APPENDIX A - COURSE SYLLABUS

FB 527: “Wet-End and Colloidal Chemistry”

Offered: Spring 2017, Tu/Th 1:30 pm -2:45 pm, & by distance education (3 credit hrs)

1. Instructor: Dr. Martin A. Hubbe
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   E-mail: hubbe@ncsu.edu
   Website: http://www4.ncsu.edu/~hubbe (Select “WPS 527”)
   Office hours for student consultation: To be posted

2. Goals and Objectives of Course

   The primary purpose of this course is to prepare graduate-level students to solve problems and
   create product development innovations in the area of paper machine wet-end chemistry. A key
   foundations for this ability is a broad understanding of how finely divided suspended particles,
   fibers, monomers, and polymeric materials interact with each other in aqueous solutions and
   suspensions, i.e. the subject of colloids. Another key foundation is the practical understanding of
   state-of-art strategies used by papermakers, i.e. wet-end chemistry.

   Wet-end and colloidal chemistry is an inter-disciplinary field relating to the efficient operation of
   paper machines and the achievement of paper property objectives. A wet-end chemist has
   knowledge and skills that apply most specifically to papermaking, but also to other fields such as
   water and wastewater treating, wet-laid nonwovens manufacture, mining separations technology,
   and various unit operations in paper recycling. Because colloid chemical concepts are thoroughly
   integrated into the course, the student is prepared to deal with issues involving new materials, new
   chemical strategies, or new product goals. Some of the most critical process issues involve
   retention of fine materials, drainage, and the uniformity of the resulting paper. Some key paper
   property issues related to chemical use are absorbency (or “sizing”), optical properties, and
   strength.

   Learning objectives for the course may be summarized as follows:

   1. Prepare graduate-level students to solve wet-end chemical-related problems and to achieve
      paper product innovations with a rigorous knowledge base in the area of wet-end chemistry,
      with an emphasis on application of colloidal chemistry.

   2. Provide opportunities for students to practice with problem sets and case studies and
      demonstrate their ability to use wet-end chemical principles.

   To meet these learning objectives and maximize the value of the course for both on-campus and
   off-campus students, the course will include a variety of teaching strategies. Innovations that have
   been incorporated into the class include recording of all lectures (live audio plus view of the
projected lesson), two essay assignments, and a series of rigorous reading assignments (scholarly review articles), each followed by an essay question, building upon concepts provided in the text.

3. Textbooks

Students are required to use a course-pack for WPS 527, which will be made available in PDF format through the course management website (Moodle). The WPS527 course-pack provides a discussion of all of the visuals that are used during lecture-discussions. Students are responsible for either printing out the course content or viewing the PDF files on a computer.

The course also makes extensive use of selected recent articles from the periodical literature. Copies of these are made available to all class participants via a password-limited Internet site. Recent articles from the literature provide the principle background upon which students will put together their first essay assignment (a critical review of an article), a second essay (addressing a challenge question, usually about a topic related to the first essay), and a class presentation (usually on the same subject as the second essay).

Starting in 2017, in addition to the primary text, there will be a series of 13 scholarly review articles focusing on different aspects of papermaking chemistry. Each of these reading assignments will be followed by an assessment (short essay type), allowing the student to demonstrate that they have mastered the material well enough to be able to discuss it and come up with useful comments about it. This new element of the course will take the place of the “Worksheets” and the three exams that originally had been part of the course.

4. Course Organization and Scope

Main Topics (approximate number of hours in parentheses)

- Introduction (1 hour)
- Overview of paper machine operations (2 hours)
- Fibers and fillers (4 hours)
- Chemical additives (4 hours)
- Interactions between additives and the furnish (5 hours)
- Sizing & absorptivity (3 hours)
- Strategies to achieve desired sizing effects
- Strength and bonding of paper (4 hours)
- Paper appearance, as affected by wet-end additives (2 hours)
- Retention strategies (3 hours)
- Dewatering strategies (2 hours)
- Strategies to improve the uniformity of paper formation (2 hours)
- Chemical interferences (3 hours)
- Control of wet-end chemical additive flows (2 hours)
- Wrap-up and course evaluation (1 hour)

5. Schedule of Reading Assignments
Due dates shown in the following list (an example from Spring 2005) are for on-campus students only. Due dates for distance education students should be within the same target week. Exceptions can be made in case of problems with transmission or mailing. See the website (http://www4.ncsu.edu/~hubbe, then select “WPS 527”) for the current due dates!

Everyone is responsible for reading and understanding this material as it is assigned. Watch the "Assignments" page on the website to know what has been assigned by what deadline. Here is a representative schedule (example taken from a past year).

<table>
<thead>
<tr>
<th>Period</th>
<th>Date (2017)</th>
<th>Items due [Off-campus-only items are in square brackets]</th>
<th>Lecture/Discussion Topics (dates not exact)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan. 10</td>
<td>[Watch first video. Send e-mail to instructor with all your phone numbers, fax numbers, and e-mail addresses. Also give the e-mail, phone, and mailing address of your selected proctor.]</td>
<td>Course overview, requirements</td>
</tr>
<tr>
<td>2</td>
<td>Jan. 12</td>
<td>Coursepack: Read the Foreword, Parts 1&amp;2; - Take Moodle quiz (Quiz) for Part 2 of course. Process Overview. Turn in your first, second, and third choice for the first essay assignment topic (see list).</td>
<td>The papermaking process</td>
</tr>
<tr>
<td>3</td>
<td>Jan. 17</td>
<td>Reading due, Part 3 - Fibers &amp; fillers; Take Quiz for Part 3</td>
<td>Fibers and fillers</td>
</tr>
<tr>
<td>4</td>
<td>Jan. 19</td>
<td>Turn in your first, second, and third choice for your second essay, a critical review (see list).</td>
<td>Porosity, surface charge</td>
</tr>
<tr>
<td>6</td>
<td>Jan. 26</td>
<td>Read: Part 4 - Chemical additives; Take Quiz for Part 4.</td>
<td>Chemical additives</td>
</tr>
<tr>
<td>Date</td>
<td>Event</td>
<td>Reading &amp; quiz/essay due</td>
<td>Section</td>
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<tr>
<td>Feb. 2</td>
<td>Part 5 - Interactions</td>
<td>Take Quiz for Part 5.</td>
<td>Interactions</td>
</tr>
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<td></td>
<td>Due date for first essay.</td>
<td></td>
<td></td>
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<tr>
<td>Feb. 9</td>
<td>Part 6 - Sizing</td>
<td>Take Quiz for Part 6.</td>
<td>Sorption and wettability</td>
</tr>
<tr>
<td>Feb. 16</td>
<td>Part 7 - Strength</td>
<td>Take Quiz for Part 7.</td>
<td>Strength</td>
</tr>
<tr>
<td>Feb. 28</td>
<td>Part 8 - Appearance</td>
<td>Take Quiz for Part 8.</td>
<td>Appearance</td>
</tr>
<tr>
<td>Mar. 9</td>
<td>SPRING BREAK</td>
<td></td>
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</tbody>
</table>
| 17    | Mar. 14      | Part 9 - Retention  
|       |              | Take Quiz for Part 9.  
|       |              | Start work on presentations. |
| 18    | Mar. 16      | Reading & quiz/essay due: Hubbe, M. A.,  
| 19    | Mar. 21      | Part 10 - Drainage  
|       |              | Take Quiz for Part 10. |
| 20    | Mar. 23      | Reading & quiz/essay due: Hubbe, M. A.,  
| 21    | Mar. 28      | Part 11 - Uniformity  
|       |              | Take Quiz for Part 11. |
| 22    | Mar. 30      | Reading & quiz/essay due: Hubbe, M. A.,  
| 23    | Apr. 4       | Second essay assignment due. |
| 24    | Apr. 6       | Part 12 - Productivity  
|       |              | Take Quiz for Part 12. |
| 25    | Apr. 11      | Reading & quiz/essay due: Hubbe, M. A.,  
| 26    | Apr. 18      | Part 13 - Monitoring and Control  
|       |              | Take Quiz for Part 13. |
|       |              | “Accurate charge-related measurements of samples from the wet end: Testing at low electrical |

Retention strategies

Drainage strategies

Uniformity

Scheduled presentations

Productivity & interferences

Monitoring and Control
|---|---|---|

### 6. Schedule of Homework Due Dates, Quizzes, and Tests

In addition to the assignments shown below, at the end of each Part in the WPS527 course-pack, each student is required to complete an on-line quiz by using the WebCT Vista system. Students will be able to see their score and an answer key as soon as they have completed the quiz.

**First essay assignment:** The written version, due early in the course is a two-page critical review of a published article. A different article is assigned to each student, based on their choice of a semester project topic (see later). The review is required to conform to the style and format of an example given in the coursepack. Students are also recommended to read relevant sections for the course-pack material before completing their essay. An example essay is provided in Appendix B.

As shown on the course calendar, the first written assignment comes due is just a short time after the start of the course. Students are urged to act promptly to “claim” their first and second choices of a focus topic for their semester projects, which include two written assignments and a presentation. E-mail is a recommended way to stake the claim – or they can tell the instructor. It is recommended to watch the due dates on the calender. An e-mail or a comment from the instructor will be the indication of which claims were successful.

For full credit, the format of the critical review must closely match the criteria and example shown in Appendix B of the course-pack. A professional level of grammar, spelling, and clarity are expected. Headings, and other features must follow the format illustrated. Figures, if included *MUST* be the student’s own original figures (not scanned from a publication). The minimum length is 1.5 pages, single-spaced, with a 12-point font. The maximum length is approximately 2 pages. The goal is quality, not quantity. Completed essays, after correction, will be viewable on the website in the “Our Fact Book” section. Students can go to the following URL to see what past students have done: [http://courses.ncsu.edu/classes/wps595b002/W595B_SW.htm](http://courses.ncsu.edu/classes/wps595b002/W595B_SW.htm) Note that the required format has changed, as of Fall 2002, compared to earlier dates.

**Second written assignment.** The second written assignment will be based on an individual “challenge question” provided to each student by the instructor. Ordinarily the question will be on
the same general topic as the first essay assignment. The instructor will make recommendations of relevant publications, and the student also is urged to use the NC State University library system to obtain relevant articles. It is recommended to read the relevant articles thoroughly and think about it so that you can write the essay completely in your own words, not those of the author. The minimum length is 3 pages, single-spaced, 12-point font. The target length is four pages. The report must Scoring will be as follows:

- 20% setting the context with a good background section
- 20% answering the question and supporting your answer
- 20% logic, and factual accuracy in explaining theory and experimental support
- 20% showing how the focus question is related to practical results
- 20% spelling, grammar, and accurately following the format

**Required Remote Participation** (off-campus requirement)

In addition to the worksheets, off-campus students are expected to use the e-mail or other practical communication methods as a primary means of following up on unclear points from the lectures or otherwise contributing to discussion. It is assumed that most students will choose to use e-mail, though other formats such as FAX and regular mail may be used in the absence of e-mail capability. Students are expected to either (a) respond to all of the general questions sent out to the class, or (b) initiate their own discussions with the instructor. (On-campus students will fulfill the requirement either by e-mail or by in-class participation in discussions.)

**7. Grading System**

- 20% Online quizzes (Moodle)
- 20% Responses to lecture questions (All students respond to the questions by e-mail.)
- 25% Essay assessments following the assigned review article readings
- 10% Written assignment 1: Brief review of an article related to your topic
- 15% Written assignment 2: Paper on your assigned challenge question
- 10% Presentation

All academic integrity rules are strictly enforced.

**8. Instructor’s Policies on Incomplete Grades and Late Assignments**

Distance-education students are strongly urged to stay “with the class” for the sake of class participation, the efficiency of the grade accounting system, and the efficient use of teaching resources. Limited exceptions can be made for bone-fide changes in life situation, including job relocations, extended medical conditions, or unexpected, extended travel, etc. Please contact the instructor right away if you believe that this applies to your case.

**9. Instructor’s Policies on Absences and Scheduling Makeup Work**

On-campus students are expected to attend all scheduled classes and any classes that are rescheduled due to weather emergencies or other situations causing closure of the facilities.
Exceptions will be made in case of excused absences, such as illness, if documented by a note from the appropriate authority.

10. Course Prerequisites or Restrictive Statements

Students are expected to have graduate standing or permission of the instructor. Undergraduate students can be admitted to the course based on their record of strong academic performance.

Where practical, it is recommended that the following courses or similar courses or related work experience either have been completed or taken simultaneously with this course:
- WPS215/216 Pulp and Paper Technology or experience in a paper mill
- CH201 and CH202 General Chemistry and lab
- CH223 Organic Chemistry II

11. Academic Integrity Statement

All academic integrity rules of the Department and University are strictly enforced. Students are encouraged to work together, if desired, when completing homework assignments and project work. No collaboration is permitted when completing quizzes, tests, and on-line quiz homework.

Students are expected to participate actively in classroom discussions and case studies. Distance students satisfy this requirement by means of their e-mail, phone, or FAX correspondence. There is no penalty for a wrong answer during class discussions. Students are expected to take initiative in making sure that they understand the material and ask questions when they do not. Questions about the material are welcome during class, during office hours, or at any time that the instructor is available in person or through e-mail.

12. NC State Policy on Working with Students with Disabilities

Students with disabilities are encouraged to schedule an appointment with Dr. Hubbe to discuss their accommodation needs.

13. Safety

There are no special safety requirements for this course, and there is no laboratory component.

14. Statement on “Pass-Through” Charges

There are no charges required for anything. If students want a hard copy of the course-pack, they may have to pay for the copying. The electronic file may be downloaded by chapter from the Moodle course management system.

15. P. Class Evaluations

Online class evaluations will be available for students to complete during the last two weeks of class. Students will receive an email message directing them to a website where they can login.
using their Unity ID and complete evaluations. All evaluations are confidential; instructors will never know how any one student responded to any question, and students will never know the ratings for any particular instructors.

Evaluation website: [https://classeval.ncsu.edu](https://classeval.ncsu.edu); Student help desk: [classeval@ncsu.edu](mailto:classeval@ncsu.edu);
More information about ClassEval: [http://www2.acs.ncsu.edu/UPA/classeval/index.htm](http://www2.acs.ncsu.edu/UPA/classeval/index.htm)