



Bioeconomy in the Circular Economy

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Biocirce is an interdisciplinary II Level Master jointly offered by 4 Universities:



University of **Bologna**



University of **Milano-Bicocca**



University of **Naples Federico**



University of **Turin**

And 4 non-academic partners:

- **Intesa Sanpaolo**
- **Novamont SpA**
- **GF Biochemicals SpA**
- **PTP Science Park**



COORDINATING COMMITTEE:

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Lucia Gardossi, CLUSTER SPRING and University of Trieste
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PROGRAM STRUCTURE

The program includes four compulsory modules (5 Credits each) delivered by the four participating Universities. Modules cover relevant scientific topics as well as economic and legal issues.

Each module envisages teaching of scientific topics by staff members of the participating Universities, whilst economic and regulatory aspects, as well as specific case studies, are covered by members of participating companies and associations.

The four modules will be followed by a six months industrial stage in a company or institution (30 credits). The stage will be completed after the submission of a dissertation thesis (10 credits) reporting on the project carried out during the stage.

Students will have the opportunity to access, upon approval of the Coordination Board, internships at the companies and institutions promoting or supporting the Master.

EDITION 2017 -2018

2017

2018

2019

L	A	S	O	N	D	G	F	M	A	M	G	L	A	S	O	N	D	G
Bando						Milano 15/1-19/1	Napoli 5/2-10/2	Torino 26/2-2/3	Bologna 9/4-13/4	Assegnazione Stage	Stage						thesis defence 14/12	TITLE AWARDING 14 January

MILANO BICOCCA MODULE

Training objectives: Participants will be provided with state-of-the-art knowledge about advanced technologies that are boosting modern Bioeconomy, in particular “omic” techniques, synthetic biology and nanotechnology. The principal components of the whole industrial production chain will be described and analyzed, thus identifying technological needs and benefits arising from the paradigm shift to circular economy. All information needed to understand mechanisms behind a long lasting successful technology transfer will be provided.

Course content: Scientific and technological advances in next generation sequencing, transcriptomics, proteomics and systems biology. Application of advanced biotechnologies to the production of metabolites, chemicals and novel biocatalysts. Case studies on the valorization of lignocellulose and waste materials into novel high-added value chains will be described. Special attention will be paid to the market needs and EU strategies, which novel production chains respond to. Examples of technological and business acceleration will be provided through business models and innovative startups within the Alimenta PTP Science Park's certified incubator. Project Management aspects will be addressed as well.

Monday, 15/1/2018. BIOECONOMY IN THE CIRCULAR ECONOMY - THE BASICS

10.00 Marina Lotti, **Unimib**. Welcome

10.10 Mario Bonaccorso, Assobiotec. Inside the World Bioeconomy.

13:00 Lunch and speakers corner

14:00 Anna Monticelli, **Banca Intesa**. Introduction to Circular Economy

16:00 Elena Manzoni, Paola Branduardi, Maurizio Casiraghi, **Unimib**.

The language of Science/The language of Bioeconomy

Tuesday, 16/1/2018. BIO-BASED PROCESSES FOR SUSTAINABLE GROWTH

09:00 Danilo Porro, **Unimib**. Microbial cell factories to obtain metabolites, chemicals and biomaterials.

11:00 Paola Branduardi, **Unimib**. Case study: A first example of “circular” project at Unimib

13:00 Lunch and speakers corner

- 14:00 Marina Lotti, **Unimib**. Biotransformations in the Bioeconomy (an introduction)
- 15:30 Paola Branduardi, **Unimib**. Case study: A second example of “circular” project and visit to Unimib spin-offs
- 17:00 Valeria Mapelli, **Sacco System**. R&D in Industrial Bioeconomy: from food to biorefineries

Wednesday, 17/1/2018. **BIOECONOMY IN ACTION**

- 09:00 Elena Sacco, **Unimib**. Systems biology: perspectives in the bioindustry
- 11:00 Monica Delsignore, **Unimib**. Introduction to Legislative constraints in Bioeconomy
- 13:00 Lunch and speakers corner
- 14:00 Monica Delsignore, **Unimib**. Food waste, what about law?
- 15:00 Alberto Fragapane, **Centro Studi Novamont**. Testimony of a former Biocirce’s student.

Thursday, 18/1/2018. **A WINDOW TO TOMORROW - THE MOST RECENT TECHNIQUES TO UNVEIL BIOLOGICAL COMPLEXITY**

- 09:00 Maurizio Casiraghi, **Unimib**. Omic platforms as tools for innovation in Bioeconomy (first fraction)
- 10:30 Fabrizio Trigila, **PTP Science Park**. Accelerating Business and R&D in the Bioeconomy Era
- 13:00 Lunch and speakers corner
- 14:00 Paola Mariani – PTP Science Park. Circular vision: the agri-food industry as source of raw materials for biotechnology and Bioeconomy.
- 16:00 Rita Grandori, **Unimib**. Omic platforms as tools for innovation in Bioeconomy (second fraction)

Friday, 19/1/2018. **FROM THE GREEN CHEMISTRY TO THE INDUSTRY (VISIT TO NOVAMONT)**

- 10:00 Federica Mastroianni, **Corporate Communication Manager**. Student reception and overview of Novamont. Circular Bioeconomy: definitions and strategies at Italian and EU level.
- 10:30 Sebastià Gestí Garcia, **New Materials and Technologies Manager, R&D Department**. Visit to R&D laboratories

- 12:00 Christian Garaffa, **Marketing Manager for Source Separation & Recycling**. Circular bioeconomy: bioplastics and waste management
- 12:30 Sara Guerrini, **Public Affairs Agriculture**. When chemistry meets agriculture and the environment.
- 13:00 Lunch and speakers corner (Novamont's canteen)
- 14:00 Cecilia Giardi, **Program Manager**. A case study: First2run Project
- 14:30 Tiziana Milizia, **Bioplastics Area Manager, R&D Department**. R&D in the circular bioeconomy.
- 15:00 End of business - End of Milan Module.

NAPOLI FEDERICO II – MODULE

Training objectives: aim of the module is to provide updates regarding advanced technologies for the industrial applications of enzymes and microbial cells as "cell factories". The activities will be focused on: i) the use of enzymes as additives and processes ancillaries for the production of products of industrial interest; ii) the strategies to optimize and exploit the productive potential of the microorganisms. The module also deals with the identification and analysis of the opportunities available for a new venture, focusing on the research for entrepreneurial initiatives (academic and not) aimed at commercializing research outcomes. Aim of the course is to equip learners with the theoretical and practical tools for the recognition and structuring of innovative business ideas.

Course content: The course focuses on scientific and technological issues regarding the potential of biotechnological processes based on enzyme systems and wild-type or recombinant microorganisms industrial case studies will be presented. During the course, the essentials of strategic and operational management of new research entrepreneurial initiatives will be presented, as well as the mechanisms for recognition of new business initiatives. Thanks to the tools provided, learners will be able to model a business idea and to evaluate it from a strategic and financial point of view.

Monday, 5/2/2018. ENZYMES, PROTEINS AND MICROBIAL CELL FACTORIES FOR BIOTECHNOLOGICAL APPLICATIONS

09.00 Piero Salatino, Giovanni Sannia, **Unina**. Mario Mattioli, **Vice Presidente Unione Industriali Napoli, Centro Studi, Education**. Welcome in Naples and introduction to the Naples Module.

- 09.30 Lucia Gardossi, **Unitrieste**. Green chemistry for an European Bioeconomy: opportunities and challenges of the new value chains.
- 11.00 Alessandra Piscitelli, **Unina**. Functional amyloids in biotechnology.
- 12.00 Marco Moracci, **Unina**. Carbohydrate active enzymes in biorefineries.
- 13:00 Lunch and speakers corner
- 14.30 Antonio Marzocchella, **Unina**. Cell factories for biofuel production: productive potentiality and market potential.
- 16.00 Chiara Schiraldi, **UniVanvitelli**. Biotechnological processes towards the production of organic acids of industrial interests: case studies on lactic acid and succinic acid production.

Tuesday, 6/2/2018. CASE STUDIES

- 09.00 Vincenzo Lettera, **Biopox**. Biopox enzymatic systems: turning research into business opportunities
- 10.30 Aris de Rijke, **GFBiochemicals**. From Biomass to Biochemical Solutions.
- 12.30 Lunch
- 14.00 Pasquale Granata, **GFBiochemicals**. Introduction of a Bio product in an existing market.
- 16:00 Simona Giacobbe, **Bionaet**. New business opportunities from agrofood secondary raw materials.
- 16.45 Marco Vastano, **BioFP**. Turning a barrier into an advantage: Bioprocesses for conversion of low value lipid substrates into biofuels and biopolymers.

Wednesday, 7/2/2018. THE NOVAMONT PIANA DI MONTE VERNA LABORATORIES

- 09.00 Bus transfer to Piana di Monte Verna
- 10.00 Maria Dani, **Novamont**. Welcome to the students
- 10.30 Giovanni Sannia, **Unina**. Risorse Preziose: Economia Circolare, Bioeconomia, Ricerca e Impresa
- 11.00 Martino Di Serio, **Unina**. La Chimica verde e le Biotecnologie
- 12.00 Antonio Marzocchella, **Unina**. Le biotecnologie per l'energia sostenibile
- 13.00 Lunch
- 14.30 Visit to the Novamont Laboratories

Thursday, 8/2/2018. **PRODUCTION AND CHARACTERIZATION OF BIOPLASTICS: CASE STUDIES**

09.00 Mohammed Sabbah, **Unina**. Bioplastic revolution: biomaterials and industrial applications.

10.30 Cinzia Pezzella, **Unina**. Microbial cell factories for biopolymer synthesis.

12.00 C. Valeria L. Giosafatto, **Unina**. Characterization of bioplastics for an industrial application.

13.30 Lunch

15.00 Cinzia Pezzella, Iolanda Corrado, **Unina**. Production and purification of microbial biopolymers: designing a bioprocess.

16.00 C. Valeria L. Giosafatto, Mohammed Sabbah, **Unina**. Experimental determination of bioplastic main properties.

Friday, 9/2/2018. **SCOUTING OF INNOVATIVE BUSINESS IDEAS AND DEVELOPMENT OF NEW COMPANIES**

09.00 Roberto Vona, **Unina**. From ideas to entrepreneurial applications, technology transfer and entrepreneurial development.

11:00 Nadia Di Paola, **Unina** Vision and Business model development, business models in the Circular Economy.

12.30 Luigi Iavarone, **Iavarone Wood Technology**. A business testimony.

13.00 Lunch

How to develop a new company

14.30 Giuseppe Meli, **Dottore Commercialista**. Business acceleration tools: Incubators, accelerators, universities.

16.00 Gionata De Vico. Biotech Management: from ideas to entrepreneurial applications.

17.30 Piero Salatino. Concluding remarks.

UNIVERSITY OF TORINO - MODULE

Training objectives: The module aims to update participants on new regulations on access to genetic resources and the possible sharing of the benefits derived from them. It will also present some examples of valorization of the processing industry by-products. The educational objective of the teaching is to present actors of the capital market operating in innovative projects funding and to provide communication tools to succeed in new businesses; furthermore the module provides an illustration of the principles and operation of Economic – financial and sustainability report.

Course content: The module aims to update participants on new national and international regulations governing access to genetic resources and the fair and equitable sharing of benefits derived from them in the event of commercial exploitation. In the second part of the scientific module the exploitation of by-products of the processing industry as a crucial step to the sustainability of supply chains will be addressed. Some industrial case studies will be presented. During the course different figures of investors will be presented illustrating investment model and procedures also involving evidences and cases. Beside it will be presented how to approach to an integrated model of communication for knowledge transfer and start up. Finally reporting models and major economic and financial key performance indicators and sustainability indicators international guidelines will be presented.

Monday, 26/2/2018. **ACCESS AND BENEFIT SHARING OF GENETIC RESOURCES**

- 09.30 Silvio Aime, **President Incubator 2i3T e Vice Rector for Research of the University of Torino**. Welcome in Torino and introduction to the Torino Module.
- 10.00 Valentina Veneroso, **Studio Legale Anello&Partners**. The Convention of Biological Diversity and the concept of genetic resource. The Nagoya Protocol: access and benefit sharing of genetic resources.
- 13.00 Lunch and speakers corner
- 14.00 Giovanna Cristina Varese, **Unito**. The effect of Nagoya Protocol on research
- 15.00 Giovanna Cristina Varese, **Unito**. The quality Management Systeem of a culture collection: the example of the Mycotheca Universitatis Taurinensis.
- 16.00 Roberto Botta, **Unito**. The hazelnut production chain.
- 17.00 Giuseppe Zeppa, **Unito**. The food valorization of vegetable by-products.
- 18.00 Elisa Valenti, **Frutti Ribelli**. The experience of the startup Frutti Ribelli in the utilization of food waste from the fruit and vegetable supply chain.

— **Tuesday, 27/2/2018. INTEGRATED REPORTING: SUSTAINABILITY REPORT**

09.00 Riccardo Beltramo, **Unito**. Sustainability report as company value.

11.00 Enrica Vesce, **Unito**. Industrial ecology and EEIA (Ecologically Equipped Production Areas).

13.00 Lunch and speakers corner

Communication for knowledge transfer

14.00 Claudia Pescitelli, **2i3T**. Integrated model of communication for knowledge transfer and start ups; Evidences and experiences in communication.

— **Wednesday, 28/2/2018. VALORIZATION OF BY-PRODUCTS**

08.00-12.00 Roberto Botta, **Unito**. Visit to the Fratelli Caffa S.A.S (Cortemiglia – hazelnut production chain)

14.30-18.30 Ileana Manera, **Ferrero**. Visit to the FERRERO S.p.A (Alba- visit to 1/2 production lines and presentation of the ongoing circular economy activity)

— **Thursday, 01/3/2018. INTEGRATED REPORTING: ECONOMIC-FINANCIAL REPORT**

09.00 Alain Devalle, **Unito**. Economic – financial report, evidences and cases.

13.00 Lunch and speakers corner

14.00 Anna Monticelli, **Intesa Sanpaolo**. Visit to Intesa Sanpaolo headquarters Trend Osservatorio – technological innovation and mega socio-economic trends - Big data analysis and management - Circular Economy - in-depth analysis of business models and enabling technologies

Maurizio Perello, **Intesa Sanpaolo**. Visit of the building (Leed Platinum certificate)

— **Friday, 02/3/2018. FUNDING AND START UP EVALUATION: BUSINESS ANGEL, VENTURE CAPITAL, CORPORATE VENTURE**

08.30 Roberto Schiesari, **Unito**. Investors and start up evaluation.

12.30 Lunch and speakers corner

13.00 Roberto Schiesari, **Unito**. Term sheet model: terms and conditions of the investment agreement.

15.00 Giuseppe Serrao, **2i3T**. Meeting with Bioentrepreneurs (SeaMarconi, Caffè Alberto, Kemia Tau).

17.00 - 17.30 Conclusions, evaluation, test assignment

UNIVERSITY OF BOLOGNA - MODULE

Training objectives: The module aim is to provide students with basic knowledge of industrial biotechnological process to sustain bioeconomy in different fields of application, including agrifood and nutraceuticals, plant genetics improvement, marine and environmental biotechnology for the production of bio-based products for industrial applications. A further goal of the course is to describe the economic characteristics and related technical bases of primary production of raw materials for the bioeconomy. It includes the ability of understanding essential economic statistics and the mechanisms of reaction of the sector to markets and policies.

Course content: Design, optimization and scale up of bioreactors. Case studies of bioproductions. Main unit operations involved in downstream processing. Biotechnological production of nutraceuticals. Introduction to plant breeding with emphasis on biotechnological approaches (marker-assisted selection - MAS -, genetic engineering, genome editing). Multipurpose biorefineries for the integrated valorization of food-processing by-products and surplus into food ingredients, biomaterials, bio-based chemicals and biofuels. Biosurfactants, enzymes and bioactive compounds produced by marine bacteria and their applications. Main characteristics of the supply of raw materials in the bioeconomy. Main characteristics of the demand of raw materials in the bioeconomy. Market structures. Forms of integration and organization: chains, contracts, districts, international markets. Bioeconomy policies. Specificity of the concept of efficiency and of the mechanisms of innovation.

Venue: FICO, Via Paolo Canale, Bologna

Monday, 9/4/2018. **INDUSTRIAL BIOPROCESSES**

10.00 Patrizia Brigidi, **Master BIOCIRCE**. Welcome in Bologna and introduction to the Bologna Module

- 10.30 Fabio Fava, **UniBo**. European and Italian Bioeconomy: state of play and opportunities
- 12.00 Giulio Zanaroli, **UniBo**. Valorization of agrifood byproducts and waste
- 13.30 Lunch
- 14.30 Noura Raddadi, **UniBo**. Marine and environmental Biotechnology
- 16.30 Silvio Salvi, **UniBo**. Plant genetic improvement for sustainable bio-economy

— **Tuesday**, 10/4/2018.

- 10.00 Davide Pinelli, **UniBo**. Industrial process Technologies
- 11.30 Davide Pinelli, **UniBo**. Bioproduction: case studies: From research to process
- 13.30 Lunch
- 14.30 Silvio Salvi, **UniBo**. Visit to CAA (Centro Agricoltura e Ambiente), Crevalcore (BO)

— **Wednesday**, 11/4/2018.

- 10.00 Alessandro Tugnoli, **UniBo**. Safety and sustainability issues in bioeconomy processes
- 11.30 Cristiana Boi, **UniBo**. Industrial Biotechnological Processes
- 13.30 Lunch
- 14.30 Cristiana Boi, **UniBo**. Visit to Cargill, Castelmasa (RO)

— **Thursday**, 12/4/2018. **ECONOMICS OF PRIMARY PRODUCTION IN THE BIOECONOMY**

- 10.00 Davide Viaggi, **UniBo**. Economics of primary production in the bioeconomy
- 11.30 Davide Viaggi, **UniBo**. Economics of primary production in the bioeconomy
- 13.30 Lunch
- 14.30 Davide Viaggi, **UniBo**. Demand of raw materials for the bioeconomy: trends of the main bio-based sectors and related needs of biomass, perspectives and scenarios
- 16.30 Davide Viaggi, **UniBo**. Forms of integration and organisation of the bioeconomy: market structure, contractualisation, vertical and horizontal integration in the

bioeconomy; specificity of the concepts of efficiency and mechanisms of innovation in the bioeconomy chains

Friday, 13/4/2018.

- 10.00 Patrizia Brigidi, **UniBo**, Silvia Buzzi, **Caviro**. Bioeconomy and food industry; a case study: CAVIRO
- 11.30 Marco Candela, **UniBo**. Microbiomes circulations in food industry
- 13.30 Lunch
- 14.30 Davide Viaggi, **UniBo**. Forms of integration and organisation of the bioeconomy: market structure, contractualisation, vertical and horizontal integration in the bioeconomy; specificity of the concepts of efficiency and mechanisms of innovation in the bioeconomy chains
- 16.30 Davide Viaggi, **UniBo**. Policies for the bioeconomy: policy instruments; main economic features of EU and national policies, interaction with agricultural and environmental policies.