

COURSE TITLE	FERTILIZER TECHNOLOGY
COURSE CODE	01CH0714
COURSE CREDITS	3

Objective:

- 1 To provide comprehensive and balanced understanding of essential link between synthetic fertilizer industry.

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.
- 4 Analyse the recent advancements in fertilizer industry.

Pre-requisite of course:Chemical Technology

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	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	8

Contents : Unit	Topics	Contact Hours
2	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 carbonate and gypsum, Ammonium chloride from Ammonium sulphate and sodium chloride	14
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.	9
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	9
Total Hours		40

Textbook :

- 1 Chemistry & Technology of Fertilizers, Slack A.V., Interscience, 1967
- 2 Outlines of Chemical Technology, M. Gopala Rao & Marshall Sittig, Dryden, East-West Press, , 1997

References:

- 1 Chemical Process Industries, 5th edition, Chemical Process Industries, 5th edition, Austin G. T, Shreve, Mc. Graw Hill Publications., 1984
- 2 Bio fertilizers in Agriculture, Bio fertilizers in Agriculture, N S Subba Rao., Oxford & IBH Publishing Company., 1993

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
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Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	25.00	25.00	10.00	10.00

Instructional Method:

- 1 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.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- 4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

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