Developing a “Live Tool” for Mechanical Engineering

Easier tools for preparing 4-year plan that meets ME, Univ reqmts
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Develop a tool to enable easier

• 4-year course planning for students, in compliance with prerequisites and schedule of offerings
• Approvals of course plans as part of ME declaration
• Approval of student readiness for graduation (Tracking which courses taken, and grades received in those courses)
• Forecasting of enrollments in the program and individual courses
• Knowledge of which academic year all our ME students are in
Declaring a major in ME

- Complete a program sheet with intended courses (on paper)
  - Note – students are allowed to use any program sheet in effect at any time since the student matriculated to Stanford
- Include courses taken with letter grades
- Seek faculty to sign/approve on the paper
- Taken to Student Services, where it is filed (but not electronically)

To change a program sheet

- Student does the above steps again (starting over)

To prepare to graduate

- Student does the above steps again, with a printed copy of their transcript

Hmmm… cumbersome, manual, tedious!
Some more background

Courses in ME

• We revised our requirements for a BS degree in 2018.
• All courses are not offered every quarter. So building a plan that takes into account offering schedule, and meeting prerequisites, can appear complicated.
• We revised our “flowchart” depicting suggested course sequencing and prerequisites.

Systems in ME

• Enrollments are varying, it would help to forecast enrollments for future course-years.
ME Course Flowchart
2019-2020 year

Key challenges
- Planning 4-yr plan
- Enforcing pre-reqs
- Faculty awareness

Separate Word document describes rationale for core sequence prerequisites, and overview of concentration requirements.

Detailed concentration requirements are listed in UGHB.
4-year plan
Example for student starting with Math AP

- Courses need to meet Math/Science/TIS/ME requirements
- Carries course by quarter/year
- Courses taken when offered
- Placeholders allowed for PWR, Thinking Matters, WAYS
- Detailed requirements are at the end of this slidedeck
Live Tool

• **Problem**: development of 4-year plan that meets all degree requirements is complicated, manual, and relies on word-of-mouth about course sequencing
  • Improved flowchart will help, but still requires a check to confirm compliance
  • Not all faculty advisors are aware of the prerequisites, and don’t always check. Instead they rely on what they know / believe to be required
Live Tool

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- Goal: develop tool that enables students to develop a 4-year course plan that
  - Ensures the plan complies with the prerequisites
  - Ensures courses selected are offered in the quarters desired
  - Confirms when a plan fulfills BSME 2.0 requirements
  - Enables approval of the plan by advisors
Live Tool

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- **Suggested Approach**: Consider development in two stages
  - Develop Program Sheet, similar to today’s “worksheets”
  - Once approved courses/AP selected, then drag&drop to 4-yr chart
Flowchart on the left (could be program sheet), 4-yr on the right

We will look at math and physics as examples
4-year plan
Example for student starting with Math AP

Student
✓ has placed CME100, with all AP meeting Math 19-21
• Selecting CME102, offered A,W,S

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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<tbody>
<tr>
<td>Math 19* (A,W)</td>
<td>CME100</td>
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<td>Total 0</td>
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<tr>
<td>Math 20* (A,W,S)</td>
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<tr>
<td>Math 21* (A,W,S)</td>
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<tr>
<td>Physics 41* or 41E (W)</td>
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<tr>
<td>Chem 31A*(A)+ 31B*(W) OR CHEM 31X (A)</td>
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<tr>
<td>CME100 (A,S)</td>
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<td>Total 0</td>
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<tr>
<td>CME102 (A,W,S)</td>
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<tr>
<td>Physics 43 (S)</td>
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<td></td>
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</tr>
<tr>
<td>Physics 45 (A)</td>
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<tr>
<td>Chem Elective</td>
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</table>

Courses typically taken Freshman year

Courses typically taken or Junior year
4-year plan
Example for student starting with Math AP

Student
✓ has placed CME100, with all AP meeting Math 19-21
✓ Placed CME102, W Freshman year
4-year plan
Example for student starting with Math AP

Student
✓ Plans Phys 41 Winter Sophomore year with AP units satisfying Math 20
• Attempting to place Phys 45 (Aut)
4-year plan
Example for student starting with Math AP

<table>
<thead>
<tr>
<th>Freshman</th>
<th>Class</th>
<th>M&amp;S</th>
<th>Engr</th>
<th>Other</th>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>CME102</td>
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</tr>
<tr>
<td></td>
<td>Total</td>
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<td></td>
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<tr>
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<th>Other</th>
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<th>M&amp;S</th>
<th>Engr</th>
<th>Other</th>
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<table>
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<th>Class</th>
<th>M&amp;S</th>
<th>Engr</th>
<th>Other</th>
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<tr>
<td></td>
<td>Total</td>
<td>0</td>
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</tr>
</tbody>
</table>

Student
- Plans Phys 41 Winter Sophomore year
- Attempting to place Phys 45 (Aut)
4-year plan
Example for student starting with Math AP

Student
✓ Plans Phys 41 Win Sophomore year
  • Attempting to place Phys 45 (Aut)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>CME100</td>
<td>CME102</td>
</tr>
<tr>
<td>Sophomore</td>
<td>Physics 41</td>
<td></td>
</tr>
<tr>
<td>Junior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note, this is red since pre-req not met
Options since prereqs met AND Phys 45 is offered
4-year plan
Example for student starting with Math AP

Student
✓ Plans Phys 41 Win Sophomore year
✗ Placed Phys 45 Aut Sophomore year.
   Red since prereqs not met
4-year plan
Example for student starting with Math AP

Student
✓ Plans Phys 41 Win Sophomore year
✓ Place Phys 45 Aut Junior year

Note, these are grey since pre-reqs met
4-year plan
Example for student starting with Math AP

Student
✓ Removes Phys 41 from plan
✗ Phys 45 Aut Junior year now red

Note, now red since pre-reqs not met
Live Tool Requirements

Program sheet

• There is an existing Worksheet for ME 2018-2019
• Update with current course requirements for 2019-2010 from Flowchart, UGHB
• Add capability for electronic approval by faculty advisor. May be physically done in person
• Allow for that approved worksheet to be referenced or accessed at later time
• Allow for that approved worksheet to be printed for paper reference

4-yr plans

• Courses to be placed in compliance with prerequisites and when courses offered
• Allow for manual placement of PWR, Thinking Matters, WAYs, electives

Changes / Maintenance

• ME Admin must be able to make changes to account for course schedule, prereqs
Live Tool Suggested User Experience

4-yr plans

- Courses to be placed can drag/drop from a program sheet to a 4-year calendar
- When student selects a course to be placed, it should have a status
  - Eligible to be placed (pre-reqs satisfied)
  - Not eligible to be placed (pre-reqs not satisfied)
  - Already placed
- When selecting a course to place, highlight available quarters on the 4-yr plan
  - Quarters when the course is offered
  - Satisfying prerequisites: Either
    - Only show available quarters chronologically after pre-reqs that have been placed, OR
    - allow the placement but be sure it stands out as “pre-reqs not met” until pre-reqs have been placed
- The plan is approvable when all courses are placed in quarters that meet pre-req and offering schedules
- There should be space for students to “write in” any non-ME course

Changes

- If a student moves a course in a way that another course prerequisites are no longer met, the course with prereqs should be highlighted showing that the prereqs are not satisfied.
- If there is a change from ME Admin (e.g., changing a course 2-years out) that would affect an approved plan, please provide a solution for how the student should be notified