



## Ph.D. IN AGRICULTURAL, FOOD AND ENVIRONMENTAL SCIENCES

XXXIV (21°) XXXV EDITION

ACCADEMIC YEAR 2019/20

### ORGANIZATION, ASSESSMENT AND DIDACTIC PLAN

1. Plan of activities:

	Year 1	Year 2	Year 3
<b>NOVEMBER</b>	Meeting with all the new Ph.D. students and the Faculty Board, aimed at communicating the rules and deadlines that must be followed during the 3 years of doctorate.		
<b>APRIL – EARLY JUNE (1<sup>st</sup> and 2<sup>nd</sup> year), SEPTEMBER (3<sup>rd</sup> year) PPT presentation</b>	<u>First seminar.</u> A bibliographic seminar introducing the topics of the doctoral thesis. <b>Duration: max 20 MIN</b>	<u>Second seminar.</u> A bibliographic seminar presenting the methodologies used for the doctoral thesis. <b>Duration: max 20 MIN</b>	
<b>OCTOBER (1<sup>st</sup> and 2<sup>nd</sup> year), NOVEMBER (3<sup>rd</sup> year).  Written Report and ppt presentation</b>	<u>First annual Report.</u> Didactic activities attended and research activities carried out during the 1 <sup>st</sup> year, and short program of the activities planned for the 2 <sup>nd</sup> year. <b>Duration max: 10 MIN.</b>	<u>Second annual Report.</u> Didactic activities attended and research activities carried out during the 2 <sup>nd</sup> year and short program of activities planned for the 3 <sup>rd</sup> year. <b>Duration max: 10 MIN.</b>	<u>Third Seminar.</u> Present the research activities carried out in the 3 years of doctorate studies <b>Duration: max 30 MIN</b> <u>Third (final) Written Report.</u> Didactic activities attended and research activities carried out during the 3 years of the doctorate.
<b>NOVEMBER, 30th</b>	-----		Submission of the Doctoral thesis to external evaluators.
<b><u>JANUARY, 30th</u></b>			Assessment from the external evaluators. Final version of the Doctoral thesis.
<b><u>MARCH</u></b>	-----		Final discussion with an

<b><u>Final evaluation</u></b>			external (national – international) evaluation committee.
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### 1. **Planning**

Seminars and Reports will be organized for thematic areas and planned in different days depending on the availability of the Tutors. Dates for seminars and reports presentation can be planned by the Ph.D. students, in agreement with their Tutors, and proposed to the Director of the Ph.D. about one month before the expected time. Members of the Department, Tutors and Co-Tutors of the Ph.D. Students must ensure their presence at the seminars and annual reports presentation.

### 2. **Training activities**

During the 3 years, each Ph.D. student must accumulate 180 didactic and research Credits, distributed as described in **Annex 1**. During the 3 years of the Ph.D. program will offer the following didactic activities:

- a. *Structured teaching from the Department Faculty*. In **D3A web page** are reported the courses offered by the Department Faculty for the next Academic year (2016-2017). Different courses are offered in English or with a tutorial English.
- b. *Seminars*. The Department is organizing different seminars with national and international experts. These seminars or other seminars from other departments of this University or those from other Universities/Organizations can be recognized as didactic activity.
- c. *Didactic excursion and conferences*. Didactic excursion and conferences organized by the Department, other departments of this University or other Universities/Organizations can be recognized as didactic activity.

### 3. **Criteria for admission to the subsequent year and to the final exam:**

- a. The PhD program has to be finalized to the high level scientific research work with the final aim to produce scientific papers. For two years after the Ph.D. we will continue to monitor the scientific outputs on international refereed journals (quoted in SCOPUS and/or WEB of SCIENCE). This s must be remembered from the beginning, having clear the rules on the setting up and implementation of experimental trials and on the dissemination of the scientific results obtained (**Annex 2**).
- b. The quality of your PhD program will be assessed annually by the PhD committee (**Annex 3**) according to the following criteria:
  - b.1. For the admission to the **second year**, the student must demonstrate that:
    - have started the research activities with an appropriate scientific methodology and achieved preliminary results;
    - have attended about 10 credits of didactic activities;
    - have received a positive assessment on the 1<sup>st</sup> bibliographic seminar (**Annex 4**) and also by the two international referees, if requested. The **Outstanding** judgment can be given to those who present a paper on a peer reviewed journal or a publication-abstract in congress proceedings, or have spent a period of research abroad (at least 3 months).
  - b.2 For the admission to the **third year**, the student must demonstrate that:
    - have developed the research activities with an appropriate scientific methodology with the achievement of the first relevant results.
    - have continued to follow the didactic activities (at least other 5 credits);
    - have received a positive assessment on the 2<sup>nd</sup> bibliographic seminar (Annex 2) and also by the two international referees, if requested. The **Outstanding** judgment can be given to those who present a further paper on a peer reviewed journal, or has already spent a period of research abroad (at least 3 months).
  - b.3. For the admission to **thesis discussion**, the student must demonstrate that:
    - have developed the Research activities within the PhD theme(s) according to an appropriate scientific methodology and reached significant results.
    - have followed all the prescribed didactic activities.
    - have produced, in the 3 years, at **least one paper on a peer reviewed journal**. The **Outstanding** judgment can be given only to those who present a paper accepted/published in refereed international

journals quoted in SCOPUS and/or WEB of SCIENCE and have completed at least three months of research abroad.

#### **4. Final Thesis**

The doctoral thesis, accompanied by a summary in English or Italian, is written in Italian or English (or in another official EU language after approval by the Faculty Board).

The doctoral thesis must be prepared according to the standard format described at the following link: <http://www.ingegneria.univpm.it/content/template-scuola-di-dottorato-scienze-dellingegneria>

For the new National rules for Ph.D. program, the thesis, with a report on the activities of the 3 years and the list of publications attached, is evaluated by at least two highly qualified Professors (thereafter called “evaluators”), belonging to national or international institutions and not involved in the issuing of the Ph.D. title. The evaluators will provide a detailed written judgment on the thesis and propose the admission to public discussion or postpone it for a period, not exceeding six months, for significant additions or corrections, if required. After this period, the thesis is in any case admitted to public discussion, accompanied by a new written opinion of the evaluators made in the light of the corrections and or additions provided. The public discussion is held in front of a commission whose composition is proposed by the Faculty Board following the Rules of the University. After the discussion, the thesis, with motivated collegial written judgment, is approved or rejected. The commission, by a unanimous vote, has the right to attribute the *Cum laude*.

#### **5. Internationalization.**

The internationalization of the Ph.D. program includes the certification of *Doctor Europaeus* that can be achieved with the following steps:

- a) Annual/final (at least from the 2nd year) reports and thesis assessed by 2 international peer reviewers.
- b) Training and research activities carried out at an external international organization (at least for 3 months).
- c) Annual/final reports and doctoral thesis written in English (or in another official EU language after approval by the Faculty Board).

Besides, Ph.D. students can carry out part of their research activities at universities or foreign institutions, subject to authorization by the Faculty Board.

The scholarship amount is increased by 50% during this period with a minimum duration of 30 days and a maximum of 18 months.

The Coordinator of the Course sends to the Rector, the authorization accompanied by the student request in order to increase the scholarship, before the beginning of the period abroad.

Ph.D. student may participate to ERASMUS programs, where this is explicitly mentioned in the ERASMUS agreements between UNIVPM and the foreign universities. The ERASMUS grant is additional to the (increased) scholarship. Further information may be requested to the Departmental Erasmus Coordinator, Prof. Raffaele Zanolì: [r.zanoli@univpm.it](mailto:r.zanoli@univpm.it).

#### **6. Research funds.**

The research activities, including participation to conferences and meeting, are supported by funds from the tutor of each Ph.D. student. Starting from the second year, each student is expected, in addition to the scholarship and depending on the availability of funds at the University, a budget for research activities in Italy and abroad, of an amount not less than 10% of the scholarship. If the student is not positively evaluated during the 3 years scholarship, or abandons it, the unused amount remains available to the institution, for the same purpose.

#### **7. Guidelines for the preparation of the written reports and oral presentations.** Written reports and oral presentations should be prepared in the following settings:

- systematic description of objectives and research activities undertaken in the first year.
- program of the research activities for the second year.
- Didactic activities followed in the year: table with titles, type of activity (internal/external, teacher/s, hours and calculating CFU); certificates of participation must be included.
- possible teaching activity.

- period(s) of staying abroad (conducted and/or planned in the year), with destination, time and activity.
- list of publications: papers and/or extended abstracts/abstracts in journals or conferences acta, dissemination activity, contribution to project reports.
- list of bibliography consulted.
- who aims for the title of European Doctorate must submit written and oral reports and thesis in English and expect to have two foreign experts as external evaluators of the thesis.
- for the oral presentation it is recommended to not exceed 15 slides, the presentation time is max 10 min.

**8. Guidelines for the preparation of the written report and oral presentation for the final examinations.** Summary of the objectives, activities and results achieved in the 3 years:

- didactic activities followed in the 3 years: table with titles, type of activity (internal/external, teacher/s, hours and calculating CFU); certificates of participation must be included.
- possible teaching activity carried out in the 3 years.
- period(s) of staying abroad (conducted in the 3 years), with destination, time and activity.
- total list of publications: papers and/or extended abstracts/abstracts in journals or conferences acta, dissemination activity, contribution to project reports.
- total list of bibliography consulted.
- those who aim for the title of European Doctorate must submit the final report and thesis in English and expect to have two foreign experts as external evaluators of the thesis.
- for the oral presentation it is recommended not to exceed 30 slides and a presentation time of 30 min. It should include summaries of research activities carried out and the most significant results.

**9. Course programs scheduled for the Academic Year 2017-2018**

In **annex 5** are listed the courses planned in 2018 including information on teachers, programs and timing. Dates and rooms of each courses will be updated depending to the teacher and room availability.

**ANNEX 1. Credits (CFU) distribution between didactic and research activities.**

Students must achieve, during the three years, 180 credits distributed as follows:

	Research Activities	Didactic Activities*	Reports*	Total
Year	*CFU (h x 25)	CFU (h x 6)	CFU (h x 25)	
1 <sup>st</sup>	35 (875)	20 (120)	5 (125)	60
2 <sup>nd</sup>	50 (1250)	5 (30)	5 (125)	60
3 <sup>rd</sup>	50 (1250)	5 (30)	5 (125)	60
<b>Total</b>	<b>135 (3375)</b>	<b>30 (180)<sup>(*)</sup></b>	<b>15 (375)</b>	<b>180</b>

**\*1 credit equals 6 hours of frontal teaching (at least 10 credits must be from courses organized by the Faculty Board) and 25 hours for research and for the preparation of reports and annual seminars.**

## Annex 2 - Ten simple rules for structuring a research work aimed to produce scientific papers

Rule 1: Focus your paper on a central contribution, which you communicate in the title

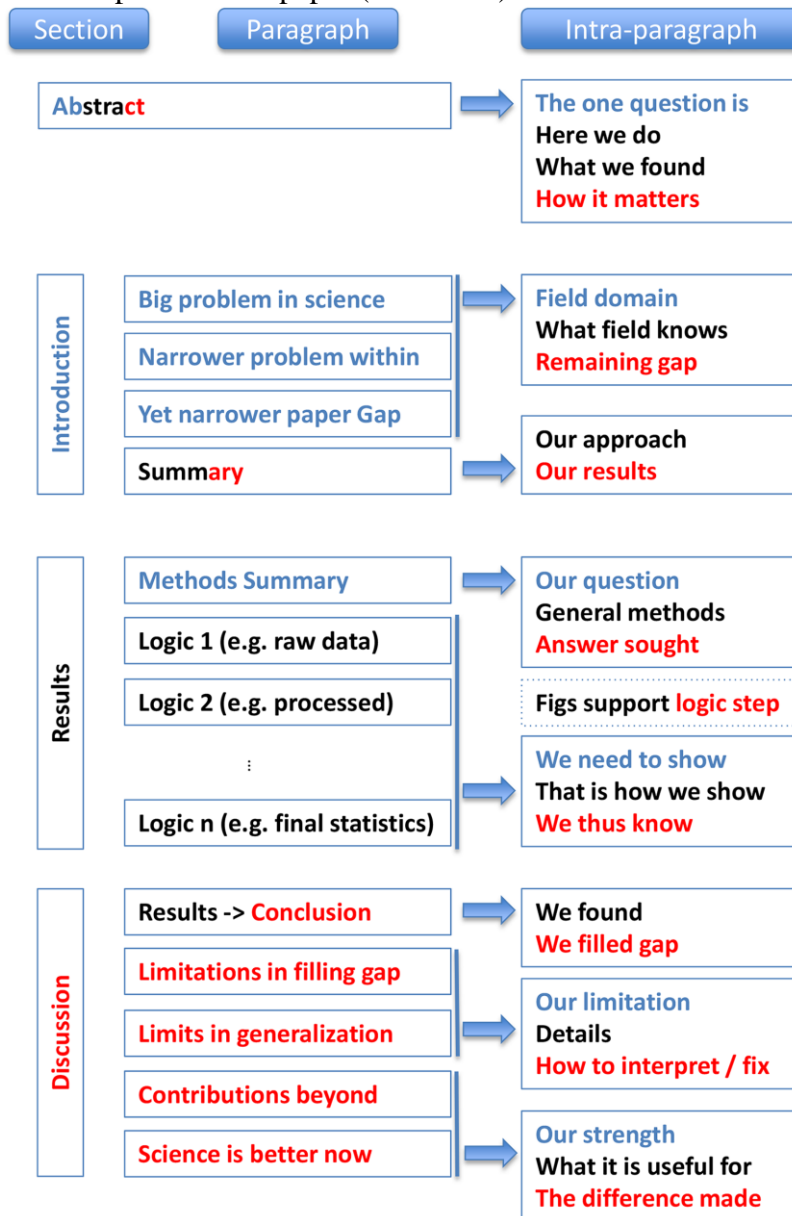
Rule 2: Write for flesh-and-blood human beings who do not know your work

Rule 3: Stick to the context-content-conclusion (C-C-C) scheme

Rule 4: Optimize your logical flow by avoiding zig-zag and using parallelism

Avoiding zig-zag - Using parallelism.

The components of a paper (Rules 5–8)



Rule 5: Tell a complete story in the abstract

Rule 6: Communicate why the paper matters in the introduction

Rule 7: Deliver the results as a sequence of statements, supported by figures, that connect logically to support the central contribution

Rule 8: Discuss how the gap was filled, the limitations of the interpretation, and the relevance to the field

Rule 9: Allocate time where it matters: Title, abstract, figures, and outlining

Rule 10: Get feedback to reduce, reuse, and recycle the story

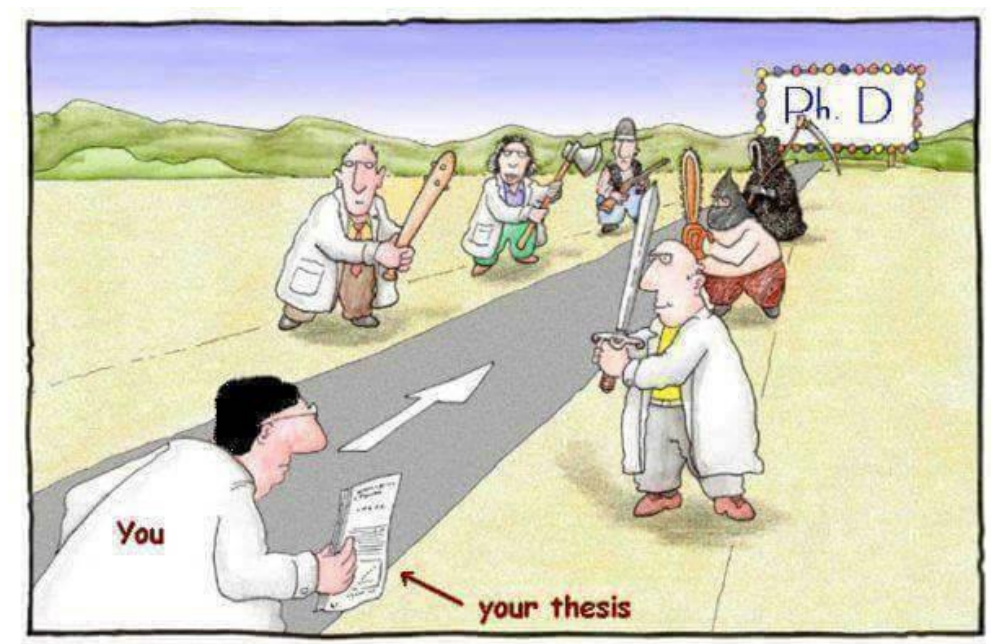
Rule	Sign it is violated
1: Focus on one big idea	Readers cannot give 1-sentence summary.
2: Write for naive humans	Readers do not “get” the paper.
3: Use context, content, conclusion structure	Readers ask why something matters or what it means.
4: Optimize logical flow	Readers stumble on a small section of the text.
5: Abstract: Compact summary of paper	Readers cannot give the “elevator pitch” of your work after reading it.
6: Introduction: Why the paper matters	Readers show little interest in the paper.
7: Results: Why the conclusion is justified	Readers do not agree with your conclusion.
8: Discussion: Preempt criticism, give future impact	Readers are left with unanswered criticisms and/or questions on their mind.
9: Allocate time wisely	Readers struggle to understand your central contribution despite your having worked hard.
10: Iterate the story	The paper’s contribution is rejected by test readers, editors, or reviewers.

<https://doi.org/10.1371/journal.pcbi.1005619.t001>

Read this article:

<http://journals.plos.org/ploscompbiol/article?id=10.1371%2Fjournal.pcbi.1005619>

### Annex 3. Be ready for a high scientific quality of your PhD Program.



## ANNEX 4. Evaluation form for seminars held by the students

**Date of seminar:** \_\_\_\_\_

**Name of the student:** \_\_\_\_\_ **year:** \_\_\_\_\_

**Title of the seminar:** \_\_\_\_\_

*Mark related to:*

1) Relevance to the proposed topic: \_\_\_\_\_

2) Literature knowledge: \_\_\_\_\_

3) Reporting capacity: \_\_\_\_\_

4) Organization of the material and respect of the timing: \_\_\_\_\_

*Overall evaluations:* \_\_\_\_\_

Comments: \_\_\_\_\_

\*\*\*\*\*

**Date of seminar:** \_\_\_\_\_

**Name of the student:** \_\_\_\_\_ **year:** \_\_\_\_\_

**Title of the seminar:** \_\_\_\_\_

*Mark related to:*

1) Relevance to the proposed topic: \_\_\_\_\_

2) Literature knowledge: \_\_\_\_\_

3) Reporting capacity: \_\_\_\_\_

4) Organization of the material and respect of the timing: \_\_\_\_\_

*Overall evaluations:* \_\_\_\_\_

Comments: \_\_\_\_\_

\*\*\*\*\*

**Date of seminar:** \_\_\_\_\_

**Name of the student:** \_\_\_\_\_ **year:** \_\_\_\_\_

**Title of the seminar:** \_\_\_\_\_

*Mark related to:*

1) Relevance to the proposed topic: \_\_\_\_\_

2) Literature knowledge: \_\_\_\_\_

3) Reporting capacity: \_\_\_\_\_

4) Organization of the material and respect of the timing: \_\_\_\_\_

*Overall evaluations:* \_\_\_\_\_

Comments: \_\_\_\_\_

(A= Out standing; B= Very good; C= Good; D= Sufficient; E= Poor)

## ANNEX 5. List and course programs scheduled for the Academic Year 2019-2020

N.	Title	TEACHER	Hours
1	Progettare la Ricerca: i progetti europei – <i>Research Design: the European projects</i>	Prof. Nicola Paone	16
2	Economia e management del trasferimento tecnologico – <i>Economics and management of technology transfer</i>	Prof. Donato Iacobucci	16
3	Dall'impostazione della prova sperimentale alla pubblicazione e valutazione della ricerca/ From experimental design to the writing of a scientific paper and research evaluation	Prof. Cianci Michele	12
4	<u>Ricerca e sviluppo per alimenti innovativi. Aspetti scientifici e normativi - <i>R&amp;D on innovative foods: scientific and regulatory issues</i></u>	Prof.ssa Francesca Clementi	12
5	The QPS (Qualified Presumption of Safety) approach: an overview	Prof. Lucia Aquilanti	12
6	La ristorazione collettiva e il rischio legato alla presenza di patogeni alimentari - Mass catering and risks related to the presence of food borne pathogens	Prof. Andrea Osimani	12
7	Rilevamento e analisi numeriche degli ecosistemi vegetali e del paesaggio - <i>Numerical ecology: survey and numerical analysis of the plant landscape</i>	Dott. Simone Pesaresi Prof. Simona Casavecchia	18 12
8	Tecnologie molecolari innovative applicate alla identificazione e allo studio dei meccanismi alla base dell'interazione microrganismi-pianta	Dott.ssa Lucia Landi	12
9	Radicali liberi ed antiossidanti / Free radicals and antioxidants	Prof.ssa Patricia Carloni	12
10	From Crop Domestication to modern Plant Breeding	Prof. Roberto Papa	18
11	Genomics and bioinformatics	Dott. Elisa Bellucci	12
12	Biotechnology and Biosafety	Prof. Bruno Mezzetti	12
13	Produzione energetica dai residui del settore agro-alimentare e forestale Energy production from of the agri-food and forestry processing residues	Prof. Giuseppe Toscano	12
14	Valutazione di sostenibilità energetica e ambientale mediante Life Cycle Assessment	Dott. Daniele Duca	12
15	Emerging Technologies for food safety and preservation	Prof. Massimo Mozzon	12
16	Postharvest diseases of fruit and vegetables	Dott. Simona Sanzani	12
17	Elaborazione dei dati sperimentali/ Processing of experimental data	Prof. Franco Capocasa	12
18	Cambiamento climatico: mitigazione e adattamento nelle colture arboree/ Climate change: mitigation and adaptation in tree crops	Dott. Vania Lanari	12
19	Microrganismi e qualità del suolo	Prof. Cristiano Casucci	12
20	Machine Learning and Deep Learning: Methods and Applications in Bioinformatics	Dott.ssa Marina Paolanti	12
21	New Biotechnological Tools for the genetic improvement of fruit tree species	Dott. Silvia Sabbadini	12



22	Analytical methods for quality evaluation in fruitculture	Dott. Luca Mazzoni	12
23	Application of Molecular Genetic Tools in Livestock	Dott. Simone Ceccobelli	12
	<b>Total Hours (equal to 51,34 CFU)</b>		<b>352</b>

### Courses offered by the University:

<http://www.univpm.it/Entra/Engine/RAServePG.php/P/1088210010400/M/1085020010412/T/Corsi-Comuni-di-Ateneo>

## CORSI COMUNI DI ATENEO

### Programmi dei Corsi

## Economia e Management del Trasferimento Tecnologico

**Prof. Donato Iacobucci**

### Obiettivi formativi

Acquisire conoscenze sulle principali modalità di trasferimento tecnologico in ambito universitario. Acquisire strumenti di analisi e gestione dei processi di valorizzazione dei risultati della ricerca con specifico riferimento all'avvio di nuove imprese. Conoscere i servizi e le strutture di supporto ai processi di trasferimento tecnologico nell'Ateneo e in ambito regionale e nazionale.

### Programma

La costituzione di spin-off accademici e di start-up: iter di costituzione, modalità di avvio e di gestione, fattori che ne favoriscono lo sviluppo.

I brevetti: condizioni di brevettabilità, iter di concessione dei brevetti in ambito nazionale e internazionale, valorizzazione sul mercato.

I contratti di collaborazione tra università e impresa: forme di relazione fra università e imprese nelle attività di ricerca condivisa e su commessa.

### Metodologia didattica

Il corso è svolto attraverso lezioni frontali, seminari con esperti e lavori di gruppo.

### Modalità di iscrizione

L'iscrizione al Corso potrà essere effettuata attraverso la piattaforma Moodle, pertanto si invitano i dottorandi interessati ad effettuare la registrazione al seguente link:

- [Piattaforma Moodle](#)

### Rilevazione presenze

Se possibile, per facilitare l'operazione di rilevazione delle presenze, si chiede cortesemente di scaricare sul proprio smartphone una applicazione per la lettura dei QR-code.

# Progettare la ricerca: i progetti europei

Prof. Nicola Paone

## Programma

1. Introduzione agli strumenti e alle agenzie di finanziamento della ricerca.
2. La ricerca europea: programmi Quadro e Horizon 2020; gli strumenti di finanziamento alla ricerca.
3. Il ruolo dell'industria nei Programmi Quadro. Le piattaforme tecnologiche
4. I passi nella preparazione di un progetto: analisi della Call e del Workprogramme; definizione degli obiettivi; definizione del partenariato; definizione dell'impatto; il programma di lavoro; stato dell'arte; il budget e le risorse
5. La valutazione dei progetti
6. Le azioni per la Mobilità dei ricercatori (Marie Curie actions)
7. La conduzione, il progresso e la rendicontazione scientifica del progetto. (Meeting di progetto, deliverables, reports, ecc.)
8. La gestione amministrativa/finanziaria: la rendicontazione finanziaria; l'audit
9. Esempi di progetti
  
10. Tutorial sessions.

## Modalità di iscrizione

L'iscrizione al Corso potrà essere effettuata attraverso la piattaforma Moodle, pertanto si invitano i dottorandi interessati ad effettuare la registrazione al seguente link:

- [Piattaforma Moodle](#)

## Rilevazione presenze

Se possibile, per facilitare l'operazione di rilevazione delle presenze, si chiede cortesemente di scaricare sul proprio smartphone una applicazione per la lettura dei QR-code.

## CONTATTI:

### Ripartizione Dottorato di Ricerca

Via Oberdan, 8 - 60122 Ancona

Tel: +39 071 2202217 - 2202355 - 2202356 - 2202443

Fax: +39 071 2202205

email: [dottorato@univpm.it](mailto:dottorato@univpm.it)

## Courses offered by D3A

In addition to the list of courses mentioned below, the seminars and conferences organized by the Department 3A can be taken in consideration as didactic activity recognized for the Ph.D. program.

Titolo del Corso: Dall'impostazione della prova sperimentale alla pubblicazione e valutazione della ricerca/ From experimental design to the writing of a scientific paper and research evaluation

Docente: Prof. Michele Cianci

**Ore complessive: 12 = 2 CFU**

### **Programma/ Program:**

Importanza della qualità della ricerca per il sistema universitario/*Quality of research for University*  
Impostazione della ricerca: obiettivi, indagine bibliografica, disegno sperimentale, elaborazione dei dati/*Planning of a research activity: aims, literature search, experimental design, data elaboration*  
Strutturazione di un articolo scientifico/*Structure of a scientific paper*  
Preparazione di un articolo, invio alla rivista, revisione, accettazione, pubblicazione/*Writing of a manuscript, submission to the Journal, revision, acceptance, publication*  
Scelta della rivista, motori di ricerca e valutazione della qualità di un articolo (ISI, Scopus, Google Scholar)/*Selection of the Journal, search engines, and evaluation of quality of a paper (ISI, Scopus, Google Scholar)*  
Valutazione della qualità della ricerca a livello individuale e aggregato (ANVUR, VQR)/*Individual and aggregate evaluation of research quality (ANVUR, VQR)*

### **DATE:**

- 1) AULA F, ore 16:30-18:30, Martedì 24-03-2020
- 2) AULA F, ore 16:30-18:30, Mercoledì 25-03-2020
- 3) AULA F, ore 16:30-18:30, Martedì 31-03-2020
- 4) AULA F, ore 16:30-18:30, Mercoledì 01-04-2020
- 5) AULA F, ore 16:30-18:30, Martedì 07-04-2020
- 6) AULA F, ore 16:30-18:30, Mercoledì 08-04-2020

Titolo del Corso: Ricerca e sviluppo per alimenti innovativi. Aspetti scientifici e normativi  
R&D on innovative foods: scientific and regulatory issues

Docente: Prof.ssa Francesca Clementi

**Ore complessive: 12 = 2 CFU**

## **Syllabus**

### **Programma**

- (Semiserious) introductory remarks: how to build up a career as an University researcher
- Product- and process- innovation in the food industry
- Beneficial microbes
- Functional foods and Probiotics
- Novel foods

- Case studies

## **Programma**

- Seminario introduttivo (semi-serio): come costruire una carriera di Ricercatore Universitario
- Innovazione di prodotto e di processo nel settore alimentare
- Beneficial microbes
- Alimenti probiotici e funzionali
- Novel foods
- Casi studio

### **Room: Aula**

25 marzo (mercoledì): 14,30-16,30 Lezione in aula A

22 giugno (lunedì) 15-17 Lezione on line

23 giugno (martedì) 15-17 Lezione on line

24 giugno (mercoledì): 11,30-14,30 Lezione in aula A

25 giugno (giovedì): 8,30-11,30 Lezione in aula A

**Titolo del Corso: The QPS (Qualified Presumption of Safety) approach: an overview**  
**Docente: Prof. Lucia Aquilanti**

**Ore complessive:** 12 = 2 CFU

### **Themes:**

- Introduction to EFSA (European Food Safety Authority)
- QPS approach: general definition
- Traditional use of micro-organisms
- Taxonomy-familiarities
- The role of molecular tools in QPS
- Advantages and disadvantages of the QPS when used for safety assessment
- QPS and GRAS (Generally Recognized As Safe) status: a comparative analysis

The program will be articulated in a series of seminars on the themes listed above, including applications and biosafety issues related to micro-organisms used in feed/food and feed/food productions, as well as genetically modified micro-organisms intended for use in feed/food and feed/food productions.

**Schedule:** Aula

20.07.2020 ore 9.30-12.30

21.07.2020 ore 9.30-12.30

22.07.2020 ore 9.30-12.30

23.07.2020 ore 9.30-12.30

Le lezioni si svolgeranno presso l'area di Microbiologia del D3A - studio docente

*Titolo del Corso: ‘La ristorazione collettiva e il rischio legato alla presenza di patogeni alimentari - Mass catering and risks related to the presence of food borne pathogens’*  
**Docente: Dott. Andrea Osimani**

**Ore complessive: 12 = 2 CFU**

### **Obiettivo**

Il corso illustrerà i principali Regolamenti Comunitari in materia di sicurezza alimentare focalizzando l'attenzione sulla ristorazione collettiva e sulle problematiche legate alla diffusione di zoonosi di origine alimentare con particolare riferimento ai principali patogeni alimentari (*Salmonella* spp. *Listeria monocytogenes* e *Campylobacter*). Verranno inoltre analizzati casi studio riportati nella letteratura scientifica.

*The main European Regulation regarding food safety will be explained, with a focus on mass catering concerns towards the diffusion of food-borne zoonoses. In more detail, the risks concerning Salmonella spp., Listeria monocytogenes e Campylobacter will be analyzed. Moreover, case studies reported in the available scientific literature will be discussed.*

### **Program**

- L'approccio alla sicurezza alimentare nell'Unione Europea
- La ristorazione collettiva
- Il rischio *Salmonella* spp. nella ristorazione collettiva
- Il rischio *Listeria monocytogenes* nella ristorazione collettiva
- Il rischio di specie termo tolleranti di *Campylobacter* nella ristorazione collettiva
- Casi studio

### **Program**

- The food safety approach in the European Union
- Mass catering
- The risk of *Salmonella* spp. in mass catering
- The risk of *Listeria monocytogenes* in mass catering
- The risk of thermotolerant *Campylobacter* species in mass catering
- Case studies

### **Schedule:** AULA H

1 Luglio - ore 14.00 16.00

6 Luglio - ore 14.00 16.00

13 Luglio - ore 14.00 16.00

20 Luglio - ore 14.00 18.00

27 Luglio - 4 ore

**AULA H**

*Titolo del Corso integrato: Rilevamento e analisi numeriche degli ecosistemi vegetali e del paesaggio -  
Numerical ecology: survey and numerical analysis of the plant landscape*  
*Docente responsabile: Dott. Simone Pesaresi 18 ore*  
*Docente responsabile: Prof. Simona Casavecchia 12 ore*

Numero complessivo di ore: 30  
CFU complessivi: 5

Obiettivo del corso è introdurre gli studenti alle modalità di rilevamento e analisi numeriche dei dati ecologici. Tali metodologie sono finalizzate alla gestione sostenibile del territorio attraverso il monitoraggio degli ecosistemi.

Il corso si articola in due moduli: con il primo modulo gli studenti apprenderanno le metodologie di rilevamento della vegetazione con lezioni teoriche (4 ore) e esercitazioni in campo (8 ore) per la raccolta di dati quantitativi; con il secondo modulo i dati raccolti verranno elaborati con analisi numeriche utilizzando programmi di statistica dedicati ai dati ecologici.

**1° MODULO: METODOLOGIE DI RILEVAMENTO DEGLI ECOSISTEMI VEGETALI**

**Docente: Prof.ssa Simona Casavecchia**

**Ore complessive:** 12= 2 CFU

**Program:**

Introduzione: fondamenti di geobotanica (concetto di flora, vegetazione, fitocenosi e unità di paesaggio).

Metodologie di rilevamento delle comunità vegetali: il rilevamento fitosociologico.

Campionamenti in campo per il rilevamento delle comunità vegetali.

**Schedule:**

21 Maggio 2020 (giovedì) 15:00-17:00: lezione teorica

28 Maggio 2020 (giovedì) 15:00-17:00: lezione teorica

5 Giugno 2020 (venerdì) 9:00-13:00: campionamenti in campo

12 Giugno 2020 (venerdì) 9:00-13:00 campionamenti in campo

**Room: AULA A**

**2° MODULO: ANALISI DEI DATI ECOLOGICI IN**

**Docente: Dott. Simone Pesaresi**

**Ore complessive:** 18= 3 CFU

**Program:**

R software

Importare i dati in R

Misure di associazione

Analisi di ordinamento:

Analisi indiretta di gradiente (PCA, NMDS, DCA...)

Variabili ambientali

Diagrammi di ordinamento

Analisi diretta di gradiente (ordinamenti vincolati) RDA &amp; CCA

Classificazione e partizione dei dati (cluster analysis)

**Schedule:**

18 giugno 2020 (giovedì) 9:00-13:00: lezione teorica e pratica

25 giugno 2020 (giovedì) 9:00-13:00: lezione teorica e pratica

2 luglio 2020 (giovedì) 9:00-13:00: lezione teorica e pratica

9 luglio 2020 (giovedì) 9:00-13:00: lezione teorica e pratica

16 luglio 2020 (giovedì) 9:00-11:00: lezione teorica e pratica

**Room: AULA B**

*Titolo del Corso: 'Tecnologie molecolari innovative applicate alla identificazione e allo studio dell'interazione microrganismi-pianta'*

*Docente: Dott.ssa Lucia Landi*

**Ore complessive: 12= 2 CFU**

1. ARGOMENTI TRATTATI	2. ore
3. Tecniche di amplificazione degli acidi nucleici classiche e innovative applicate nello studio di microrganismi in pianta quali la PCR qualitativa end point e quantitativa in Real Time PCR (RT-qPCR e qPCR) e la Droplet Digital PCR: differenze nell'approccio analitico e applicativo.	9. 3
4. Progettazione di esperimenti in Real Time PCR per la quantificazione assoluta (qPCR) e relativa (RT-qPCR).	
5. Linee guida per il disegno di sonde necessarie alle tecnologie TaqMan; Molecular Beacons, <i>Locked Nucleic Acid</i> (LNA).	
6. Studio del polimorfismo a singolo nucleotide (SNP) utilizzando il metodo High resolution melt (HMR).	
7. PCR multiplex per lo studio contemporaneo di più geni.	
8. Interpretazione dei protocolli MIQE.	
10. Introduzione alla tecnologia Droplet Digital PCR ed alle applicazioni tra cui:	14. 3
11. Detection di sequenze rare e mutazioni	
12. - Analisi di espressione genica, e di miRNA;	
13. quantificazione dei campioni per Next Generation Sequencing	
15. <b>Prova Pratica</b> - Preparazione di un test in PCR Real Time per lo studio di identificazione di patogeni e applicazione dei software per lo studio HMR.	18. 3
16. Preparazione e analisi qPCR dei campioni estratti.	
17. Analisi dei dati: applicazione dei software per lo studio HMR	

19. <b>Prova Pratica</b> - Preparazione di un test in Droplet Digital PCR: 20. Preparazione del campione e analisi 21. Analisi dei dati	22. 3
23. <b>ARGOMENTI TRATTATI</b>	24. ore
25. Tecniche di amplificazione degli acidi nucleici classiche e innovative applicate nello studio di microrganismi in pianta quali la PCR qualitativa end point e quantitativa in Real Time PCR (RT-qPCR e qPCR) e la Droplet Digital PCR: differenze nell'approccio analitico e applicativo. 26. Progettazione di esperimenti in Real Time PCR per la quantificazione assoluta (qPCR) e relativa (RT-qPCR). 27. Linee guida per il disegno di sonde necessarie alle tecnologie TaqMan; Molecular Beacons, <i>Locked Nucleic Acid</i> (LNA). 28. Studio del polimorfismo a singolo nucleotide (SNP) utilizzando il metodo High resolution melt (HMR). 29. PCR multiplex per lo studio contemporaneo di più geni. 30. Interpretazione dei protocolli MIQE.	31. 3
32. Introduzione alla tecnologia Droplet Digital PCR ed alle applicazioni tra cui: 33. Detection di sequenze rare e mutazioni 34. - Analisi di espressione genica, e di miRNA; 35. quantificazione dei campioni per Next Generation Sequencing	36. 3
37. <b>Prova Pratica</b> - Preparazione di un test in PCR Real Time per lo studio di identificazione di patogeni e applicazione dei software per lo studio HMR. 38. Preparazione e analisi qPCR dei campioni estratti. 39. Analisi dei dati: applicazione dei software per lo studio HMR	40. 3
41. <b>Prova Pratica</b> - Preparazione di un test in Droplet Digital PCR: 42. Preparazione del campione e analisi 43. Analisi dei dati	44. 3

### Schedule

- Lunedì 6 Aprile dalle ore 14.30 alle 17.30 (**AULA G**)
- Mercoledì 8 Aprile dalle ore 14.30 alle ore 17.30 (**AULA A**)
- Giovedì 16 Aprile dalle ore 14.30 alle ore 17.30

(Presso il Laboratorio di Biologia Molecolare - Area Patologia Vegetale Edificio 1, Blocco D, PTTT, N°60)

- Venerdì 17 Aprile dalle ore 14.30 alle ore 17.30

(Presso il Laboratorio di Biologia Molecolare - Area Patologia Vegetale Edificio 1, Blocco D, PTTT, N°60)

**Room:** area patologia

**Titolo del Corso:** **Radicali liberi ed antiossidanti / Free radicals and antioxidants**  
**Docente:** Prof.ssa **Patricia Carloni**

**Ore complessive:** 12= 2 CFU



**Programma:**

I radicali liberi (4 ore); Le principali classi di antiossidanti ed i loro meccanismi di azione (4 ore);  
Metodi per la determinazione dell'attività antiossidante negli alimenti (4 ore).

**Calendario:**

27 Marzo 2020, ore 9.30-13.30 (I radicali liberi);

1 Aprile 2020, ore 9.30-13.30 (Le principali classi di antiossidanti ed i loro meccanismi di azione);

3 Aprile 2020, ore 9.30-13.30 (Metodi per la determinazione dell'attività antiossidante negli alimenti)

**Room:** D3A c/o SIMAU - CHIMICA presso Ingegneria Edificio 2 Belluschi Quota 165

**Titolo del Corso: From Crop Domestication to modern Plant Breeding**

**Docente:** Prof. Roberto Papa

**Ore complessive:** 18= 3 CFU

**Program:**

**Introduction:** Genetic diversity in agriculture and the concept of biodiversity

**Genetic resources:** Different types of genetic resources (crops and natural populations) and genetic resources conservation (lectures and examples): germplasm, landrace, wild forms and wild relatives, center of origin, gene pools, exploration and germplasm collection, *in situ* and *ex situ* conservation, characterization, valorization and exploitation of germplasm. Brief introduction on biodiversity in sustainable agriculture, climate change, healthy and valuable food products.

Brief introduction on International, National, and local institutional and regulatory frame work with respect to conservation and management of genetic resources (examples).

**Crop domestication:** The domestication syndrome (traits and examples, *Phaseolus*, *Triticum*, etc...), cultivated and wild form and outline on gene flow. The consequences of domestication on the genetic diversity and on the genome: the case of common bean. Domestication and Breeding.

**Prerequisite:** basic knowledge on Genetics, Plant biology, and Botany.

**Schedule:**

28 Feb. 2020

6 March 2020

13 March 2020

20 March 2020

27 March 2020

3 April 2020

**Room:** Aula A

**Titolo del Corso: Genomics and bioinformatics**

**Docente:** Dott.ssa Elisa Bellucci

**Ore complessive:** 12 = 2 CFU

**Program:**

**Introduction:** Genome projects: aims and objectives

**Bioinformatics data and databases** Main bioinformatics databases. Plant genome projects. Homology and homology search. Practical work. Information retrieval from plant genome and generic databases.

**High-throughput data generation.** Sequencing and genotyping: classical gene technologies. Next generation sequencing. Genotyping by sequencing. RNA-seq. Case studies from recent bibliography.

**Genome diversity and evolution.** Comparison within species and marker development. Resequencing. Structural variation. SSRs, SNPs and haplotypes. Comparison across species and synteny analysis. Diversity analysis and mapping. Marker discovery and primer design. Case studies from recent bibliography.

**Bioinformatics in plant breeding.** Application of Genomic Tools in Plant Breeding. Case studies from recent bibliography.

**Prerequisite:** basic knowledge of Genetics, Plant biology, and Botany

**Schedule:** There will be 6 classes (3 hours each) from May to July, with both lectures and practical training.

**Aula:** to be defined

*Titolo del Corso:* **Biotechnology and Biosafety**

*Docente:* Prof. **Bruno Mezzetti**

**Ore complessive:** 12 = 2 CFU

**Themes:**

- Biotechnology in plants
- Biotechnology applications in horticultural crops
- Biosafety rules and methods of study
- Case studies

The program will include the following activities:

- A series of seminars on the applications and biosafety issues and rules of plant biotechnologies, in collaboration with colleagues from EFSA (European Agency for Food Safety).
- Seminars and case studies in the computer room of the Faculty.
- A mini symposium on the main aspects of the Biosafety with reports given by experts from research institutions and national and international organizations.

A detailed program of the one week activity will be prepared and distributed in June 2016.

**Schedule:** 16, 17, 18 GUIGNO 2020

**Ore 10:00**

**Room:** *PRESSO L'AREA DI FRUTTICULTURA*

*Titolo del Corso:* **Produzione energetica dai residui del settore agro-alimentare e forestale**

*Energy production from of the agri-food and forestry processing residues*

*Docente:* Prof. **Giuseppe Toscano**

**Ore complessive:** 12 = 2 CFU

**Programma/ Program:**

Biomasse residuali: tipologie e inquadramento normativo. Caratteristiche energetiche e proprietà combustibile. Misure di laboratorio. Le filiere ed i sistemi di produzione energetica.

*Residual biomass: types and regulatory framework. Energy and fuel property characteristics. Laboratory measurements. Supply chains and energy production systems.*

**Calendario/Schedule:** 3, 4 and 5 of June – The time will be determined within May 9<sup>th</sup>. Participants should contact the professor before this date.

3,4 e 5 di giugno – l'orario sarà stabilito in accordo con il docente che deve essere contattato entro il giorno 9 di maggio per chi intende partecipare.

**Room:** presso l'area di ingegneria agraria ed i laboratori pesanti.

<p>Titolo del Corso: <b>Valutazione di sostenibilità energetica e ambientale mediante Life Cycle Assessment</b> Docente: Dott. <b>Daniele Duca</b></p>
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**Ore complessive:** 12 (2 CFU)

**Programma:**

Sostenibilità (definizioni, aspetti considerati, iniziative nazionali e internazionali). Utilizzo di risorse e impatto ambientale. Consumi energetici per settori produttivi. Analisi del ciclo di vita e relative norme ISO. Struttura dell'analisi, unità funzionali, confini di sistema, inventario, calcolo dell'impatto, problemi di allocazione. Indicatori usati per valutare l'impatto delle produzioni. Etichette ambientali. Analisi di articoli scientifici su casi di valutazioni LCA applicate in ambito agrario e agroalimentare.

**Calendario/Schedule:**

- 8,9,10,15 giugno ore 10-13

**Room: AULA H**

<p>Titolo del Corso: <b>“Emerging Technologies for food safety and preservation”</b> Docente: <b>Prof. Massimo Mozzon</b></p>
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**Ore complessive:** 12 = 2 CFU

1. Basics of food safety and preservation
2. Electrothermal technologies: Ohmic and inductive heating; microwaves and radio frequencies heating.
3. Non-thermal preservation processes: High pressure processing; Pulsed electric fields; Cold atmospheric plasma

**Schedule:** 9, 16, 23 and 30 of June from 14:30 to 17:30  
9, 16, 23 e 30 Giugno, dalle 14:30 alle 17:30

**Room/AULA B**

*Course title: Postharvest diseases of fruit and vegetables*  
*Docente: Dott. Simona Marianna Sanzani, Università di Bari*

**Ore complessive/Hours: 12 = 2 CFU**

**Programma/ Program:**

Postharvest losses. Why we should control postharvest decay? Main postharvest disease agents and their toxic metabolites.

Control of postharvest diseases in organic and conventional agriculture.

Alternatives to synthetic fungicides: biological control, induced resistance, use of decontaminating agents, physical means (UV-C, hypobaric treatments, controlled and modified atmosphere, ozone).

**Calendario/Schedule:**

**Room: to be defined**

Titolo del Corso: "ELABORAZIONE DEI DATI SPERIMENTALI" - "Processing of Experimental Data"  
Docente: **Prof. Franco Capocasa**

Ore complessive: **12 = 2 CFU**

Obiettivo

Il corso ha la finalità di fornire nozioni teorico-pratiche relative alla acquisizione, organizzazione, controllo, validazione, elaborazione dei dati sperimentali tramite l'applicativo MS Excel di Office.

The aim of the course is to provide theoretical and practical knowledge related to the acquisition, organization, control, validation and processing of experimental data through the application MS Excel Office

Programma

- Acquisizione e organizzazione dei dati sperimentali;
- Errori nelle misure
- Calcolo della media, deviazione standard, errore standard nel controllo dei dati sperimentali;
- Utilizzo dell'applicativo MS Excel nella creazione di database ed elaborazione dei dati sperimentali

- Presentazione dei dati sperimentali;

- Esercitazioni con l'applicativo MS Excel.

Program

- Acquisition and organization of experimental data;
- Errors in the data measurements
- Mean, standard deviation, standard error calculation in the check of experimental data;
- Use of the MS Excel application in creating databases and processing of experimental data
- Presentation of the experimental data;

- Exercises with the MS Excel.

PROPOSTA DI CALENDARIO (AULA DA DEFINIRE):

**Calendario/Schedule:**

03 luglio 14.30-18.30

10 luglio 14.30 – 18.30

17 luglio 14.30 – 18.30

**Room: AULA L**

Titolo del Corso: Cambiamento climatico: mitigazione e adattamento nelle colture arboree/Climate change: mitigation and adaptation in tree crops.

**Docente: Dott.ssa Vania Lanari**

**Ore complessive:** 12= 2 CFU

**Obiettivo del corso:**

Il corso consente agli studenti di acquisire conoscenze sul cambio climatico e sulle ripercussioni in arboricoltura, sulle azioni di intervento e strategie innovative per l'adattamento delle varie colture all'attuale condizione climatica. Il corso intende, inoltre, fornire agli studenti le capacità di gestire i dati meteo e di interpretare i risultati. In fine, saranno esaminati alcuni casi di studio.

**Course objective:**

The course allows students to acquire knowledge on climate change and the effects in arboriculture, on intervention actions and innovative strategies for the adaptation of the various crops to the actual climatic condition. The course also aims to provide students the ability to manage weather data and to interpret results. Finally, some case studies will be examined.

**Programma:**

1. Cambio climatico e impatto in arboricoltura.

Trend del cambio climatico. Impatto del cambiamento climatico sulle fasi fenologiche (anticipo delle principali fasi e problematiche connesse), fisiologia delle piante (aspetti relativi a fotoinibizioni e riduzione dell'efficienza fotochimica) e sugli areali di coltivazione.

2. Strategie di adattamento e mitigazione al cambiamento climatico.

Strategie di adattamento a breve e lungo termine ed interventi di mitigazione in arboricoltura.

3. Approccio nell'elaborazione e presentazione dei dati.

Acquisizione e gestione dei dati meteo, elaborazione dei dati e rappresentazione grafica.

4. Casi di studio

**Program:**

1. Climate change and impact in tree crops.

Climate change trend. Climate change effects on the phenological phases (advance of the main phenological phases and problems), plants physiology (aspects related to photoinhibition and reduction of the photochemical efficiency) and the cultivation areas.

2. Adaptation and mitigation strategies for climate change.

Adaptation strategies in short and long-term and mitigation interventions in arboriculture.

3. Approach in data processing and presentation. Acquisition and management of weather data, data processing and graphical representation.

4. Case studies

**Aula/Room:**

8-9-10-11 giugno 2020 dalle 9.30 alle 12.30 AULA A

(il 10 in aula informatica per esercitazione)

*Titolo del Corso: Microrganismi e qualità del suolo*  
*Docente: Prof. Cristiano Casucci*

**Ore di lezione:** 12 (2CFU)

**Programma:**

- I microrganismi del suolo e le loro funzioni
- Fertilità del suolo e componente microbica
- Indici di fertilità biologica
- La respirazione del suolo
- Microrganismi efficaci per il miglioramento e il risanamento del suolo.
- Attività di laboratorio

**Date:**

venerdì 22 maggio 10:00-13:00      **Aula B**  
venerdì 29 maggio 10:00-13:00      **Aula B**  
venerdì 5 giugno 10:00-13:00        **Aula B**  
venerdì 12 giugno 10:00-13:00 ( **Laboratorio** )

*Titolo del Corso: Machine Learning and Deep Learning: Methods and Applications in Bioinformatics*  
*Docente: Dott.ssa Marina Paolanti*

**Ore di lezione:** 12 (2CFU)

**Programma:**

**July 10, 2019**

- Introduction in Machine Learning. Statistical Foundations.
- Supervised learning techniques for regression and classification
- Unsupervised learning techniques for data modeling and analysis
- Probabilistic versus non-probabilistic viewpoints
- Examples and exercises.

**July 17, 2019**

- Learning parameters from data for various machine learning methods
- Optimization and inference algorithms for model learning
- Examples and exercises.

**July 2020**

- GWAS data analysis
- Testing various combinations of feature selection methods, data reduction techniques,

training algorithms and classifier types using the data provided.

### **July , 2020**

- The basics of neural networks including how to train them (e.g. back propagation).
- Introduction to convolutional neural networks
- Training and applying convolutional and recurrent neural networks for image analysis
- Utilizing data augmentation and other preprocessing steps to further improve the generalization
- Examples and exercises.

### **Calendario/Schedule:**

- 6 luglio ore: 9 - 11
- 10 luglio ore: 9 - 11
- 13 luglio ore: 9 - 11
- 17 luglio ore: 9 - 11
- 20 luglio ore: 9 - 11
- 24 luglio ore: 9 - 11
- 27 luglio ore: 9 - 11
- 31 luglio ore: 9 - 11

### **AULA L**

**Course Title:** New Biotechnological Tools for the genetic improvement of fruit tree species

**Docente:** Dott.ssa Silvia Sabbadini

**Total hours:** 12 = 2 CFU

#### **Course aim:**

The main objective of the course is to provide theoretical and practical knowledge on the use of New biotechnological tools for plant genetic improvement, in particular applied to fruit tree species.

#### **Themes and program:**

- Main objective for the genetic improvement of fruit tree species (cultivars and rootstocks).
- Biotechnological methods for the genetic improvement of plants: Transgenesis, Cisgenesis, Trans-grafting, Gene editing, RNAi.
- Case studies of New Biotechnological Tools (NBTs) applied to fruit tree species.
- Examples of protocols applied for in vitro regeneration and genetic modification of fruit tree species.
- Laboratory experience: *Agrobacterium tumefaciens*-mediated transformation trial of grapevine somatic tissues and detection of transient transformation events.

#### **Course schedule:**

- 1 class on the themes listed above (4 hours). (September 2020)
- 3 laboratory practices, where an in vitro regeneration and transformation trial will be carried out by students on a specific fruit tree species (8 hours complex). (September 2020)
- Wednesday , 1 July : 4 hours, theoretical
- Tuesday, 7 July : 4 hours , practice

- Friday 10 July : 4 hours , practice

**Room:** General Arboriculture and arboreal cultivation area - ROOM A

**Titolo del corso:** Nuovi strumenti biotecnologici per il miglioramento genetico delle specie da frutto

Dott.ssa Silvia Sabbadini

**Ore complessive:** 12 = 2 CFU

**Obiettivo del corso:**

L'obiettivo principale del corso è fornire conoscenze teoriche e pratiche sull'uso di nuovi strumenti biotecnologici per il miglioramento genetico delle piante, in particolare delle specie da frutto.

**Programma:**

- Principali obiettivi del miglioramento genetico di specie da frutto (varietà e portinnesti).
- Metodi biotecnologici applicati per il miglioramento genetico di specie vegetali: Transgenesi, Cisgenesi, sistema innesto modificato/nesto non modificato, Editing genetico, RNAi.
- Casi studio di applicazione dei Nuovi strumenti biotecnologici (NBTs) a specie da frutto.
- Esempi di protocolli di rigenerazione in vitro e modifica genetica applicati a specie da frutto.
- Esperienza pratica di laboratorio: prova di trasformazione genetica di tessuti somatici di vite e rilevamento di eventi di trasformazione transiente.

**Organizzazione del corso:**

- Mercoledì 1 luglio: 4 ore teoriche (dalle 9-13)
- Martedì 7 luglio: 4 ore pratiche laboratorio Frutticoltura (9-13).
- Venerdì 10 luglio: 4 ore laboratorio frutticoltura (9-13).

**Stanza:** Area di arboricoltura generale e coltivazioni arboree – AULA A

**Titolo del Corso: Analytical methods for quality evaluation in fruitculture**  
**Dott.: Luca Mazzoni**

**Credits (ECTS) 2, hours 12 (lectures 4 hours; laboratory activities 8 hours)**  
**SSD: AGR/03 (General Arboriculture and Arboreal Cultivation)**

***Development of the course***

The course is taught through frontal lectures (4 hours), while the second part of the course (8 hours) consists of practical demonstrations in the laboratory.

***Program***

- Introduction to the fruitculture, definition of the concept of quality and its determinant factors.
- Evaluation of fruit quality: factors that affect the fruit quality, the objectives of fruit quality, the difference between qualitative and nutritional aspects.
- Tools for the evaluation of fruit quality: control methods, post-harvest technical standards.
- The importance of sensory analysis in the evaluation of fruit quality.



- The importance of the nutritional analysis in the evaluation of fruit quality: deepening their meaning and the most used laboratory instruments for their implementation.

### ***Objectives of the course***

- (a) to know and apply the most common methods for fruit quality organoleptic evaluation;
- (b) to know and apply the analytical methods for the qualitative and quantitative determination of specific vitamins and nutrients;
- (c) to know the scientific basis for the use of analytical techniques in the quality evaluation and prediction;
- (d) to know and understand the factors that positively or negatively influence the quality of a fruit product.

### ***Course schedule***

- Lunedì 22 giugno 2020: 4 ore teoriche (dalle 9 alle 13) --> Aula A
- Lunedì 29 giugno 2020: 4 ore pratiche (dalle 9 alle 13) --> Laboratorio di frutticoltura
- Lunedì 6 luglio 2020: 4 ore pratiche (dalle 9 alle 13) --> Laboratorio di frutticoltura

***Course Title: Application of Molecular Genetic Tools in Livestock***

***Teacher: Dr. Simone Ceccobelli***

***Frontal teaching: 12 h= 2 CFU - ECTS***

### ***Program***

#### ***Course Aim***

The course is conceived:

- to provide the participants with an introduction to the techniques most frequently applied in the animal genetic field;
- to understand the principal statistical reference of scientific publications in order to pinpoint the most relevant results;
- to evaluate with statistical tools the conclusions made from other researchers;
- to provide case studies focused on application of genomic tools and selective breeding in livestock.

#### ***Introduction***

Main problems on advanced genetic technologies in the animal breeding: principal differences with plant breeding, costs and ethical limits.

#### **Molecular biotechnology**

A variety of molecular technology are available to analyse molecular data that will be taken in account during the course:

- parentage analysis (SSR and SNPs markers);
- gene detection associate to economic/productive traits in animal production;
- SNPs genotyping technologies and their applications in in farm animal breeding programs.
- genome editing from the beginning to the CRISPR/Cas system.

**Room:** computer classroom

***LABORATORIO INFORMATICO***

- 10/06/2020 ore 14.30 -17.30
- 17/06/2020 ore 9-12
- 24/06/2020 ore 9-12
- 01/07/2020 ore 9-12