

INSTITUTE	DIPLOMA STUDIES
PROGRAM	DIPLOMA ENGINEERING (CHEMICAL ENGINEERING)
SEMESTER	5
COURSE TITLE	FERTILIZER TECHNOLOGY
COURSE CODE	09CH2507
COURSE CREDITS	4

Objective:

- 1 The course objective is to build a link between chemistry and synthetic fertilizers manufacturing. Hence after completion of this course student will be able to demonstrate the knowledge for arranging treatment, reaction and separation steps in a flow diagram for variety of fertilizers including Nitrogenous fertilizers, Phosphate fertilizer, Potash Fertilizer, Complex fertilizer and Bio fertilizers is essential

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

- 1 Classify various types of soil nutrients essential for plant growth
- 2 Utilize reactions and unit operations steps in manufacturing of various fertilizers such as Nitrogenous Fertilizers, Potassium Fertilizers, Phosphorus Fertilizers, NPK Fertilizers etc
- 3 Characterize fertilizers on the basis of different properties
- 4 Identify and solve various engineering problems in fertilizer manufacturing

Pre-requisite of course: Basic concepts of Chemical Process Industries and Chemical Technology

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	INTRODUCTION TO FERTILIZERS Introduction to Plant nutrients, Fertilizer specifications, Terminology and Definitions, Application of fertilizers considering Nutrient, Balance and types of crop. Development of fertilizer industry; Fertilizer production and consumption in India; Classifications of Soil nutrients, Macronutrients, Micronutrients	6

Contents : Unit	Topics	Contact Hours
2	NITROGENOUS FERTILIZERS Ammonium Nitrate: Properties, production and storage, Nitric acid: preparation and process flow diagram; Manufacturing of Nitric Acid by Pressure ammonia oxidation process and Intermediate pressure ammonia oxidation process. 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	6
4	PHOSPHORUS FERTILIZERS AND POTASH FERTILIZERS Production Processes of Phosphoric acid; Dihydrate process, Hemihydrate (HH) process, Ammonium Phosphates, Potash Fertilizers; Manufacturing process of potassium sulphate and potassium nitrate	8
5	MISCELLANEOUS FERTILIZER AND BIO FERTILIZERS Manufacturing of NPK, Ammonium Sulphate Phosphate (ASP), Calcium Ammonium Nitrate (CAN), Bio fertilizers, Types of Bio fertilizers, Nitrogen- fixing bio fertilizers, Preparation of a bio fertilizers	8
Total Hours		42

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Experiment 1 Prepare chart for fertilizer classification with chemical formula and nutrient content	4
2	Experiment 2 Estimate percentage of Nitrogen in Ammonium sulfate by substitution method	2
3	Experiment 3 Estimate percentage of Nitrogen in Ammonium chloride by back titration	2
4	Experiment 4 Estimate percentage of Nitrogen in Ammonium sulphate by back titration	2
5	Experiment 5 Estimate percentage of Nitrogen in Ammonium Chloride/Sulphate by Kjeldhal's method.	4

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
6	Experiment 6 Estimate burette content in Urea sample by color comparison	2
7	Experiment 7 Estimate percentage of Nitrogen in DAP by Formaldehyde method	2
8	Experiment 8 Estimate percentage of Nitrogen in DAP by Kjeldhal's method	2
9	Experiment 9 Prepare potassium sulphate	2
10	Experiment 10 Prepare potassium chloride	2
11	Experiment 11 Prepare potassium nitrate	4
Total Hours		28

Textbook :

- 1 Hand book of Fertilizer Association of India, Fertilizer Association of India, Fertilizer Association of India, 1998

References:

- 1 Chemistry & Technology of Fertilizers, Chemistry & Technology of Fertilizers, Slack A.V, Interscience, 1967
- 2 Chemical Technology, Volume I & II, Chemical Technology, Volume I & II, Pandey & Shukla, Vani Books Company, 2011
- 3 Bio fertilizers in Agriculture, Bio fertilizers in Agriculture, 6. N S Subba Rao, Oxford & IBH Publishing Company, 1999

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 / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking
40.00	40.00	10.00	10.00	0.00	0.00

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

Instructional Method:

- 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://onlinecourses.nptel.ac.in/noc22_ag14/preview