ENGR 310

Lecture 10

15 Feb 2008

Announcements

- No class Monday!

- Recitations all meet next week!
- Assignment 3 due the day before recitation.

Project Deliverables

Design Fair Poster

Model

Team Notebook

Assignment Grading

+1	Superior performance; exceeds expectations.
0	Acceptable quality; meets expectations
-1	Poor quality or incomplete
-2	Late or missing

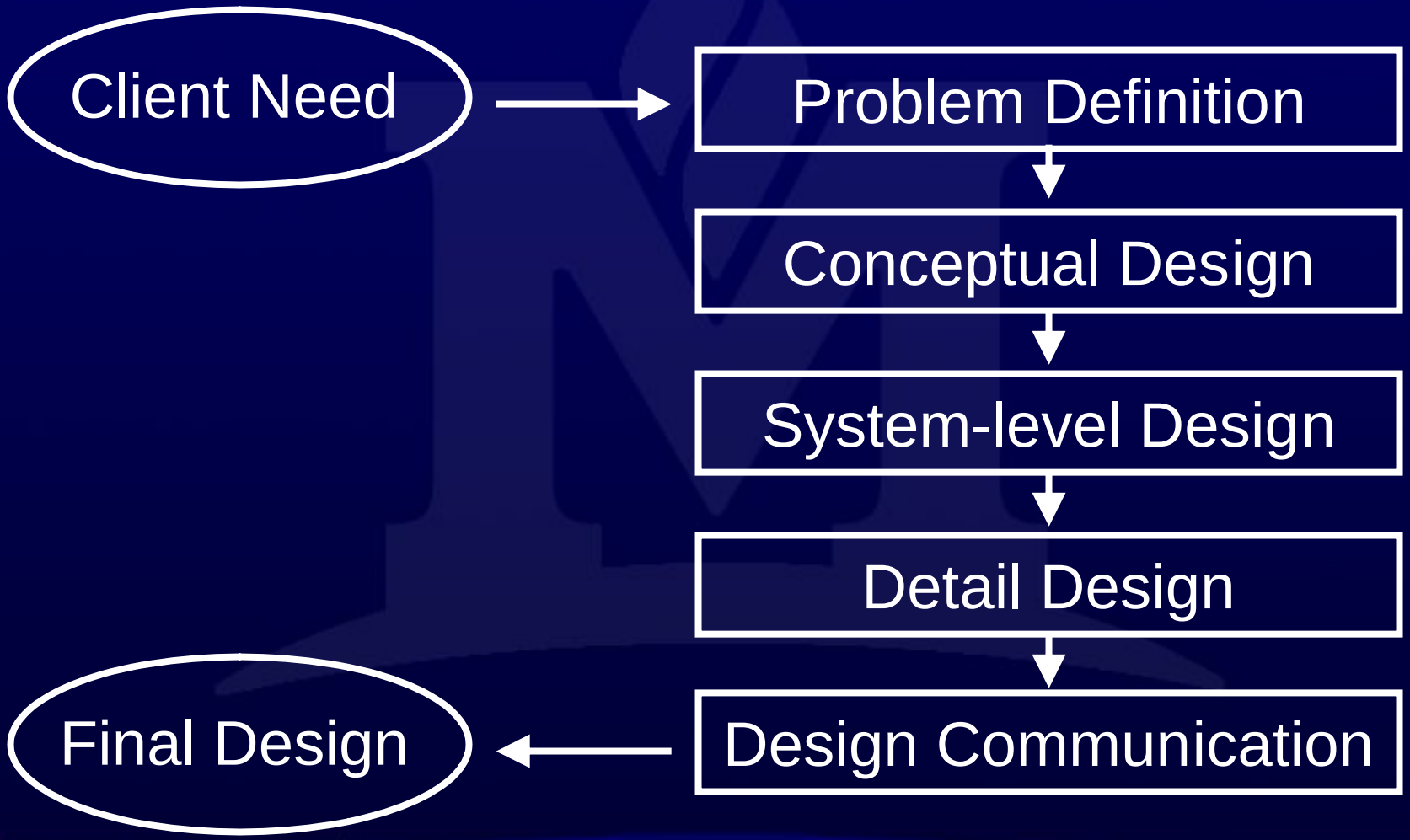
Sum of assignment grades will be added to your final project score.

Today

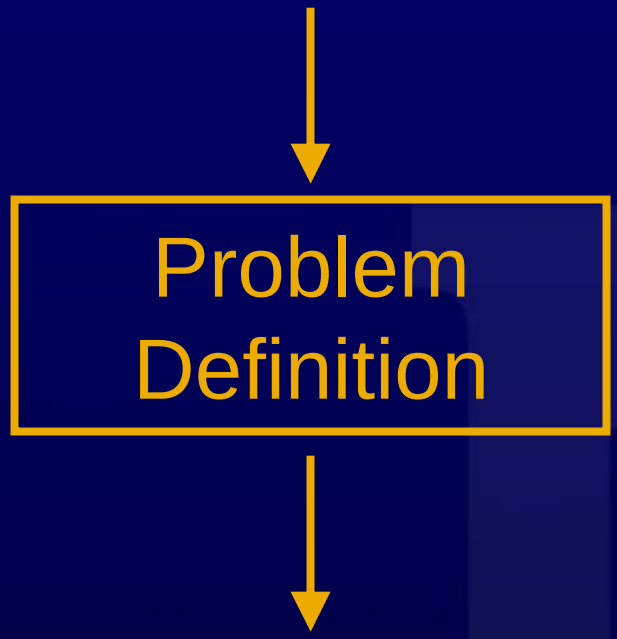
Quantifying what we hope to accomplish:

- Functional specifications
- Constraints
- Design metrics

An Engineering Design Process



client's statements



statement of:

objectives
constraints
requirements
functions

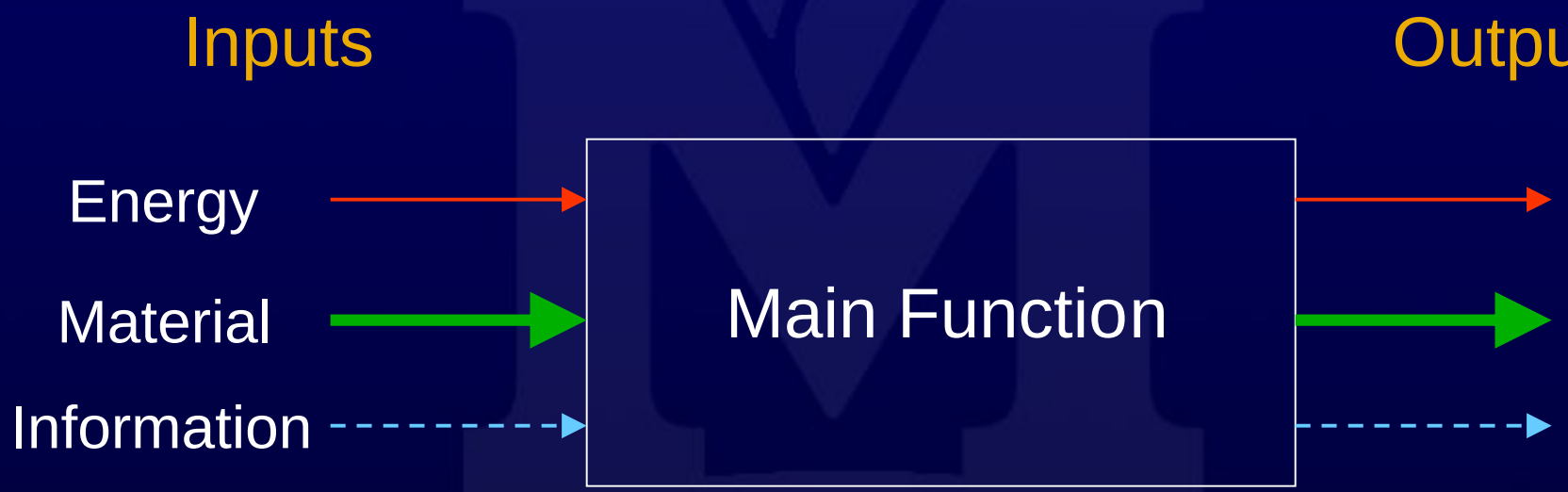
Gather information to develop a statement of client wants in engineering terms:

1. Clarify objectives
2. Establish user requirements
3. Identify Constraints
4. Define desired functions

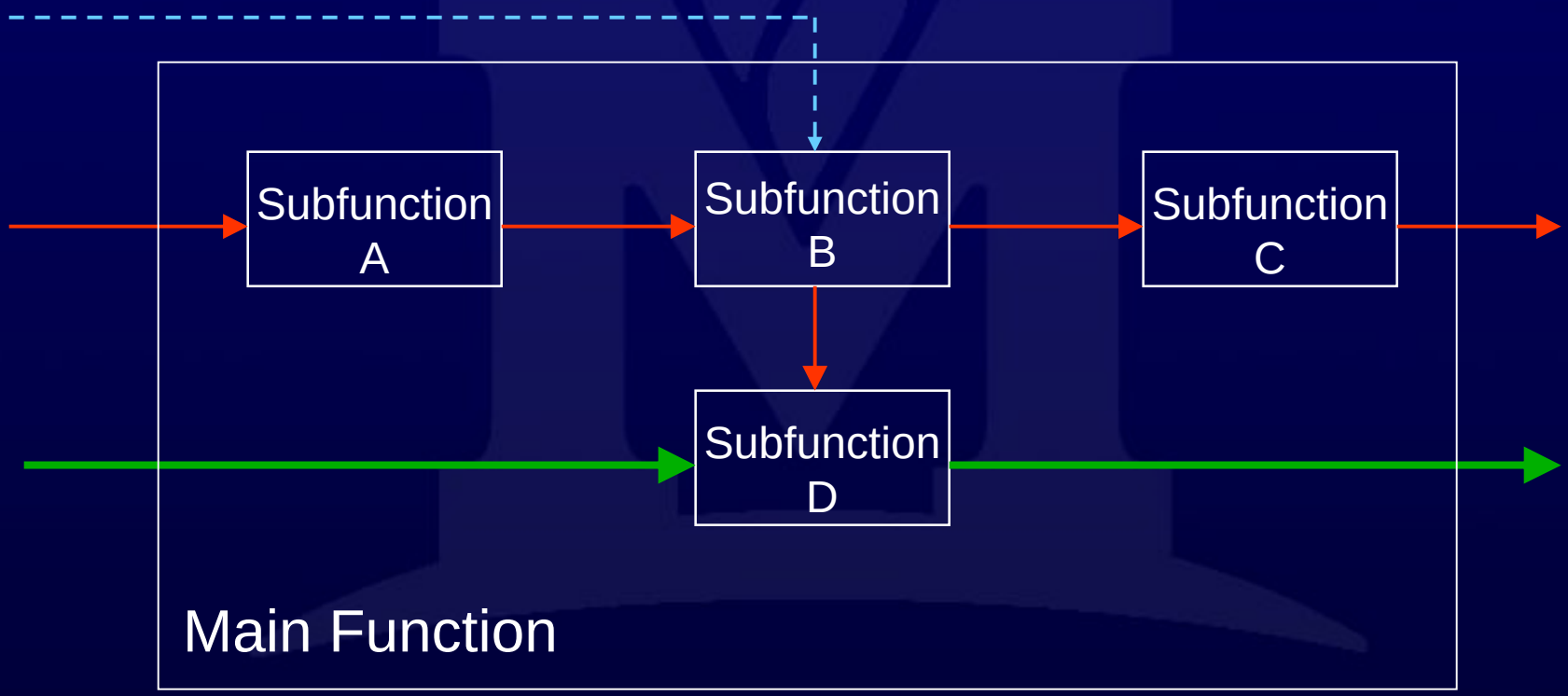
Last Time

Functions = what system must do to achieve objectives

Black Box Approach



Divide Functions into Subfunctions

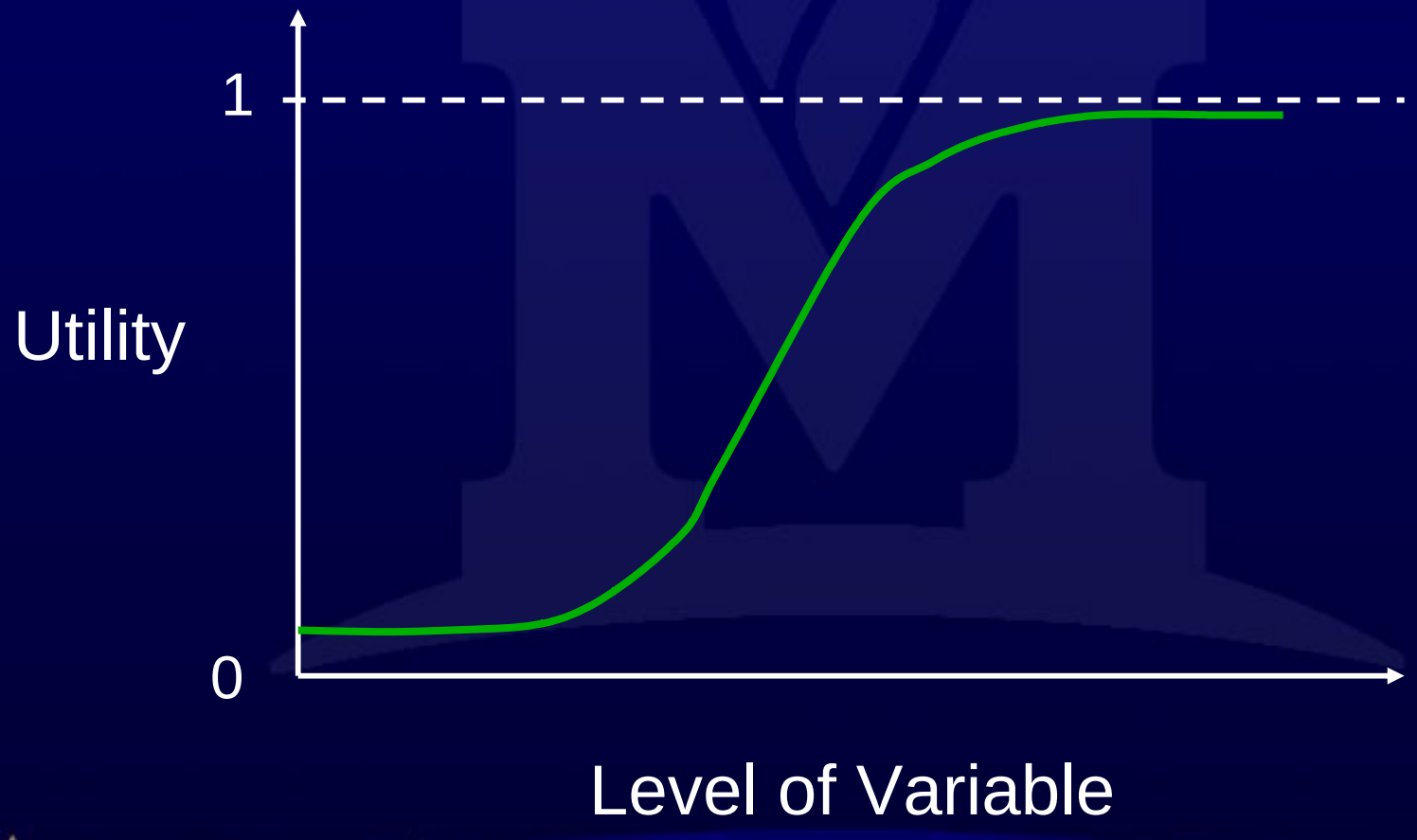


Functional Specifications

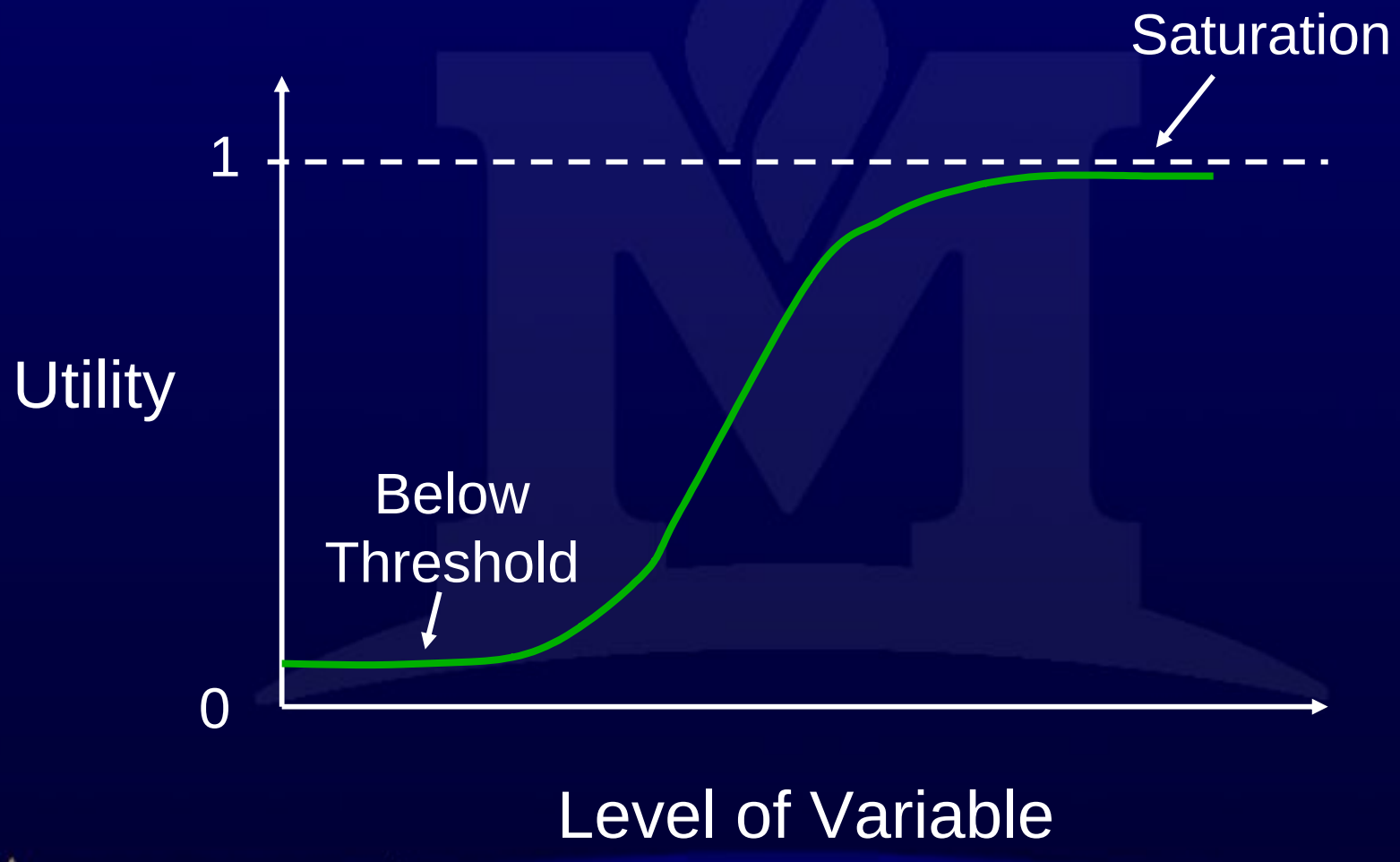
How well must the design accomplish the functions?

- Measurable
- Solution neutral
- Things client/users care about

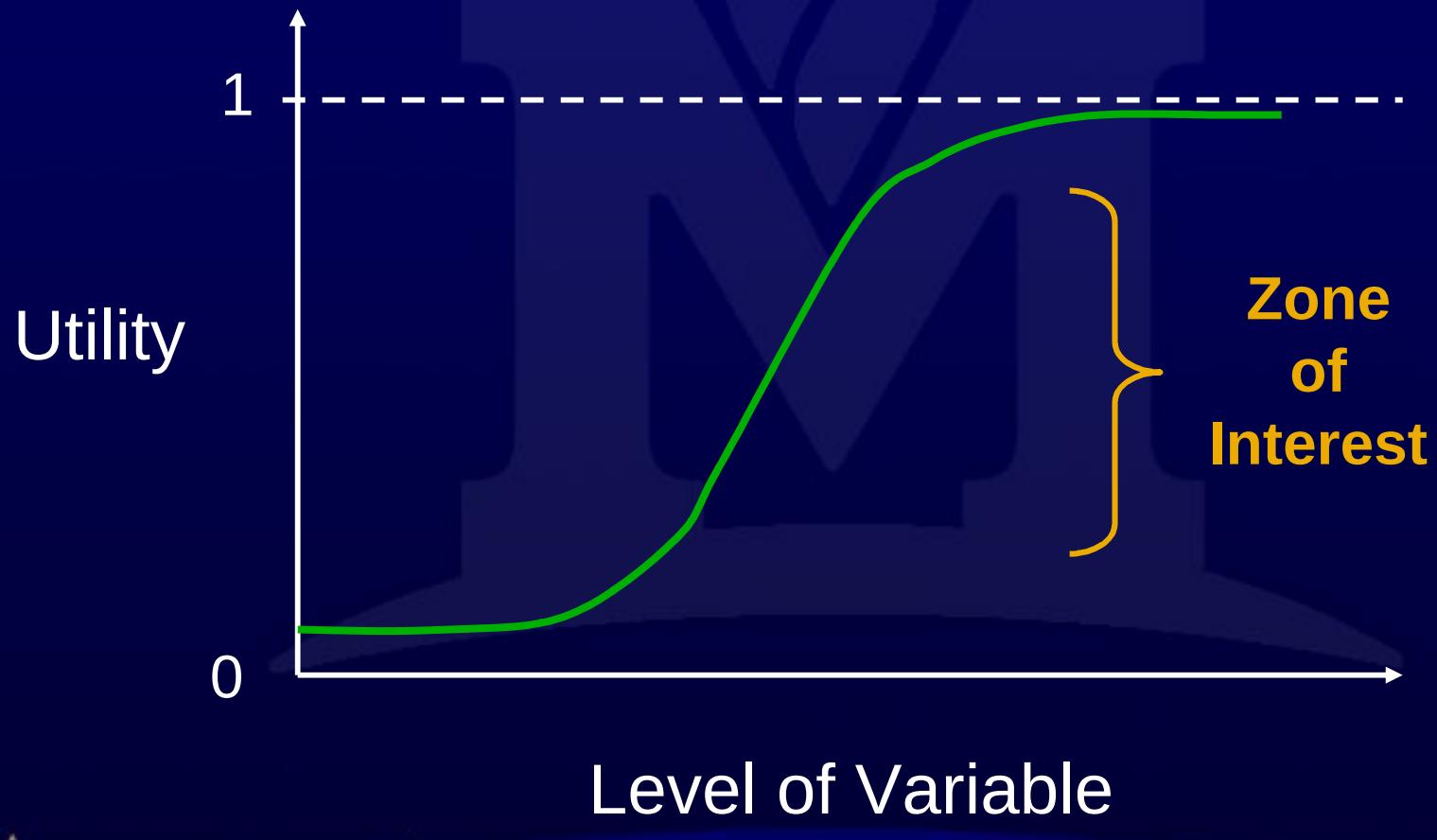
Utility Graph



Threshold and Saturation Regions



“Zone of Interest”



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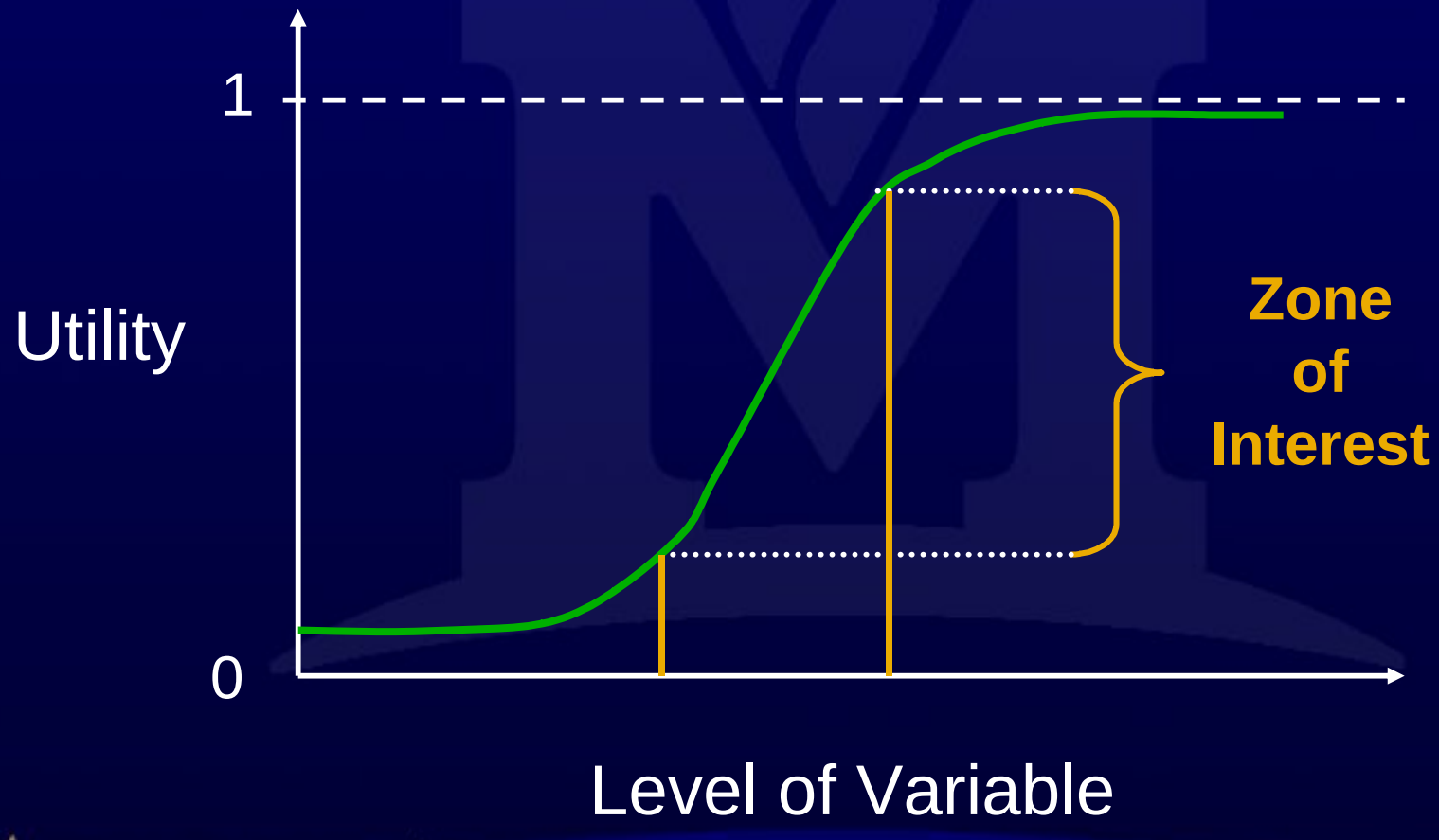

Example: Braille Printer Noise

Quieter is better, but how quiet?

Example: Braille Printer Noise

dB	Typical Source
10	Physical hearing threshold
20	Whisper
30	Quite conversation
40	
50	Normal office background
60	Normal conversation
70	
80	Electric Razor
90	Lawnmower

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Marginal Value?

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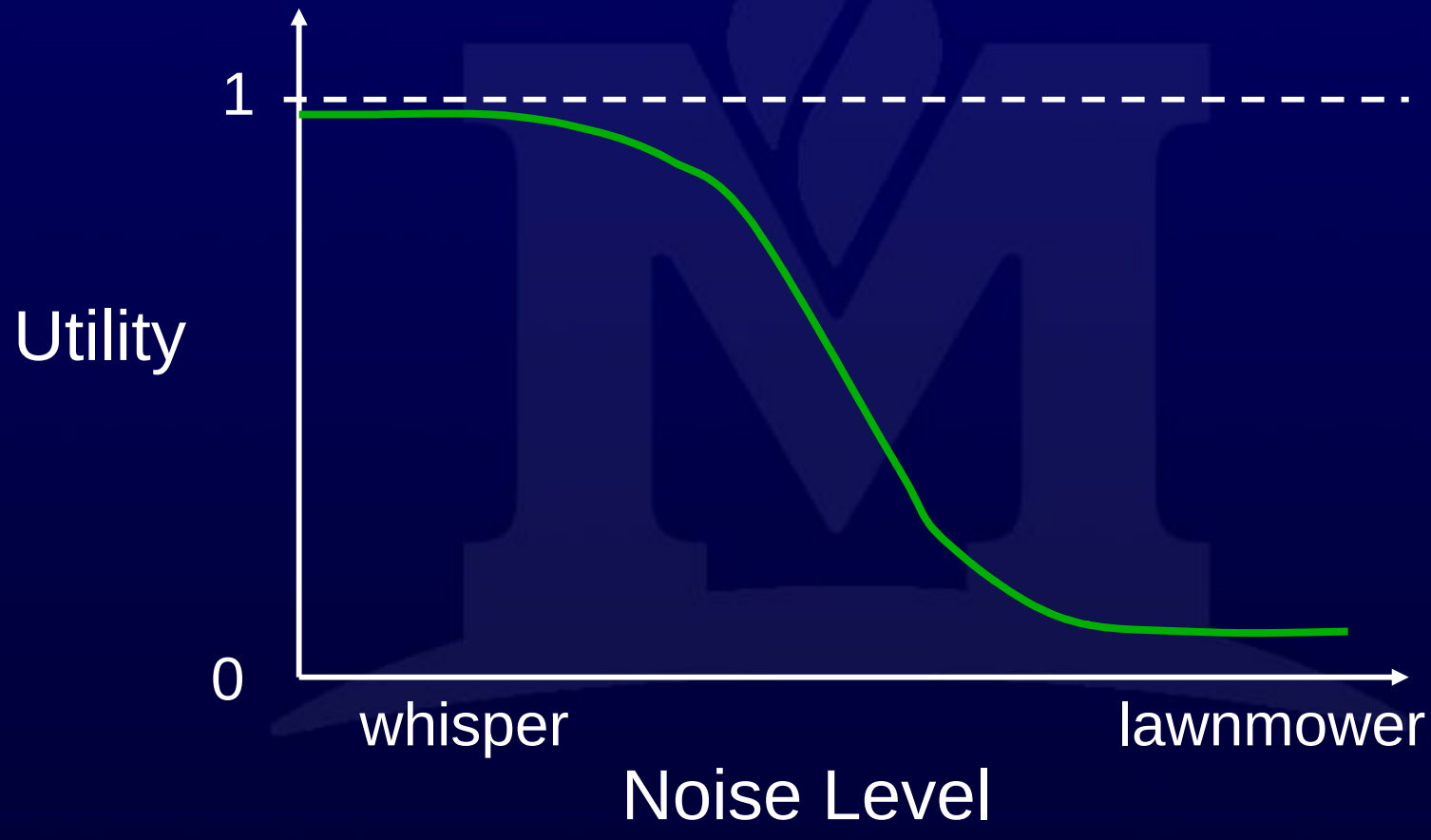
Marginal Value?

Graphically



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OSHA Req't

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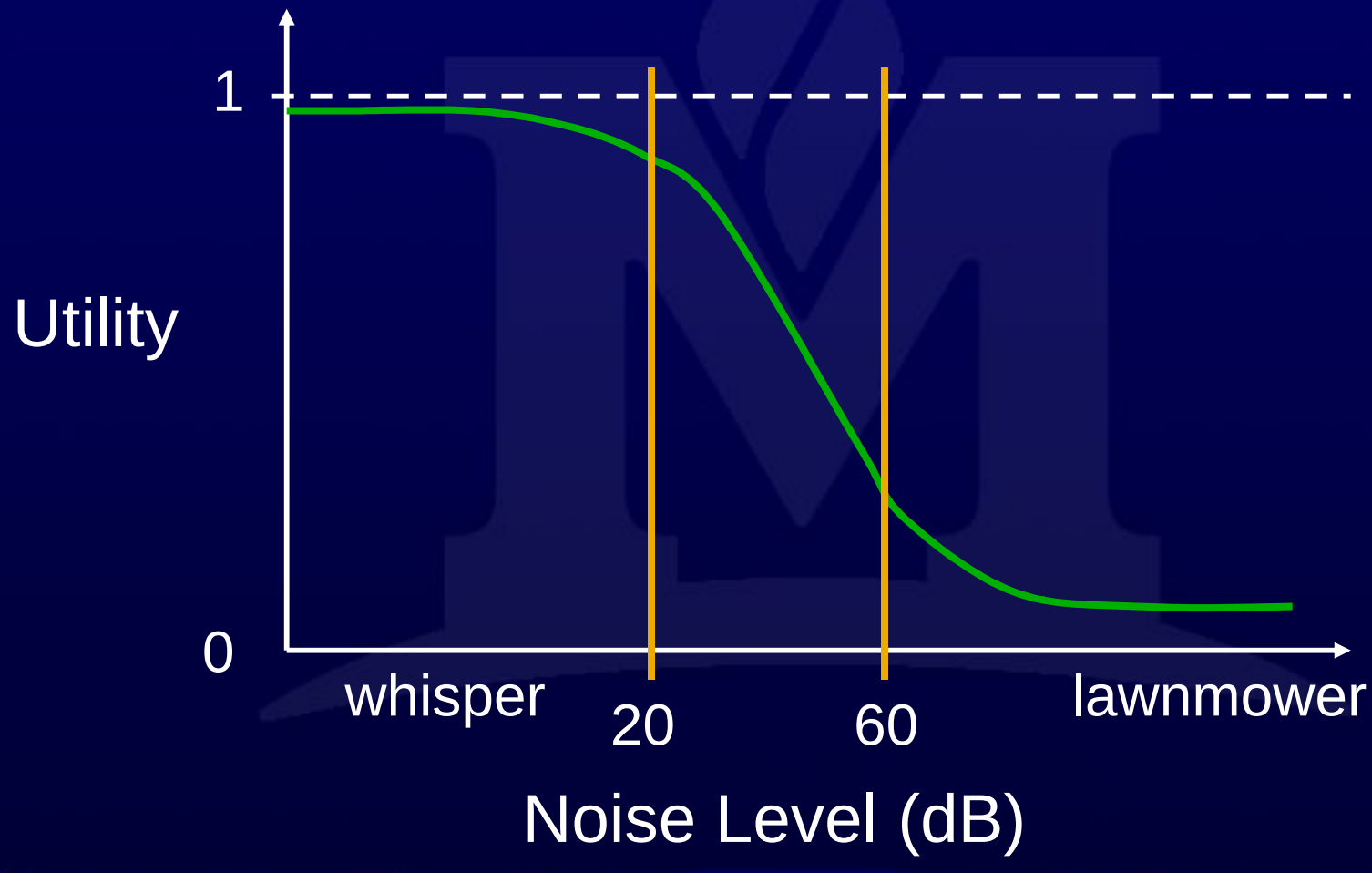

1
Utility
0
whisper
20
60
lawnmower
Noise Level (dB)

Exercise

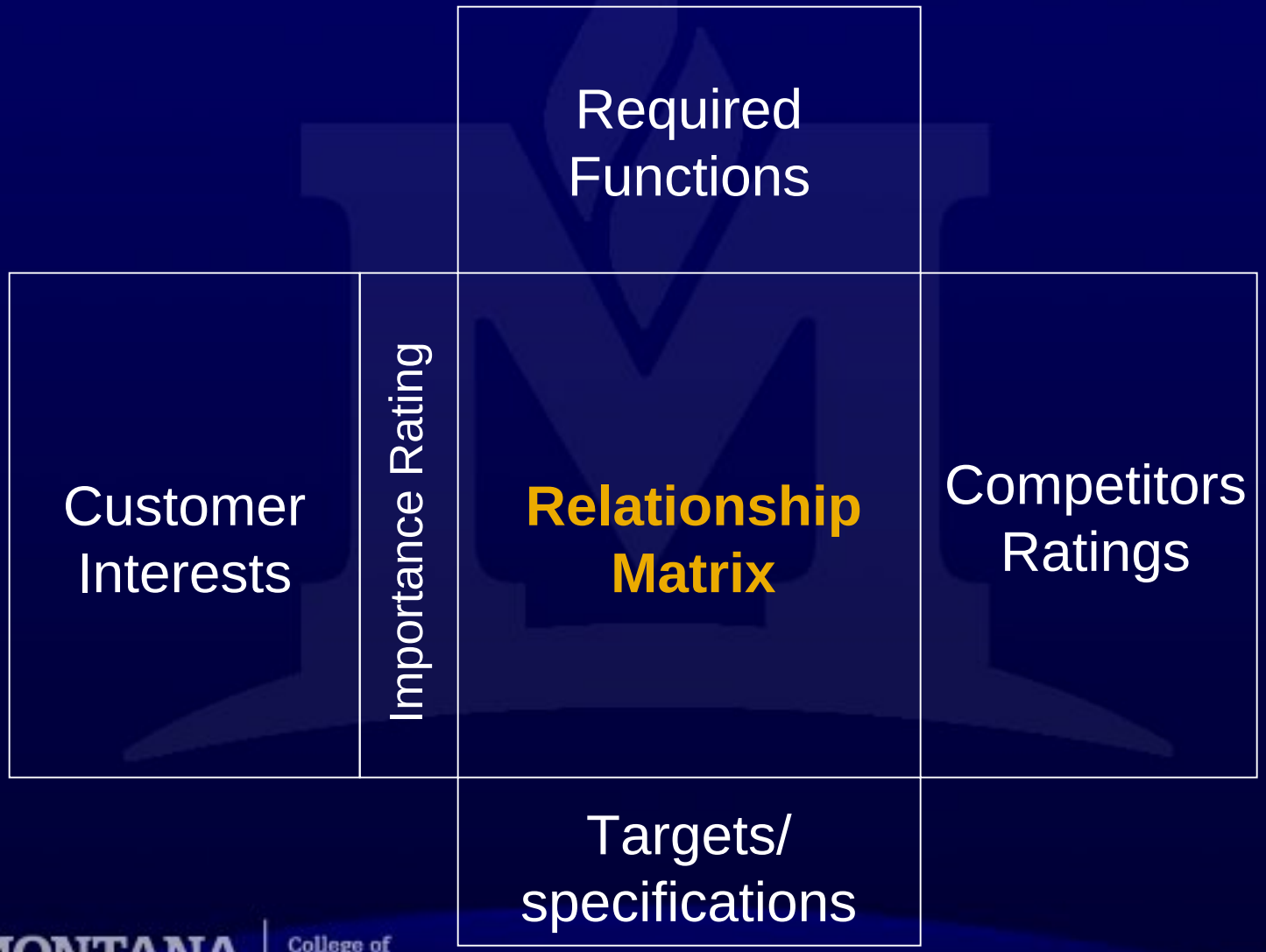
With your team members

- Identify a key function of your design.
- Make a list that shows the full range of performance levels possible
- Identify:
  - Threshold level
  - Saturation level
  - Zone of interest
- How can you quantify?

How to set specification levels?

- Client and user input
- Competitive analysis
- Field analysis

House of Quality



Example: House of Quality

- Handout

Constraints

- Often numerical
- Can be upper/lower bounds on functional performance
- Do not add frivolously! Only if truly exist.

Metrics vs. Specifications

Functional Specifications = how well system must perform

→ *correspond to functions*

Design Metrics = measure extent to which an objective has been realized

→ *correspond to objectives*

Design Metrics

- Define units (e.g., kg, $, N)
- Determine level of accuracy
- Define how you will measure
- Assess whether it is reasonable
  - does it measure what you want to measure?
  - is it accurate enough?
  - is measurement practically feasible?
  - is it repeatable?