



Dipartimento di Scienze e Tecnologie

ACADEMIC YEAR 2017/2018

DEGREE in Biotechnology
COURSE of Industrial Biotechnology - Plants

TEACHER: Prof. Giuseppe Graziano

Chemical kinetics. Reactions of I and II order. Half-life. Consecutive reactions and the steady state hypothesis. Enzymatic kinetics. Mechanism of Michaelis and Menten. Arrhenius equation and dependence on the temperature of the enzymatic kinetics.

Chromatography. Distribution equilibria and operation of a chromatographic column. Partitioning and adsorption chromatography. Ion exchange chromatography. Molecular exclusion chromatography. Chromatography by affinity.

Industrial production of sugar from cane and beet. Analysis of industrial plants and related issues. Industrial production of bioethanol: first-generation and second-generation plants. Production of biodiesel. Paper production.

Power generation: Faraday's electromagnetic induction. Diagram of an alternator. Hydroelectric, thermoelectric and thermonuclear power Plants. Fuel cells. Semiconductors, doping, p-n junctions. Photovoltaic effect and energy production.

Water hardness. Problems for a plant that uses high temperature water. Demineralisation of water: columns with ion exchange resins. Water cooling towers. Thermodynamic analysis of a refrigeration cycle. Importance of the cold chain for the present society. Waste waters: BOD and COD; plants for their treatment. Active mud.

Liquid-gas equilibrium. Temperature-composition state diagrams for two-component solutions with different boiling points. Distillation columns: matter balance and energy balance for steady state. Determination of the number of theoretical plates using the McCabe and Thiele method. Azeotropic distillation and steam distillation. Liquid-liquid extraction processes in counter-current.

Principles of chemical reactors. Discontinuous reactors and continuous reactors. Treatment of CSTR reactors and PFR reactors. Fixed and mobile bed reactors. Introduction to reactor design. Effect of temperature and pressure. Reactors for biotechnological applications: bioreactors.

Industrial microbiology. Vitamin C production and its uses. Fermentations: raw materials and operating modes. Lactic fermentation and applications in the dairy, chemical-pharmaceutical and canning industry. Alcoholic fermentation and applications in the wine, beer and bakery industry. Production of super-adhesives by means of biotechnological procedures.



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Biocatalysts for industrial production. Production of enzymes and their market. Carbohydrates in the starch industry, sweeteners, drinks and paper. Proteases in the food industry and detergents.

Textbook

Industrial Biochemistry – Verga and Pilone, Springer.

Class notes and material available online.