- Identify the probability distribution modelling a given data
- Complete the task given, working as a team
- Compile the learning as a report and present the same
Note that the report should include
 - (i) a brief account of how the team functioned
 - (ii) what were the individual responsibilities and
 - (iii) date and timings of the team meetings

Instructions and Guidelines

- Each student will be a part of a 5 to 6 member team
(Those students who have volunteered to be a part of the faculty project, will be informed by the math faculty about their tasks)
- As soon as you get to know your team number and your team mates, initiate contacting your team members
- Give a name to your team
- This is a team effort
- Write the problem statement
- Divide the task amongst the team members
- Keep a record of the date, time and the discussions during each meeting
- Obtain the averages, draw the graphs and record your inferences through discussions as required (the task and the allotments are given in the succeeding pages)
- Make a list of learnings from the project
- Make a list of references that you used
- Prepare a small report of not more than 6 pages (including the graphs)
- Submit the report on or before **Friday, February 28, 2025**
- There will be presentations of the reports during the **second week of March, 2025**
- For any queries, please contact your Mathematics teacher
- Happy team work!

Rubrics for evaluation

Total marks in Term Work: 10

| S.No. | Criterion | Marks |
|-------|-------------------|---|
| 1 | Critical Thinking | 4 (while analyzing the data) Did not use any reasoning: 0 Used only intuition: 1 Used intuition and observation: 2 Used intuition, observation and statistical tools : 4 |
| 2 | Inferences | 2 Not able to infer anything from the data : 0 inference using only intuition: 1 Used intuition, observation and statistical tools : 2 |
| 3 | Team Work | 2 Team work not evident : 0 Only some members seem to be involved in the work: 1 Good coordination evident among all members : 2 |
| 4 | Timely submission | 2 Not submitted and no communication : 0 Submitted on time , but report not complete in all aspects: 1 Submitted on time and report complete in all aspects: 2 |

Group wise Data allotment:

| Team No. | Problem Statement |
|-----------------|---|
| IT 1 | <p>Generate 100 one digit numbers randomly. Draw the frequency curve of digits vs frequency. Record the number of times you have obtained an even number Next perform 10 trials of generating 100 one digit numbers Step 1: Find the number of times you have obtained an even number in each trial- that is, Count Step 2: Draw the graph of Count vs frequency for all the trials put together. Increase the number of trials to 20, 30, 40, \dots, 100, 200, \dots, 1000, \dots of generating 100 one digit numbers Repeat Steps 1 and 2 in each case. What do you observe ?- Can you identify the distribution?</p> |
| IT 2 | <p>Toss 10 fair coins simultaneously. Record the number of heads. Perform 5 trials of this process of tossing 10 coins. Step 1: Record the number of heads you received in each trial- that is, Count Step 2: Draw the graph of Count vs frequency for all the trials put together. Now perform 10 trials of this process of tossing 10 coins. Repeat Steps 1 and 2. Increase the number of trials to 20, 30, 40, \dots, 100, 200, \dots, 1000, \dots Repeat Steps 1 and 2 in each case. What do you observe ?- Can you identify the distribution?</p> |
| IT 3 | <p>Generate 100 one digit numbers randomly. Draw the frequency graph of digits vs frequency. Next perform 10 trials of generating 100 one digit numbers Step 1: Find the number of times you have obtained an 0 or 1 in each trial- that is, Count Step 2: Draw the graph of Count vs frequency for all the trials put together. Increase the number of trials to 20, 30, 40, \dots, 100, 200, \dots, 1000, \dots of generating 100 one digit numbers Repeat Steps 1 and 2 in each case. What do you observe ?- Can you identify the distribution?</p> |

| Team No. | Project Details |
|----------|--|
| IT 4 | <p>Generate 100 one digit numbers randomly. Draw the frequency graph of digits vs frequency. Next perform 10 trials of generating 100 one digit numbers Step 1: Find the number of times you have obtained an 2 or 4 or 6 in each trial- that is, Count Step 2: Draw the graph of Count vs frequency for all the trials put together. Increase the number of trials to 20, 30, 40, \dots, 100, 200, \dots, 1000, \dots of generating 100 one digit numbers Repeat Steps 1 and 2 in each case. What do you observe ?- Can you identify the distribution?</p> |
| IT 5 | <p>Generate 100 one digit numbers randomly. Draw the frequency graph of digits vs frequency. Next perform 10 trials of generating 100 one digit numbers Step 1: Find the number of times you have obtained an 1 or 3 or 5 or 7 in each trial- that is, Count Step 2: Draw the graph of Count vs frequency for all the trials put together. Increase the number of trials to 20, 30, 40, \dots, 100, 200, \dots, 1000, \dots of generating 100 one digit numbers Repeat Steps 1 and 2 in each case. What do you observe ?- Can you identify the distribution?</p> |
| IT 6 | <p>Throw two dice 10 times and record the sum of the numbers obtained. Draw the frequency curve of sum vs frequency. Record the number of times you obtain the sum as greater than 7. Next perform 10 trials of throwing two dice for 10 times. Step 1: Find the number of times you obtain the sum as greater than 7, in each trial- that is, Count Step 2: Draw the graph of Count vs frequency for all the trials put together. Next perform 20 trials of throwing two dice for 10 times. Repeat Steps 1 and 2. Increase the number of trials to 30, 40, \dots, 100, 200, \dots, 1000, \dots Repeat Steps 1 and 2 in each case. What do you observe ?- Can you identify the distribution?</p> |

| Team No. | Project Details |
|----------|---|
| IT 7 | <p>Toss 8 fair coins simultaneously. Record the number of heads.</p> <p>Perform 5 trials of this process of tossing 8 coins.</p> <p>Step 1: Record the number of heads you received in each trial - that is, Count</p> <p>Step 2: Draw the graph of Count vs frequency for all the trials put together.</p> <p>Now perform 10 trials of this process of tossing 8 coins.</p> <p>Repeat Steps 1 and 2.</p> <p>Increase the number of trials to 20, 30, 40, \dots, 100, 200, \dots, 1000, \dots</p> <p>Repeat Steps 1 and 2 in each case.</p> <p>What do you observe ?- Can you identify the distribution?</p> |
| IT 8 | <p>Toss 8 fair coins simultaneously. Record the number of tails.</p> <p>Perform 5 trials of this process of tossing 8 coins.</p> <p>Step 1: Record the number of tails you received in each trial - that is, Count</p> <p>Step 2: Draw the graph of Count vs frequency for all the trials put together.</p> <p>Now perform 10 trials of this process of tossing 8 coins.</p> <p>Repeat Steps 1 and 2.</p> <p>Increase the number of trials to 20, 30, 40, \dots, 100, 200, \dots, 1000, \dots</p> <p>Repeat Steps 1 and 2 in each case.</p> <p>What do you observe ?- Can you identify the distribution?</p> |

| Team No. | Problem Statement |
|----------|---|
| IT 9 | <p>Throw two dice 10 times and record the sum of the numbers obtained. Draw the frequency curve of sum vs frequency.</p> <p>Record the number of times you obtain the sum as greater than 8. Next perform 10 trials of throwing two dice for 10 times.</p> <p>Step 1: Find the number of times you obtain the sum as greater than 8, in each trial- that is, Count</p> <p>Step 2: Draw the graph of Count vs frequency for all the trials put together.</p> <p>Next perform 20 trials of throwing two dice for 10 times. Repeat Steps 1 and 2.</p> <p>Increase the number of trials to 30, 40, \dots, 100, 200, \dots, 1000, \dots</p> <p>Repeat Steps 1 and 2 in each case.</p> <p>What do you observe ?- Can you identify the distribution?</p> |
| IT 10 | <p>Toss 6 fair coins simultaneously. Record the number of heads. Perform 5 trials of this process of tossing 6 coins.</p> <p>Step 1: Record the number of heads you received in each trial - that is, Count</p> <p>Step 2: Draw the graph of Count vs frequency for all the trials put together.</p> <p>Now perform 10 trials of this process of tossing 6 coins. Repeat Steps 1 and 2.</p> <p>Increase the number of trials to 20, 30, 40, \dots, 100, 200, \dots, 1000, \dots</p> <p>Repeat Steps 1 and 2 in each case.</p> <p>What do you observe ?- Can you identify the distribution?</p> |

| Team No. | Problem Statement |
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| IT 11 | <p>Throw two dice 8 times and record the sum of the numbers obtained. Draw the frequency curve of sum vs frequency. Record the number of times you obtain the sum as greater than 7. Next perform 10 trials of throwing two dice for 8 times. Step 1: Find the number of times you obtain the sum as greater than 7, in each trial- that is, Count Step 2: Draw the graph of Count vs frequency for all the trials put together. Next perform 20 trials of throwing two dice for 8 times. Repeat Steps 1 and 2. Increase the number of trials to 30, 40, \dots, 100, 200, \dots, 1000, \dots Repeat Steps 1 and 2 in each case. What do you observe ?- Can you identify the distribution?</p> |
| IT 12 | <p>Toss 6 fair coins simultaneously. Record the number of tails. Perform 5 trials of this process of tossing 6 coins. Step 1: Record the number of tails you received in each trial - that is, Count Step 2: Draw the graph of Count vs frequency for all the trials put together. Now perform 10 trials of this process of tossing 6 coins. Repeat Steps 1 and 2. Increase the number of trials to 20, 30, 40, \dots, 100, 200, \dots, 1000, \dots Repeat Steps 1 and 2 in each case. What do you observe ?- Can you identify the distribution?</p> |