

## ChE 441 Fertilizer, Pulp and Paper Technology

3.00 credits, 3 hours/week

### Course Content:

The world fertilizer market. Fertilizer industries in Bangladesh Nitrogen fertilizers (ammonia, urea): raw materials, reaction kinetics, manufacturing processes, design considerations, status of production, comparative economics of different nitrogenous fertilizers. Phosphate fertilizers (SSP, TSP): raw materials, reaction kinetics, manufacturing processes, design considerations, comparative economics of different phosphate fertilizers. Manufacturing process of different potash fertilizers and their uses. Complex and compound fertilizers and their economics. Waste disposal methods. The world pulp and paper market. Pulp and paper industries in Bangladesh. Types of raw materials, composition and chemical properties of wood. Preparation of raw material for pulping. Comparative assessment of the different pulping processes. Kraft process: chemistry, digesters, black liquor recover unit. Bleaching, beating and sizing. Paper making. Waste disposal methods.

### Course Instructors:

Prof. Dil Afroza Begum, & Mr. Monir Ahammad

### Meeting Place and time:

Time: Saturday: 1100 AM; Tuesday: 1000 AM and Wednesday: 1100 AM

Place: Room 255, OAB

### General Information:

Four (4) class tests will be taken during the course and best three (3) of them will be counted to cover 20% of the total marks. Attendance will be counted as 10% of total marks. Hence active participation in the class is highly expected. Rest 70% marks will be accommodated from the term final exam. **If any scheduled class or class test etc cannot be make due to some kind of incident, that activity (class or class test) would be deferred to the next available day.**

### Supporting materials:

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No specific textbook is required since handouts will be provided. **All the handouts would be available via course website.** It is important to be noted that **handouts are not self contained materials.** You have to listen the class lectures very carefully. For complimentary reading the following references could be useful.

Course website: <http://teacher.buet.ac.bd/mahammad/>

**Pulp & paper:**

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1. **Handbook of pulping and papermaking** by Christopher J. Biermann, 2<sup>nd</sup> ed Academic press (1996).

<b>Chapter/ Section/subsection</b>	<b>Description</b>	<b>Pages</b>
2.3 to 2.6	Wood chips preparation and handling at pulp mill <b>to</b> wood chemistry	22-40
Chapter 3	Pulping fundamentals <b>Full</b>	55 - 97
Chapter 4	Kraft liquor recovery <b>Full</b>	101 - 118
5.1 to 5.4	Pulp bleaching	123- 129
8.1, 8.3, 8.4, 8.5	Stock preparation and additives	190 - 205
9.1 to 9.3; 9.12	Paper manufacture ( <b>read class related descriptions only</b> )	209 -

**Fertilizer:**

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1. **Ammonia: Principles and industrial practice** by Max Appl, Wiley VCH Verlag GmbH, 1999

<b>Chapter/ Section/subsection</b>	<b>Description</b>	<b>Pages</b>
4.1; 4.3.1.2; 4.5;	Read class <b>related topics only</b> within these pages of chapter 4	65-69; 83 – 91; 126-131; 144-162;
Chapter 11	Environment safety and health aspects	223 to 230

2. **Fertilizer manual** by IFDC/UNIDO 1998

<b>Chapter/ Section/subsection</b>	<b>Description</b>	<b>Pages</b>
Chapter 9	Urea <b>Full</b>	257 -270
11.2, 11.3	Chapter 11: Phosphoric acids	311 -333
12.1, 12.2, 12.4;	Chapter 12: MAP, TSP, DAP	354-364; 370-372
14.1;	Chapter 14 SSP:	401-405
15.1; 15.2, 15.4.2; 15.5;	Chapter 15: Potash	417; 421-425