USC Viterbi
School of Engineering

Aerospace and Mechanical
Engineering Department

To: AME faculty and Ph.D. students
From: B. Yang
Date: November 9, 2020
Subject: AME Screening Exam
Friday, January 22, 2021

The screening exam is one component of the overall screening procedure that involves each student's complete academic/research record. The faculty of the Aerospace and Mechanical Engineering Department have approved the following format of the AME PhD Screening Exam:

1. **Structure of the examination:** The examination will be organized as follows:
   a. All students will take the written part of the examination.
   b. After examining the results of the written part of the examination, the faculty will determine whether an oral examination needs to be administered to each student.

2. **Frequency of the examination:** The examination will be offered once a year in January. If an oral examination is required, it will be administered no later than two weeks after the results of the written part were discussed by the faculty.

3. **Written part of the examination**
   a. *Format*
   The examination will consist of the following categories
      i. Applied Mathematics - Two (2) problems
      ii. Major area - Three (3) problems
      iii. Minor area - Two (2) problems
      iv. The examination will be closed book.
      v. Calculators are allowed, but other electronic devices are not permitted

   b. Structure:
      i. *Applied Mathematics:* There will be two (2) problems and both of them must be solved. The student must be prepared to answer problems in each of these three topics: Linear Algebra, Complex Analysis and Partial Differential Equations.
      ii. *Major and Minor Areas:* In each of these parts there will be three problems covering the various topics of the area.

   c. *Length of the examination:* The examination will be divided into two parts given in the morning and afternoon of the same day. One part will consist of Applied Mathematics and will last one and a half (1.5) hours. The second part will include the Major and Minor areas and will last three and a half (3.5) hours.

   d. *Grading and evaluation of results:* Evaluation of the results will be performed in three stages.
      i. The problems will be graded by the corresponding faculty.
      ii. Faculty will meet and decide whether the student passed or failed an area.

iii. The faculty will then determine whether the student needs to take an oral examination.

4. **Oral part of the examination**

a. *Composition of the committee:* A committee will be formed for each student and will include three faculty in the student's major area of research.

b. *Evaluation of results:* The oral examination committee will write its recommendations and a decision will be made at a faculty meeting whether the student passed the screening examination. A Pass/Fail decision will be made for each student at the AME faculty meeting. The general policy is that the screening exam can be taken only once. Individual exceptions to this policy may be approved by the faculty on the basis of other significant indicators, such as, for example, research potential.

5. **At the time of registration.** A Sample copy of a past exam will be posted on the AME web page. At the time of registration, a student must:

a. Be admitted to the AME PhD Program, with all conditions cleared in case of a conditional admission;

b. Have completed at least 9 units of graduate work (taken for a letter grade) in AME;

c. Have completed no more than 24 units of graduate work in AME including research courses, as per AME graduate student handbook;

d. Have a cumulative GPA of 3.25 or greater in the AME Graduate Program;

e. Declare his/her major and minor in which he/she wishes to be examined;

f. Provide evidence that an AME faculty member has agreed to serve as his/her Ph.D. advisor.

6. **Applied mathematics, major and minor areas.** To facilitate preparation, the material covered in the screening exam, for some research areas, is identified below by a relevant AME course number and a typical textbook and/or names of the AME faculty members, who may be contacted for further information.

1. **<u>Applied Mathematics</u>** (Profs. *Newton*, Kanso, Newton, Pahlevan, Sadhal, Udwadia)
   - i. Complex Variables
     AME 525, Text: "Complex Variables and Applications" by Churchill and Brown.
   - ii. Linear Algebra
     AME 525, Text: "Linear Algebra" by Shilov.
   - iii. Differential Equations
     AME 526

2. **<u>Combustion</u>** (Profs. *Egolfopoulos*, Pantano-Rubino, Ronney)

   AME 513a/b, Texts: "Combustion" by I. Glassman; "An Introduction to Combustion" by S. Turns.

3. **<u>Control Theory</u>** (Profs. *Flashner*, Perez-Arancibia)
   AME 451, Text: "Modern Control Systems" by R. C. Dorf and R. H. Bishop.
   AME 541, Text: "Linear Systems and Theory" by C.-T. Chen.
   AME 552, Text: "Nonlinear Systems" by H. Khalil.

4. **Design** (Prof. Jin)
   AME 410
   AME 503
   AME 505

5. **Dynamics and Vibrations** (Profs. *Udwadia*, Yang)
   AME 420
   AME 521
   AME 524

6. **Elasticity and Solid Mechanics** (Profs. *Safadi*, Oberai, Plucinsky)
   AME 403
   AME 506
   AME 509

7. **Fluid Dynamics** (Profs. *Luhar*, Bermejo-Moreno, Domaradzki, Newton, Pantano-Rubino, Uranga)
   AME 530a
   AME 511
   AME 535a

8. **Heat Transfer** (Dr. *Sadhal*)
   AME 515 Advanced Heat and Mass Diffusion
   AME 516 Convection Processes
   AME 517 Radiation Heat Transfer

9. **Materials** (Profs. *Hodge*, Kassner)
   MASC 551
   AME 560

10. **Medical Engineering (Minor Only)** (Profs. *Newton*, Oberai, Pahlevan, Sadhal)
    AME 536
    AME 599
    AME 515

11. **Advanced Manufacturing** (Prof. Gupta)
    AME 547 Manufacturing Automation
    AME 554 Additive Manufacturing Technologies
    ISE 511L Mechatronics Systems Engineering