

ED5518: Data Visualization for Engineers

Instructor: Dr. Palaniappan Ramu | **Email:** palramu AT iitm DOT ac DOT in

Office: 314, Engineering Design Building

Slot: J (M: 17-17.50, W: 14.00-15.15, Th:15.30-16.45)

Venue: ED 307

Credits: 9

TA: TBD

Grading

HW/ Mini projects :30%

Q 1 :15%

Q 2 :15%

End sem Exam:

part 1(Written) :15%

part 2 (Project) :25%

- This is the current grading structure (July 2026) but subject to change with notice
- No late homeworks will be accepted. Any complaints on the homework grading will be resolved with the instructor
- Electronic version submission format:
File name: HWNumber_RollNumber.pdf [only PDF files will be accepted]
- Attendance rules apply.

Course Description

This course introduces students to the use of graphical methods for data analysis, from an analytics perspective. The course will introduce a formal thought process on graphing data to communicate information and to learn its structure, towards decision making.

Prerequisites

- Linear algebra (vectors, matrices, eigenvalues...)
- Optimization (objective functions, constraints, pareto fronts...)
- Data science and machine learning (regression, classification, predictions...)
- Programming (Matlab, Python...)

Course Objectives:

Towards the end of the course, a participant can expect to be able to:

- Identify appropriate visual representation for the type of data presented
- Analyse structures within the data using graphical methods
- Apply visualization to support regression modelling and optimization
- Communicate analytical insights effectively through plots and dashboards

Course Outline:

Week	Topic	Details
1	How technology shapes charts	A classic chart by hand, by code, by AI; ask AI to invent a new form.
2	Perception: human and machine	"Spot the mislead" in 20 charts; encode perceptual rules into an AI critic; compare human vs vision-model misreads
3	Interpretation and misinterpretation	Data Detective moves on an engineering dataset; build a semantic model a human and an agent read identically
4	Purpose and problem framing	Turbine case: keep running or shut down? Full decision brief including blind spots and what-if-we-are-wrong
5	Uncertainty I	Make a chart that is honest about what you don't know: distributions, variation, residuals
6	Uncertainty II	Engineering evidence: envelopes, data density, extrapolation risk, failure modes, drift; SOMs and surrogates
7	Selection and exclusion	Generate 15-20 candidate views with AI; converge; list what each survivor hides
8	From insight to outcome	One problem, three deliveries: chart, one-line answer, direct agent action; argue which was right
9	Verification	Chart unit tests, generator-auditor loops, interpretation checks; ship with an evidence packet
10	Critique	Cross-group publish / fix / kill with independent verdicts
11	Accountability	Deployment, monitoring, insight laundering, chart inflation; who signs off
12	The feedback loop + capstone decision room	Defend a live decision interface before engineers, users, and skeptics