Housekeeping notices

Written assignments have been modified. Look at the course web site for the updated schedule and discussion on report writing.

Housekeeping notices

Storage lockers are available near the Measurements Lab on the third floor of the old ME building for items related to your group.
PROJECT PLAN

As practiced in ME 4054

(Ref: Chap. 5, Ulrich & Eppinger text)
Draft Deliverables due September 28

1. Problem Statement
2. Design Description
3. Design Requirements (Design Specifications)
4. Work Breakdown Structure
5. Gantt Chart

1. Problem Statement

A one-paragraph overview of the problem your team is trying to solve.
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A one-paragraph overview of the problem your team is trying to solve.

Each team member writes a draft and the team combines these into a single statement.

2. Design Description

A one-paragraph description of what the product is, who the customers are, and why your product is better than current or past solutions.
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A one-paragraph description of what the product is, who the customers are, and why your product is better than current or past solutions.

Each team member writes a draft and the team combines these into a single paragraph.

3. Design Requirements/Product Specifications

When?

- Identify customer needs
- Establish target requirements
- Generate concepts
- Select concept
- Refine requirements
- Detail design, test, prototyping
Would you buy this stereo?

Denon AVR-5803...THX Ultra2 Certified THX Surround EX/DTS ES 6.1
Discrete/Dolby Digital EX Pro Logic II/DTS A/V Surround Reference Receiver (www.denon.com)

PRODUCT SPECIFICATIONS

THX Ultra2 Certified • THX Surround EX; DTS Extended Surround Discrete 6.1; DTS ES Matrix 6.1; DTS Neo:6 Cinema & Neo:6 Music Matrix Decoding; Dolby Digital; Dolby Pro Logic; Dolby Headphone; DTS • Ultra2 7.1 Cinema and Music modes • Lucasfilm Home THX Cinema 4.0, 5.1 and 6.1ES post-processing; THX Surround EX decoding • DVD-Audio decoding with Adjustable Digital Bass Management, Delay, Channel Levels and Tone Controls, through DENON Link or External Analog Inputs • DDSC-Digital featuring New dual Analog Devices HammerHead SHARC 32-bit floating point DSP processors • 7 Channels equal power amplifier section • 170 watts per channel (8 ohms, 20 Hz-20 kHz, <.05%THD) • 200 watts per channel (8 ohms, 20 Hz-20 kHz, <.05%THD) • 24 bit, 192 kHz/A/D conversion (Burr-Brown PCM-1904 x 4) on all analog inputs, including External 7.1 inputs • 16 Burr-Brown PCM-1738E 24-bit, 192-kHz highest resolution DACs, with DSD compatibility - each audio channel operating in differential mode • Pure Audio mode, features 4 DACs per audio channel in dual-differential mode • ALPHA 24 Processing Plus in Stereo/Direct/Pure Direct modes (left/right channels) • 4 24 bit,192 kHz Digital Interface Receivers • 3 sets component video inputs, compatible with wideband (480p, 720p, 1080i) response for progressive DVD, DTV (100 MHz) • 8 sets composite and "S" video inputs • Video Conversion of Composite to S-Video and/or to Component • 1 AC-3 RF digital input for laser disc • TWO sets of 7.1 external wide bandwidth (100 kHz) inputs for multi-channel formats with full Bass Management(defeatable) • 11(5 Coax, 6 Opt.) assignable digital inputs • 8 Channel Digital External Inputs • 13 analog inputs including built-in AM/FM tuner • Multi-Zone 1 stereo pre-amp outputs with video output • Multi-Zone 2 outputs, pre-amp outputs or speaker outputs • RS-232C port for external controllers • Remote In/Out Ports • 12 and 5 volt triggers • DENON Link, for connection to DVD-9000 • Variable high/low pass Crossover 40/60/80/100/120 • Audio Delay adjustment to match audio signals with video signals(0-200ms) • Digitally regulated volume control with .5dB increment adjustments and step range of -80 to +15 • Delay time adjustment increased to 20 feet per speaker in .5 foot increments • Auto Surround Mode stores modes by signal type(analog or digital) in memory • AKTIS RC-6001ST Charger/RF Base Station included • Download the owner's manual in PDF format • Dimensions: 17.1"w x 8.5"h x 19.1"d • SRP $4300

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DEFINING PRODUCT REQUIREMENTS
(a.k.a. Product Specification or Product Design Specification)

- A documented statement of what the product is to do
- Living document, but defined early
- Driven by customer needs
- Shows what you are trying to achieve
- Contains:
  - List of Customer Needs
  - Design Specifications

Establishing Target Specifications

1. Prepare a list of metrics
2. Collect competitive benchmarking information
3. Set *ideal* and *marginally acceptable* target values
4. Reflect on the results and process
METRICS (I)

- The design criteria
- Should be:
  - Practical
  - Achievable
  - Easy to understand
  - Derived from a customer need

METRICS (II)

“Hard”

<table>
<thead>
<tr>
<th>Need</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Must fit in a toolbox</td>
<td>Size</td>
</tr>
<tr>
<td>Wants to pick up</td>
<td>Weight</td>
</tr>
<tr>
<td>Concerned with cost</td>
<td>Cost</td>
</tr>
</tbody>
</table>

“Soft”

<table>
<thead>
<tr>
<th>Need</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>For DIY market</td>
<td>Easy to assemble</td>
</tr>
</tbody>
</table>
Target values

- Numeric….with units
  - 4.0 lbs, or 2 by 2 ft, or 10 in³, or $20
- Express target as:
  - Exact ($20)
  - Less than (< $20)
  - Greater than (> $20)
  - Range ($20-$30)

Group Exercise: Create a Product Specification Table with top 5 Metrics

Create an Excel spreadsheet with the appropriate headings

<table>
<thead>
<tr>
<th>Metric #</th>
<th>Need #s</th>
<th>Metric</th>
<th>Importance</th>
<th>Units</th>
<th>Marginal Value</th>
<th>Ideal Value</th>
</tr>
</thead>
</table>
Example: Calibration Reference Device for ASHRAE Standard 52.2

<table>
<thead>
<tr>
<th>Metric #</th>
<th>Need #s</th>
<th>Metric</th>
<th>Importance</th>
<th>Units</th>
<th>Marginal Value</th>
<th>Ideal Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>Pressure Drop</td>
<td>4</td>
<td>in. water</td>
<td>&lt;1.5</td>
<td>&lt;1.0</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>Weight</td>
<td>3</td>
<td>lb</td>
<td>&lt;50</td>
<td>&lt;25</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>Air Flow Rate</td>
<td>5</td>
<td>cfm</td>
<td>500-2000</td>
<td>2000</td>
</tr>
</tbody>
</table>

SOME MORE METRICS

- Time-to-market
- Environment
- Users
- Storage life
- Service life
- Product life
- Maintenance
- Warranty
- Shipping size
- Packaging
- Materials
- Manufacturing facility
-Prototyping facility
-Regulatory environment
-Reliability
-Patents
-Test protocol
-Safety
-User interface
-Mfg cost
-End-user price
-Delivery time

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The design requirements must:

- reflect customer need
- differentiate the product from the competition
- be technically and economically feasible

Sandy Cutler, CEO of Eaton, asks his engineers:

• Is the customer asking for it?
• What differentiation does it offer Eaton?
• What value does it offer the customer?