
COURSE (TITLE): Biotechnological Industrial Processes

LECTURER:

YEAR and SEMESTER: 2019, First

CREDITS (CFU): 6

SECTOR (SDS): BIO10/ Biochemistry

ACADEMIC YEAR:

ASSESSMENT: Oral Exam

LOCATION: Department of Environmental, Biological and Pharmaceutical Science and Technologies, Via Vivaldi 43 Caserta

COURSE OBJECTIVES/OUTCOMES:

The course aims to provide advanced concepts on cells and biocatalyst application for industrial production. The students will acquire improved knowledge on downstream processes towards purification of bioactive molecules. Successively case studies will be presented and discussed.

Enzymes, production and applications. Recombinant

Cells factories of proteins and other metabolites of application interest. Proteins from mesophilic and extremophilous microorganisms. Production of proteins from genetically modified organisms. Purification strategies; extracellular and intracellular enzymes; cell lysis and extraction. Inclusion bodies. Clarification of cell lysates; methods of pre-purification and purification. Scale-up of the extraction and purification process. Technical and economic implications of the purification strategy. Enzymes and proteins for industrial applications. Immobilized enzymes, immobilization techniques, specific bioprocesses and bioprocesses. Enzymes of interest in the transformation of carbohydrates: amylase, glucosidase, glucose isomerase. Enzymes degrading cellulose, hemicellulose, lignin and pectin. Lipases and their applications. Biotechnological production of short chain fatty acids and their industrial applications, description of current processes and current patent applications: production of citric acid and lactic acid. Stabilizing agents from natural sources and their potential biotechnological and biomedical applications: trehalose, ectoine and mannosil-glycerate in comparison. Bioprocesses for bacteriocins production from lactic bacteria. Notes on the biotechnological production of amino acids. Production and characterization of polysaccharides of cosmeceutical, nutraceutical and pharmaceutical interest: hyaluronic acid, heparin and chondroitin. Notes on the production of monoclonal antibodies with fed-batch cultures of transformed mammalian cells. Purification train for monoclonal antibodies, diagnostic and pharmaceutical use. Metabolic engineering: methods, definitions, case studies. Good Manufacturing practices, a specific approach for biotechnological products.

SYLLABUS (overview):

Introduction to industrial biochemistry, and biotechnological processes. The course is aiming at improving knowledge of biochemical and biotechnological updated techniques to obtain bioproducts of applicative interests. An in depth presentation of purification procedures with specific regards to pharmaceutical biotechnological products will be presented. Case studies on class of molecules will be introduced with a specific applicative focus (i.e. patent literature,

updated established bioprocesses)

SYLLABUS (Detailed description):

Cell programming for industrial production. Cells factories of proteins and other metabolites of application interest. Proteins from mesophilic and extremophilous microorganisms. Production of proteins from genetically modified organisms. Purification strategies; extracellular and intracellular enzymes; cell lysis and extraction. Inclusion bodies. Clarification of cell lysates; methods of pre-purification and purification. Scale-up of the extraction and purification process. Technical and economic implications of the purification strategy. Enzymes and proteins for industrial applications. Immobilized enzymes, immobilization techniques, specific bioprocesses and bioprocesses. Enzymes of interest in the transformation of carbohydrates: amylase, glucosidase, glucose isomerase. Enzymes degrading cellulose, hemicellulose, lignin and pectin. Lipases and their applications. Biotechnological production of short chain fatty acids and their industrial applications, description of current processes and current patent applications: production of citric acid and lactic acid. Stabilizing agents from natural sources and their potential biotechnological and biomedical applications: trehalose, ectoine and mannosil-glycerate in comparison. Bioprocesses for bacteriocins production from lactic bacteria. Notes on the biotechnological production of amino acids. Production and characterization of polysaccharides of cosmeceutical, nutraceutical and pharmaceutical interest: hyaluronic acid, heparin and chondroitin. Notes on the production of monoclonal antibodies with fed-batch cultures of transformed mammalian cells. Purification train for monoclonal antibodies, diagnostic and pharmaceutical use. Metabolic engineering: methods, definitions, case studies. Good Manufacturing practices, a specific approach for biotechnological products.

TEXTBOOKS:

Industrial Enzymology, Godfrey T. and West S.; Industrial microbiology:an introduction Waites M.J., Morgan N., Rockey JS, Higton G..

ADDITIONAL READING:

Course notes, article reprints, patents to be obtained from the Espacenet, or USpatent.gov web sites.
