Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Institute of Technology
Semester-5 (B.Tech.)

Subject: Fertilizer Technology – BETCH15315

Type of course: Professional Elective courses

Prerequisite: Basics of Chemical Process Industries and Chemical Technology

Rationale: Even with growing industrialization of India and service sector, India is heavily dependent on the agriculture sector for economy as well as to feed the common people. therefore agricultural sector will be always greatest important in Indian prospective, and fertilizers can be considered as catalyst as well as fuel of agricultural production. this subject includes different varieties of fertilizers (nitrogenous, potash and miscellaneous)

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
3	0	0	3	60	30	10	0	50	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Sr. No.	Course content	Hrs.	Weightage
1	**Introduction 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.	10	20%
2	**Ammonia and Urea:** 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	15	30%

	Topsoe process, Storage and Transportation of Ammonia. **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 **Green Ammonia and Urea**		
3	**Potassium Fertilizers:** Physical, chemical properties and uses of Potassium Chloride, Potassium nitrate, Potassium sulphate, Manufacturing of potassium chloride from sylvinite, Preparation of Potassium nitrate, Potassium sulphate.	10	30%
4.	**Miscellaneous Fertilizer and Bio Fertilizers:** Manufacturing of NPK, Ammonium Sulphate Phosphate (ASP), Calcium Ammonium Nitrate (CAN), Biofertilizers, Types of Biofertilizers, Nitrogen fixing biofertilizers, Phosphate-solubilizing biofertilizers, Preparation of a biofertilizers	10	20%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1.	**Fertilizer:** Students will prepare poster presentations based on Unit 1 topics provided by the faculty, and posters will be uploaded on GMIU web portal.	10
2.	**Ammonia and Urea:** Collect data of ammonia production using electrochemical methods or new alternate methods, and its applicability and feasibility in future. prepare presentations and presents in class, faculty will provide specific topics related to ammonia production to individual/group of students, upload presentations in GMIU web portal.	10
3.	**Simulation of Fertilizer production process:** Students will identify a section of any process used in the fertilizer industry or process provided by faculty related to the fertilizer industry and simulate it using ASPEN/DWSIM with conditions provided by faculty or student choice. submit simulation report on GMIU web portal	10
4.	**Numerical Problems on Unit Process of Fertilizer Production** Faculty will pride 5 numerical related to fertilizer industry process calculation, students have to upload solutions on GMIU web portal.	10
5.	**Recent advancement in Bio-fertilizer** Students will review recent research articles about bio-fertilizer and prepare a short review out of it and upload it on GMIU portal, faculty can provide specific points of review to individual or group of students.	10

Suggested Specification table with Marks (Theory): 60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	40%	40%	20%	0%	0%	0%

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from the above table.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Summaries importance different type of fertilizer used in agriculture and produced in chemical industries.
CO2	Understand the basics of ammonia and urea production with upcoming green ammonia and urea trends and scope.
CO3	Apply knowledge of potassium-based fertilizer and its production technologies
CO4	Apply knowledge of bio-fertilizers and its working.

Instructional Method:

The course delivery method will depend upon the requirement of content and needs 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.
From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos,

e-courses, Virtual Laboratory

The internal evaluation will be done based on Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

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.