

Subject Code: 01CH0806
Subject Name: Fertilizer Technology
B.Tech. Year – IVth (VIII-Semester)

Objective: To provide comprehensive and balanced understanding of essential link between synthetic fertilizer industry.

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Use reactions and unit operations steps in manufacturing of various fertilizers
2. Identify engineering problems in fertilizer manufacturing.
3. Select appropriate synthesis fertilizer.

Pre-requisite of course: Basics of Chemical Process Industries and Chemical Technology

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CSE	Internal (I)	Viva (V)	Term work (TW)	
3	0	0	3	50	20	30	25	25	150

Contents:

Unit	Topics	Contact Hours
1	<p>Overview of Fertilizer: Synthetic fertilizers, Classification of fertilizers, Role of essential Elements in plant Growth, Macro elements and Micro elements, Application of fertilizers considering Nutrient, Balance and types of crop. Development of fertilizer industry; Fertilizer production and consumption in India; Nutrient contents of fertilizers; Secondary nutrients; Feedstock and raw materials for nitrogenous, phosphatic and potassic fertilizers.</p>	8
2	<p>Nitrogenous Fertilizers: Introduction to Ammonia: Physical & chemical properties, applications, Synthesis gas by Catalytic partial oxidation Steam Hydrocarbon reforming, Ammonia converters: Design aspect of Single bed and multi-bed converter, Kellogg process and Haldor Topsoe process, Storage and Transportation of Ammonia. Introduction to Nitric acid: Chemical, physical properties and applications, Manufacturing of Nitric Acid by Pressure ammonia oxidation process and Intermediate pressure ammonia oxidation process, Concentration of Nitric acid by $Mg(NO_3)_2$. Urea: Physical, chemical properties, Manufacturing of Urea by Stamicarbon's CO_2 stripping process, Toyo-Koatsu total recycle process, Manufacturing of Ammonium nitrate by Prilling process, Ammonium sulphate from Ammonium</p>	12



	carbonate and gypsum, Ammonium chloride from Ammonium sulphate and sodium chloride	
3	Potassium Fertilizers: Physical, chemical properties and uses of Potassium Chloride, Potassium nitrate, Potassium sulphate, Manufacturing of potassium chloride from sylvinit, Preparation of Potassium nitrate, Potassium sulphate.	8
4	Miscellaneous Fertilizer and Bio Fertilizers: Manufacturing of NPK, Ammonium Sulphate Phosphate (ASP), Calcium Ammonium Nitrate(CAN), Biofertilizers, Types of Biofertilizers, fixing biofertilizers, Phosphate-solubilizing biofertilizers, Preparation of a biofertilizers	8
	Total Hours	36

Reference Books:

1. Hand book of Fertilizer Association of India, New Delhi, 1998.
2. Slack A.V., Chemistry & Technology of Fertilizers, Interscience, New York, 1967.
3. M. Gopala Rao & Marshall Sittig, Dryden's Outlines of Chemical Technology, East-West Press, 3rd Edition, New Delhi.
4. Austin G. T, Shreve's Chemical Process Industries, 5th edition, Mc. Graw Hill Publications.
5. Pandey & Shukla, Chemical Technology, Volume I & II, 2nd Edition, Vani Books Company.
6. N S Subba Rao, Bio fertilizers in Agriculture, Oxford & IBH Publishing Company.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
35%	35%	10%	10%	5%	5%

Instructional Method:

- a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.



- b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Design Based Problems (DP)/ Open Ended project (OEP):

In the beginning of the session, subject faculty will allot an OEP / DP to the students. Students will be free to choose a topic of their choice which will be relevant to the syllabus and they will either prepare a working model/ report / presentation / poster on their topic.

Online course material

- a. <https://nptel.ac.in/courses/103106108/33>