COURSE SYLLABUS AND COURSE REQUIREMENTS ACADEMIC YEAR 2022/23 SEMESTER II.

Course title	*Genetic Modification and GMO*
Course Code	*MSM633AN-EA-00, MSM633AN-LA-01*
Hours/Week: le/pr/lab	*2+2*
Credits	*4*
Degree Programme	*Biomedical Engineering MSc*
Study Mode	*Full time*
Requirements	*Fisnhing prerequisites*
Teaching Period	*3. semester*
Prerequisites	*Cell and molecular biology, biochemistry*
Department(s) Course Director	*Dr. Krisztian Kvell*
Teaching Staff	*Dr. Krisztian Kvell, Dr. Balázs Nemes, Ou Hairui*

COURSE DESCRIPTION

A short description of the course (max. 10 sentences).
Neptun: Instruction/Subjects/Subject Details/Basic data/Subject description

The subject aims to provide students with basic information on how to perform nucleic acid manipulation in both cells ar genetically-modified organisms or GMOs). The curriculum covers methods of nucleic acid manipulation as well as the use vectors. Classic examples of monogenic hematological disease treatments are also discussed as examples describing met therapeutic goals and achievements. Potential drawback and pitfalls are also highlighted during the course. The cou provide hands-on experience for students.

SYLLABUS

Neptun: Instruction/Subjects/Subject Details/Syllabus

1. GOALS AND OBJECTIVES

Goals, student learning outcome.
Neptun: Instruction/Subjects/Subject Details/Syllabus/Goal of Instruction

a) Knowledge

− Knows theory and practice in natural sciences and engineering sciences related to biomedical engineering.

− Knows methods and tools of mathematical modelling and computer simulation related to engineering and biological sys

− Knows basic communication, leadership, organisation skills and ethics rules.

b) Ability

− Has the ability to utilise natural science and engineering science knowledge, then process, categorise, analyse and draw

gathered with healthcare system.

− Has the ability for modelling and describing the functional structure of the human body, physiological processes and reg

− Has the ability to enrich basic knowledge in the field of biomedical engineering.

c) Attitude

− Dedicated to security and safety as well as health improvement.

− Thrives to perform a job in a complex perspective applying systems integration and a process-oriented manner.

− Aims for new research, development and innovation goals, and to fulfil such goals.

2. COURSE CONTENT

Neptun: Instruction/Subjects/Subject Details/Syllabus/Subject content

	TOPICS
LECTURE	1. *Enzymes 1 Restriction endonucleases* 2. *Enzymes 2. Restriction cloning* 3. *Plasmids* 4. *Traditional PCR* 5. *PCR cloning* 6. *Real-time PCR* 7. *Digital PCR* 8. *Transfection methods* 9. *Viral gene delivery methods* 10. *RNA interference* 11. *CRISPR methodology* 12. *GM animal production* 13. *---* 14. *---* 15. *Exam*
PRACTICE, LABORATORY PRACTICE	1. *Enzymes 1. Enzymatic digestion* 2. *Enzymes 2. Gel electrophoresis* 3. *Plasmids: Bacterial transformation* 4. *Traditional PCR* 5. *PCR cloning* 6. *Real-time PCR* 7. *Digital PCR* 8. *Transfection in prokaryotes and eukaryotes* 9. *Viral gene delivery methods* 10. *RNA interference* 11. *CRISPR methodology* 12. *GM animal production*

DETAILED SYLLABUS AND COURSE SCHEDULE

ACADEMIC HOLIDAYS INCLUDED

LECTURE

week	Topic	Compulsory reading; page number (from … to …)	Required tasks (assignments, tests, etc.)
1,	Enzymes 1 Restriction endonucleases	Addgene Plasmids 101: A Desktop Resource (3rd Edition) Page 28- 33+ lecture material will be uploaded to Teams	
2,	Enzymes 2. Restriction cloning	Addgene Plasmids 101: A Desktop Resource (3rd Edition) Chapter 2 Page 45-50+ lecture material will be uploaded to Teams	
3,	Plasmids	Addgene Plasmids 101: A Desktop Resource (3rd Edition) Chapter 1 Page 8-27+ lecture material will be uploaded to Teams	
4,	Traditional PCR	PCR handbook: 6-9	
5,	PCR cloning	Lecture material will be uploaded to Teams	
6,	Real-time PCR	ThermoFisher: Real-time PCR handbook 2-19	
7,	Digital PCR	ThermoFisher: Real-time PCR handbook 62-68	
8,	Transfection methods	Addgene Plasmids 101: A Desktop Resource (3rd Edition) Chapter 3 Page 75-87+ lecture material will be uploaded to Teams	
9,	Viral gene delivery methods	An introduction to genetic engineering, 3rd edition (DST Nicholl, 2008, ISBN: 978-0521615211) + lecture slides	
10,	RNA interference	An introduction to genetic engineering, 3rd edition (DST Nicholl, 2008, ISBN: 978-0521615211) + lecture slides	
11,	CRISPR methodology	An introduction to genetic engineering, 3rd edition (DST Nicholl, 2008, ISBN: 978-0521615211) + lecture slides	
12,	GM animal production	An introduction to genetic engineering, 3rd edition (DST Nicholl, 2008, ISBN: 978-0521615211) + lecture slides	
13,	---		

week	Topic	Compulsory reading; page number (from … to …)	Required tasks (assignments, tests, etc.)
14,	---		
15,	Exam		

PRACTICE, LABORATORY PRACTICE

week	Topic	Compulsory reading; page number (from … to …)	Required tasks (assignments, tests, etc.)
1,	Enzymes 1. Enzymatic digestion	Laboratory protocols will be uploaded to Teams	Lab notes
2,	Enzymes 2. Gel electrophoresis	Laboratory protocols will be uploaded to Teams	Lab notes
3,	Plasmids: Bacterial transformation	Laboratory protocols will be uploaded to Teams	Lab notes
4,	Traditional PCR	Laboratory protocols will be uploaded to Teams	Lab notes
5,	PCR cloning	Laboratory protocols will be uploaded to Teams	Lab notes
6,	Real-time PCR	Laboratory protocols will be uploaded to Teams	Lab notes
7,	Digital PCR	Laboratory protocols will be uploaded to Teams	Lab notes
8,	Transfection in prokaryotes and eukaryotes	Laboratory protocols will be uploaded to Teams	Lab notes
9,	Viral gene delivery methods	Laboratory protocols will be uploaded to Teams	Lab notes
10,	RNA interference	Laboratory protocols will be uploaded to Teams	Lab notes
11,	CRISPR methodology	Laboratory protocols will be uploaded to Teams	Lab notes
12,	GM animal production	Laboratory protocols will be uploaded to Teams	Lab notes
13,	---		
14,	---		
15,	Exam		

3. ASSESSMENT AND EVALUATION

(Neptun: Instruction/Subjects/Subject Details/Syllabus/Examination and Evaluation System)

Attendance

In accordance with the Code of Studies and Examinations of the University of Pécs, Article 45 (2) and Annex 9. (Article 3) a student may be refused a gra the number of class absences exceeds 30% of the contact hours stipulated in the course description.

Method for monitoring attendance *(e.g.: attendance sheet / online test/ register, etc.)*

attendance sheet

ASSESSMENT

Cells of the appropriate type of requirement is to be filled out (course-units resulting in mid-term grade or examination). Cells of the other type can be de

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Course resulting in mid-term grade *(PTE TVSz 40§(3))*

Mid-term assessments, performance evaluation and their ratio in the final grade *(The samples in the table to be deleted.)*

Midterm evaluation is not planned.

Opportunity and procedure for re-takes *(PTE TVSz 47§(4))*

The specific regulations for improving grades and resitting tests must be read and applied according to the general Code of Studies and Examinations. E. repeated/improved at least once every semester, and the tests and home assignments can be

Not applicable.

Grade calculation as a percentage

Not applicable.

Course-unit with final examination

Mid-term assessments, performance evaluation and their weighting as a pre-requisite for taking the final exam

Midterm evaluation is not planned.

Requirements for the end-of-semester signature

Signature requirement is having less than three missed weeks during the semester based on attendance sheets.

Re-takes for the end-of-semester signature *(PTE TVSz 50§(2))*

The specific regulations for grade betterment and re-take must be read and applied according to the general Code of Studies and Examinations. E.g.: submitted can be repeated/improved each at least once every semester, and the tests and home assignments can be repeated/improved at least onc examination period.

Five exam options will be provided for students, including retake options.

Type of examination *(written, oral): written test.*

40

The exam is successful if the result is minimum   *%.*

Calculation of the grade *(TVSz 47§ (3))*

The performance at the exam accounts for

% in the calculation of the final grade.

100

Calculation of the final grade based on aggregate performance in percentage.

Course grade	Performance in %
excellent (5)	85 % …
good (4)	70 % ... 85 %
satisfactory (3)	55 % ... 70 %
pass (2)	40 % ... 55 %
fail (1)	below 40 %

The lower limit given at each grade belongs to that grade.

4. Specified literature

In order of relevance. (In Neptun ES: Instruction/Subject/Subject details/Syllabus/Literature)

COMPULSORY READING AND AVAILABILITY

- Medical Biotechnology, editors: Pongracz J, Keen M, Elsevier (2009)
- Genetic Engineering, editors: PS Verma, VK Agarwall (2014)
- Genetic Engineering: Principles and Practice, editor: Mitra S (2015)

All are readily available through web / library.

RECOMMENDED LITERATURE AND AVAILABILITY

- An introduction to genetic engineering, 3rd edition, editor: DST Nicholl (2008)
- Addgene Plasmids 101
- ThermoFisher: Real-time PCR Handbook
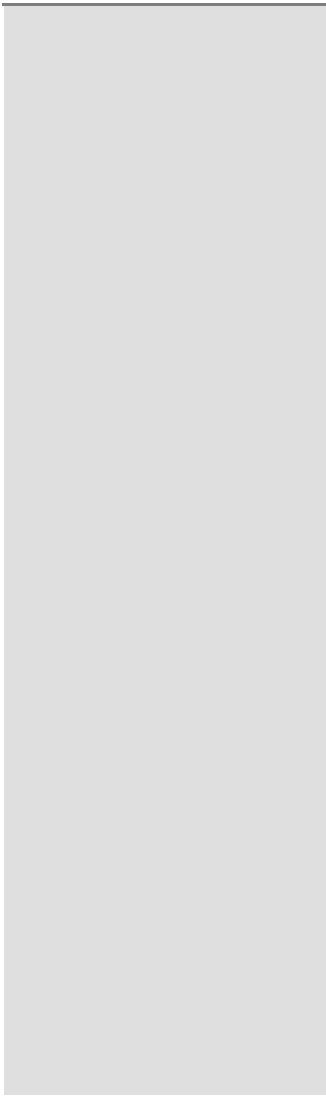
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Completion date, due date
9. May 2023
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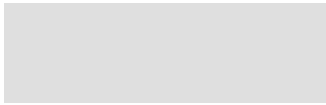
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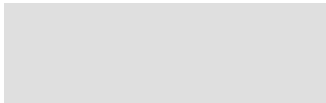
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