VNIVERSITAT DE VALÈNCIA

Course Guide
33195 Microbiological control in industrial processes

COURSE DATA

Data Subject	
Code	33195
Name	Microbiological control in industrial processes
Cycle	Grade
ECTS Credits	4.5
Academic year	2020 - 2021

Study (s)

Degree	Center	Acad. year	Period
1102 - Degree in Biotechnology	Faculty of Biological Sciences	4	First term

Subject-matter

Degree	Subject-matter	Character
1102 - Degree in Biotechnology	105 - Microbiological control of industrial processes	Optional

Coordination

Name	Department
FERRER SOLER, SERGIO	275 - Microbiology and Ecology

SUMMARY

The aim of the teaching program of the subject "Microbiological Control Process" is to show the student control systems that are used at industrial level, both from the point of view of microorganisms as formal object (isolation, improvement and conservation) raw materials, monitoring and monitoring of microbial growth, safety, regulatory and critical control points. They are used but not basic concepts that have been taught in other subjects such as "Microbiology", "Biochemistry", "Genetics", "Introduction to Biochemical Engineering", "bioreactors" and "Basic Operations in Biotechnological processes" will be explained, among other . The practical program of this subject is a fundamental objective that the student is able to reproduce the scale of some laboratory applications contemplated in the theoretical program, using methodologies already learned in basic subjects such as "Microbiology", "Molecular Biology "or" Genetics "to achieve the objectives proposed.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

The subject Microbiological Control of Industrial Processes is part of the Degree in Biotechnology at the University of Valencia (Plan 2009). It is a 4.5-credit subject that is part of the Optional Module along with 11 other subjects that are taken in the fourth year of the Biotechnology Degree. Therefore it has been preceded by all those compulsory subjects that are basic or fundamental so that the student has developed and assimilated the necessary basic concepts.

OUTCOMES

1102 - Degree in Biotechnology

- Poseer y comprender los conocimientos en Biotecnología.
- The ability to apply this knowledge in the professional world.
- Capacidad de interpretar datos relevantes.
- Be able to convey ideas, problems and solutions in the field of biotechnology.
- Develop skills to undertake further study.
- Have abilities for teamwork and cooperation in multidisciplinary teams.
- Have abilities to disseminate and participate in the social debate on aspects related to biotechnology and its use.
- Assimilate the ethical and legal principles of scientific research in biotechnology.
- Know how to design and implement a complete protocol for obtaining and purifying a biotechnological product.
- Conocer las estrategias de producción y mejora de alimentos por métodos biotecnológicos.
- Know and know how to apply the criteria of biotechnological risk assessment.
- Have an integrated view of the R&D&I process from the discovery of new basic knowledge to the development of particular applications of that knowledge and the introduction of new biotechnological products into the market.
- Conocer los diferentes tipos de procesos biotecnológicos asociados a la producción industrial.
- Ser capaz de evaluar las aplicaciones biotecnológicas de los microorganismos.
- Determinar los marcadores moleculares apropiados en procesos de mejora con fines biotecnológicos.

- Diseñar procesos de manipulación y obtención de productos biotecnológicos.
- Analizar a nivel molecular el resultado de la manipulación de un organismo.
- Aplicar soluciones biotecnológicas a problemas medioambientales.
- Diseñar y aplicar aproximaciones biotecnológicas en el campo de la Agroalimentación.

LEARNING OUTCOMES

Know and apply correctly the vocabulary and specific terminology of biotechnology discipline.
Apply previously acquired knowledge to understand the current processes for microbiological control of industrial processes.
Distinguish and identify the various useful organisms for the synthesis of molecules of biotechnological interest.
Knowing what the current trends in research are products of biotechnological interest.
Linking Microbiology, Genetics, Molecular Biology and Physiology Metabolism, IT, Process Engineering, Basic Operations and necessary to understand a bioprocess.
Understand and evaluate control strategies on the production and improvement in the production of metabolites by biotechnological methods.
Furthering the development of manual and mental skills necessary for developing problems or practices that arise.
Being able to detect the approach or procedure errors committed during the laboratory work, and discern the extent that the results have faults committed.
To know and handle the documentary sources of all kinds related to obtaining biotechnology products, with special attention to the basic texts of wide international acceptance and also accessible sources through computer networks.
Acquiring the knowledge base needed to enter the professional work.
Knowing industrial applications and scope of the methods of control of microorganisms, both methods of detection and monitoring as hygiene materials, and equipment surfaces.
Knowing selection strategies of microorganisms and search for new metabolites or activities.
Acquire an integrated view of the R + D + i, from the discovery of new basic knowledge to the development of specific applications of this knowledge and market introduction of new biotech products.

DESCRIPTION OF CONTENTS

1. Introduction

Historical perspective of the control systems of microbial growth in industrial processes

2. Industrial cultivation of microorganisms

Substrates used as culture media. The inoculation of microorganisms in industrial volumes. The problem of scale: large volumes and high inertia. Solid substrates fermentations.

3. Monitoring systems and control of microbial growth in industrial processes

System selection process and depending on the microorganism: direct and indirect methods.

4. Disinfection methods of industrial plants

Control surfaces. Removing microbial spores and biofilms. Concept of "white room". Types of disinfectants and disinfection processes.

5. Methods for detection and control of contaminating microorganisms

Cultural and molecular techniques. Biosensors. Hazard Analysis and Critical Control Point (HACCP). Regulations on methods of microbiological analysis.

6. Case studies

Analyses and solutions

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	31,00	100
Laboratory practices	12,00	100
Tutorials	2,00	100
Development of group work	12,50	0
Development of individual work	10,00	0
Study and independent work	30,00	0
Preparing lectures	12,00	0
Preparation of practical classes and problem	3,00	0
TOTAL	**112,50**	

TEACHING METHODOLOGY

Theoretical content

The basic theoretical contents of the subject will be taught by the teacher using the master lesson. Attendance at these sessions is optional by the student, although regular follow-up is recommended. During the development of the class, the teacher will invite the students to express their opinion or their strategies about some of the aspects that are dealt with in the subject. It will not have a specific qualification and its objective is to involve students through personal contributions to the topic being addressed.

Practical content

The practices will take place at the rate of three 4-hour sessions in the laboratory. Attendance is considered compulsory for at least 80% of practical hours.

Students will take part in them in groups of 2 to 4 people according to practice. Each group will have their own results that they will collect in some worksheets that must be completed by each student; the teacher will supervise the results obtained. The teacher will also supervise and correct the acquisition of skills in each practice session, as well as compile the results of all the students and organize their discussion in the last session, in which the students will be invited to draw conclusions from of the results obtained by themselves, taking into account all the casuistry that may have occurred in their development (manipulation errors, the inconsistency of results, etc.).

Seminars

The teacher will organize the students in the class in small groups so that they develop a topic for a seminar. They will be asked to provide sources of scientific, informative, media information, etc. Each group will have to read the material at their disposal, summarize it, draw conclusions and prepare a presentation of the seminar. They must present to the teacher, at least one week in advance of the scheduled date for the presentation, the additional material they have collected, as well as the summary of the information and the conclusions of the same, together with the presentation on computer support. The presentation of the seminars will take place throughout the course and during it, the participation of the rest of the group's students will be encouraged and requested.

Discussion of practical cases

Students will be presented with a series of practical cases for presentation, discussion and resolution, to learn how to apply the acquired knowledges to the problems of industrial processes. The teacher will pose questions to the students and evaluate their answers.

Personalized tutoring

Group tutoring: there will be 2 sessions of 1 hour of small group tutoring (16 students). Student assistance is recommended for orientation in the activities related to the subject such as the preparation of seminars, guided discussion or the preparation of volunteer work.

Individual learning: a previous dedication of half an hour per theory session is recommended, to know the contents to be presented and, at least 2 hours per week of study to establish knowledge and prepare for the exam.

The distribution of teaching and the relationship between classroom and non-classroom activities may be modified throughout the course if necessary. In the event that any of the aforementioned activities could not be carried out as described, it may be replaced by another such as tutored work or others.

EVALUATION

It is considered essential for learning assessment conducted by the student direct finding its level through personalized tutoring conducted over the course, which can provide guidance on the state of basic knowledge acquisition through questionnaires, and established relationship with the professor in the lab, and this level of relationship one of the most informative and efficient. This will allow the teacher to establish a direct way a dynamic picture of the evolution over the course of each student, while respecting the maximum number of students per group and subgroups of practice. The numerical rating of knowledge and skills acquired be established, however, to benefit from methods that allow objective and comparable measure thereof, with record results, which involves written test score and job preparation. You need to pass have obtained a minimum of 50 points out of 100 with the following distribution:

Theory: 60 out of 100. Minimum needed to pass the theory: 30 points.

PRACTICES: 25 out of 100.
- Compulsory attendance: entitles examination (minimum 80% of the sessions).
- Review Practices: up to 25 points (minimum 12.5 points: evaluation of practices be overcome independently to the theory).

SEMINARS: 10 points out of 100.
- Implementation, delivery and presentation binding.
- TOTAL seminars: up to 10 points.
- No minimum points to overcome this part

DISCUSSION OF CASE STUDIES: 5 points out of 100.
- No minimum points to overcome this part

After passing each of the parties listed above assessment, the marks obtained will be kept until the second call, if any of the other parts were not surpassed in the first call. There will, therefore, an examination of theory and practical exam on second call, whose qualifications, once overcome both independently rating will add previously obtained in the seminar and other activities, if any.

Second enrollment students (repeaters), they have made the minimum number of practice sessions in the course immediately above may, if they choose, not to attend the contact sessions in the laboratory, and may retain the practical exam score have approved, as long as you credit the responsible teacher last year.

This accreditation must be submitted during the month of October the course of study. The other matter assessable activities be performed in their entirety.

REFERENCES

Basic

- Renneberg, R. 2008. Biotecnología para principiantes. A. L. Demain (Ed.) Reverté.
Smith, J. 2009. Biotechnolgy 5th edition. Cambridge University Press.
Kun, L. Y. (Ed.). 2006. Microbial Biotechnology. Principles and applications (2nd edition) World Scientific Press.
Crueger, W. y Crueger, A. 1993. Biotecnología: Manual de microbiología industrial. Editorial Acribia. Zaragoza.
Glazer, A.N. y Nikaido, H. 1998. Microbial Biotechnology. Freeman and Company. New York.
Murooka, Y. Y Imanala, T. (Eds.). 1994. Recombinant microbes for industrial and agricultural applications. Marcel and Dekker, Inc. New York

La información necesaria para la comprensión y desarrollo de las prácticas se encuentra en el cuadernillo de prácticas, disponible en Aula Virtual.

Additional

- Arora, D.K., Elander, R.P. y Mukerji, K.G. 1991. Handbook of Applied Mycology. 5 volúmenes. Marcel Dekker. New York.
Balows, A., Trüper, H.G., Dworkin, M., Harder, W. y Schleifer, K.-H. (Eds.). 1992. The Prokaryotes. Second edition. Springer-Verlag. New York.
Glick, B.R. y Pasternak, J.J. 2003. Molecular Biotechnology. Principles and applications of recombinant DNA. ASM Press. Washington.
Murooka, Y. Y Imanala, T. (Eds.). 1994. Recombinant microbes for industrial and agricultural applications. Marcel and Dekker, Inc. New York
Primrose, S.B. 1991. Molecular Biotechnology. Blackwell Scientific Publications. Oxford.
Rehm H.-J. and Reed G. (eds.) 1999. Biotechnology : a multi-volume comprehensive treatise. 2nd ed. Wiley-VCH, Weinheim.
Rose, A.H. y Harrison, J.S. (Eds.). 1993. 2nd edition. Yeast Technology (Yeast Genetics, Volume 5) Series: The Yeasts. Elsevier.
The yeasts. 6 volúmenes. Academic Press. Nueva York y Londres.
de Winde, J. H. (Ed.) 2003. Functional genetics of industrial yeast. Series: Topics in Current Genetics Vol. 2. Springer-Verlag. Berlin Heidelberg.

Alonso, E., Ferrer, S., Uruburu, F. y Vicente, E. 1987. Penicillium auxotrophic mutants can be detected by using xanthene dyes. Experientia 43: 206-207.
Doyle, A., Hawksworth, D.L., Hill, R.L., Kirsop, B.E., Komagata, F. y Stevenson, R.E. (Eds.). desde 1988. Living resources for Biotechnology. Cambridge University Press. Cambridge. Se trata de 4 volúmenes dedicados a Yeasts

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

English version is not available