



**Course: Histology with Embryology**

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**Course Collaborators: Prof.dr.sc. Astrid Krmpotić**

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**Department: Department for Histology and Embryology**

**Study program: University Integrated Undergraduate and Graduate Study of Dental Medicine**  
(in English)

**Study year: First**

**Academic year: 2023/24**

## **SYLLABUS**

**Course description (a brief description of the course, general instructions, locations and types of lessons, necessary equipment, instructions for attendance and preparation for classes, student obligations, etc.):**

Histology with Embryology is a compulsory course during the first year of the Integrated Undergraduate and Graduate University Study of Dental Medicine in English. It consists of 40 hours of lectures, 40 hours of seminars, and 40 hours of laboratory practicals, overall, 120 hours (8 ECTS).

### **Course objectives**

Histology is one of the basic fields of medicine, which deals with the structure of a human body that can be studied using the microscope. Special emphasis is given on the structure of the oral cavity and teeth.

The major role of histology is to provide basic understanding of microscopic structure of tissues and organs. Knowledge about the normal structure is the basis for understanding physiology and also pathophysiological processes.

Embryology studies the development of the embryo from zygote to the newborn. Emphasis is on morphogenesis, especially during development of the face and teeth. Congenital malformations and errors in embryological development are discussed.

### **Expected course learning outcomes**

At the end of this course students will be able to demonstrate a working knowledge of human histology and development, and correlate the structure with the function. Students will acquire a reasonable working knowledge of how cells are organized in the tissues integrated to form the organs.

Students should master the skills of microscopy of the cells, tissues, and organs presented as histological slides. By utilizing their previous knowledge in biochemistry, biology, and anatomy, students should gain insight into the normal structure of the human body by means of light and electron microscopy.



Student should be able to recognize, describe, and differentiate tissue types, as well as organs according to their cellular structure and tissue distribution. He/she should be able to describe the sequence of events leading in implantation and organogenesis and to describe processes associated with development of the face and the teeth.

#### **Course content**

##### **Histology part include the following topics:**

The basic tissues – organization and microscopic structure of cells and extracellular substance in the epithelial and connective tissues, muscle tissues and nervous tissue.

Organ system histology - circulatory system, immune system, endocrine glands, respiratory system, digestive tract and associated glands, urinary system, reproductive system, special senses.

##### **Embryology part cover following topics:**

Fertilization, cleavage, gastrulation and formation of primary germ layers; differentiation of primary germ layers and organogenesis; fetal membranes and placenta. Periods of intrauterine development, development of the face and oral cavity, development of the temporomandibular joint, birth defects.

##### **Part about the teeth:**

Microscopic structure of enamel, dentin-pulp complex, cementum, periodontal ligament, bony socket, gingiva. Early development of teeth (bud, cap, bell) formation and characteristics of ameloblasts, odontoblasts, cementoblast; the formation of mineralized parts of teeth, amelogenesis, dentinogenesis, cementogenesis, development of periradicular tissues and gingiva. Physiological tooth movements: eruption and shedding.

Lectures, seminars and laboratory practicals will take place in the lecture halls of the Medical faculty according to the schedule in the syllabus with the use of histological images from the atlas, microscopes, and histology slides. If for some reason it is not possible to hold a live class, it will be organized online.

#### **Assigned reading:**

T.W.Sadler: Langman's Medical Embryology, XIV edition, Wolters Kluwer Health, Philadelphia, 2022.

A.L. Mescher.: Junqueira's Basic Histology, XVI edition, The McGraw –Hill Education, New York 2021.

Nanci A. Ten Cate's Oral Histology. IX edition, Elsevier, 2018.

#### **Optional/additional reading:**

<https://www.anatomicum.com/en/?articleid=58>

<http://microanatomy.net/digestive/tooth.htm>

<http://www.uky.edu/~brmacp/oralhist/html/ohoc.htm>

<http://www.histologyguide.com/index.html>

#### **COURSE TEACHING PLAN:**

##### **The list of lectures:**



1. Importance of histology
2. Epithelial tissue
3. Connective tissue 1
4. Blood
5. Connective tissue 2
6. Cartilage
7. Bone
8. Muscle tissue
9. Circulatory system
10. Nervous tissue
11. Urinary system
12. Male reproductive system
13. Female reproductive system 1
14. Female reproductive system 2
15. Introduction to embryology, Gametogenesis, fertilization, first week of development
16. 1st and 2nd week of development, Implantation and gastrulation
17. Neurulation, Derivatives of ectoderm
18. Differentiation of mesoderm
19. Derivatives of endoderm
- 20.21. Development of the head
22. Birth defects
23. Digestive system: Oral cavity
24. Digestive system: Alimentary canal
25. Digestive system: Associated organs
26. Immune system
27. Endocrine glands
28. Respiratory system
- 29.30. Development of the tooth
31. 31.32. Dentin-pulp complex
33. Dentinogenesis
34. Enamel
35. Cement
36. Development of the root
37. Gingiva
38. Eruption of the tooth
39. 40. Sensory organs



**The list of seminars with description:**

During seminars, students will discuss in more detail themes introduced during the lectures and explain the unclear and insufficiently understandable topics. The seminars also introduce the topics that will be revealed on LP.

1. Epithelial tissue
2. Connective tissue, blood
3. Cartilage, bone
4. Muscle tissue, Circulatory system
5. Nervous tissue
6. Female reproductive system
7. Urinary and male reproductive system
8. Embryology I
9. Embryology II
10. Digestive system: Oral cavity
11. Digestive system: Alimentary canal
12. Immune system
13. Endocrine glands
14. Digestive system: Associated organs
15. Respiratory system
16. Development of the tooth
17. Skin, Ear
18. Eye
19. Osteogenesis
20. Nervous system
21. Fetal membranes and placenta
22. Dental pulp
23. Dentinogenesis
24. Amelogenesis
25. Bony socket, PDL
26. Age-related changes
28. Sensory organs
29. Evaluation of knowledge
30. Consultations



**The list of practicals with description:**

LP follows the topics of seminars that precede. Every practical involves an overview of histological slides of tissues and organs using light microscopes and atlases mentioned in literature list. The student should draw a sketch of the tissues and organs presented on slides and discuss it with the teacher or demonstrator.

1. Epithelial tissue
2. Connective tissue, blood
3. Cartilage, bone, osteogenesis
4. Muscle tissue, Circulatory system
5. Nervous tissue and system
6. Female reproductive system
7. Urinary and male reproductive system
8. Embryology I
9. Embryology II
10. Digestive system I: Oral cavity
11. Digestive system II: Alimentary canal
12. Immune system
13. Endocrine glands
14. Digestive system III: Associated organs
15. Respiratory system
16. Tooth development
17. Skin, Ear
18. Eye
19. Tooth structure I
20. Tooth structure II
21. Slide repetition
22. Slide recognition.

**Students' obligations:**

Class attendance is mandatory. Students may be absent from 30% of each form of teaching provided they have a justifiable cause. If a student is absent for more than 30% of the classes, he/she will have to re-enroll the course.

Absence from practicals can be compensated at the end of the course.

Students are expected to actively participate in all aspects of the course, create sketches in a notebook during practicals, and attend the examinations. Moreover, preparation of the course content, which is going to be discussed during seminars and practicals, is obligatory.

During practicals, students are obligated to have tools (a notebook without lines, a blue and a red pencil, white coat).



**Assessment (exams, description of written / oral / practical exam, the scoring criteria):**

Student grading will be conducted according to the current Ordinance on Studies of the University of Rijeka.

Assessment of student work

Student work will be assessed and graded during the course and on the final exam. During the course, students may obtain a total of 100 grade points (credits). Students can achieve up to 70% of the final grade during the classes, and a maximum of 30% of the final grade at the final exam.

Evaluation of students' progress during classes, midterms, and the final exam in the academic year 2023/20243 is shown in Table 1.

Table 1. Distribution of grade points in the course "Histology and Embryology"

	Evaluation	Grade points
Midterm exams	Midterm exam	16
	Midterm exam	16
	Midterm exam	16
	<b>Total</b>	
Seminars/laboratory practicals	Short exams	3
	Completed practicals	2
	Accepted notebook	2
Tissue section recognition		15
	<b>Total</b>	<b>70</b>
Oral exam		30
<b>Total</b>		<b>100</b>

**Midterm exams**

During the course, three written midterm exams are planned. All written midterm exams consist of 40 multiple-choice questions and will be evaluated according to the criteria shown in Table 2.

MT I – 24.04.2024.

MT II – 03.05.2024.

MT III – 23.05.2024.

Table 2. Evaluation of written midterm exams I-III

Number of correct answers	Grade points
17-19	6
20 - 23	10
24 - 26	12
27 – 29	13
30 – 32	14
33 – 36	15
37 – 40	16



Students can retake the midterm exam once - in the case of absence or because they are not satisfied with the obtained grade points. Then, **the points gained from the retaken midterms will be considered**. Students will have the opportunity to correct one or more midterm exams only once. Correction of the midterm exam I-III will be held at the end of the course, before final exams (28.05.2024.)

**During course** students can obtain 7 grade points by answering short exams at Merlin, actively attending laboratory practicals and completing a notebook with drawings

**Tissue section recognition** is a compulsory oral exam and is required for students to be qualified for the final exam. A student must identify at least 8 of the 10 microscopic slides, as well as the structures described (and drawn) during the laboratory practicals. Each slide is evaluated with 0,5; 1, or 1,5 points depending on the student's knowledge, maximum is 15 points.

Recognition of tissue sections will be organized during the week prior to the final exam.

#### Final exam

The final oral exam covers the entire course content. During the final exam, students can obtain a maximum of 30 credits. Students can refuse the grade if he/she is not satisfied with it. In that case, he/she must retake the final exam.

Students who accomplish 35 or more grade points during course (or after correction of the midterm exams) and pass Tissue section recognition can access the final exam.

Student who achieves less than 35 grade points during course even after the correction of the midterm exams, or didn't pass Tissue section recognition or is absent for more than 30% of classes, cannot take the final exam, is graded as unsuccessful (F) and must re-enter the course next year.

**The final grade** represents a sum of all grade points obtained during course and on the final exam according to the following criteria:

90-100 points	A	5
75 – 89 points	B	4
60 – 74 points	C	3
50 – 59 points	D	2
0 – 49 points	F	1

Final exam dates

03/06/2023,

04/07/2023

05/09/2024

#### Other important information regarding to the course:

It is expected that all students follow the Code of Academic Honesty in accordance with the Code of Ethics for the students of the Faculty of Medicine at the University of Rijeka.

For questions and concerns, please feel free to contact us personally, by e-mail or via Merlin.



### COURSE SCHEDULE (for the academic year 2023/2024)

Date	Lectures (time and place)	Seminars (time and place)	Practicals (time and place)	Instructor
15.04.2024	<b>L1,L2</b> (9 <sup>15</sup> -10 <sup>45</sup> ) Dept.of histology			Prof.dr.sc. J Tomac
	<b>L3,L4</b> (11 <sup>15</sup> – 12 <sup>45</sup> ) Dept.of histology			Prof.dr.sc. J Tomac
16.04.2024	<b>L5</b> , (12 <sup>15</sup> - 13 <sup>00</sup> ) Lecture room P7			Prof.dr.sc. J Tomac
		<b>S1 LP1</b> , (13 <sup>15</sup> – 15 <sup>30</sup> ) Dept.of histology		Doc.dr.sc. M Babić Čač
17.04.2024	<b>L6,L7</b> (9 <sup>30</sup> -11 <sup>11</sup> ) Lecture room P1	<b>S19</b> (11 <sup>15</sup> -12 <sup>00</sup> ) Lecture room P1		Prof.dr.sc. A Krmpotić
		<b>S2, LP2</b> (12 <sup>15</sup> -14 <sup>30</sup> ) Dept.of histology		Doc.dr. V Jelenčić
18.04.2024	<b>L 8,L9</b> ( 8 <sup>30</sup> -10) Lecture room P4			Prof.dr.sc. J Tomac
	<b>L10,S20</b> (10 <sup>15</sup> -11 <sup>45</sup> ) Lecture room P4			Prof.dr.sc. A Krmpotić
19.04.2024		<b>S3 LP3</b> (10 <sup>15</sup> -13 <sup>15</sup> ) Dept.of histology		Doc.dr.sc. M Babić Čač
22.04.2024		<b>S4LP4</b> (8 <sup>30</sup> -10 <sup>45</sup> ) Dept.of histology		Doc.dr.sc. M Babić Čač
		<b>S5LP5</b> (11 <sup>00</sup> -13 <sup>15</sup> ) Dept.of histology		Doc.dr. V Jelenčić
24.04.2024		<b>S29</b> (14 <sup>00</sup> -15 <sup>00</sup> ) Dept.of histology		Prof.dr.sc. A Krmpotić
25.04.2024	<b>L12</b> (9 <sup>15</sup> -10) Lecture room P7			Prof.dr.sc. J Tomac
	<b>L13,14</b> (10 <sup>15</sup> -11 <sup>45</sup> ) Lecture room P7			Prof.dr.sc. J Tomac
26.04.2024		<b>S6LP6</b> (8 <sup>30</sup> -10 <sup>45</sup> ) Dept.of histology		Doc.dr.sc. M Babić Čač
	<b>L 15</b> (11 <sup>00</sup> -11 <sup>45</sup> ) Lecture room P7			Prof.dr.sc. J Tomac





	<b>L16,17</b> (12 <sup>00</sup> -13 <sup>30</sup> ) Lecture room P1			Prof.dr.sc. A Krmpotić
29.04.202 4	<b>L18,L19</b> (8 <sup>30</sup> -10) Lecture room P7			Prof.dr.sc. A Krmpotić
		<b>S7LP7</b> (1 <sup>15</sup> -11 <sup>45</sup> ) Dept.of histology		Doc.dr. V Jelenčić
	<b>S21</b> (12 <sup>15</sup> -13) Lecture room P7			Doc.dr.sc. M Babić Čač
30.04.202 4	<b>L20,21</b> (11 <sup>30</sup> -13) Lecture room P7			Prof.dr.sc. A Krmpotić
		<b>S8 LP8</b> (13 <sup>15</sup> -16 <sup>15</sup> ) Dept.of histology		Doc.dr. V Jelenčić
02.05.202 4	<b>L22</b> (12 <sup>15</sup> -13) Lecture room P2			Doc.dr.sc. M Babić Čač
		<b>S9LP9</b> (13 <sup>15</sup> - 16 <sup>15</sup> ) Dept.of histology		Doc.dr. V Jelenčić
03.05.202 4		<b>S29</b> (10-11) Dept.of histology		Doc.dr.sc. M Babić Čač
	<b>L23</b> (11 <sup>15</sup> -12) Lecture room P8			Prof.dr.sc. J Tomac
	<b>L24,25</b> (12 <sup>15</sup> -13 <sup>30</sup> ) Lecture room P8			Prof.dr.sc. B Polić
06.05.202 4		<b>S10LP10</b> (8 <sup>30</sup> -10) Dept.of histology		Doc.dr. V Jelenčić
	<b>L26</b> (10 <sup>15</sup> - 11) Lecture room P4			Prof.dr.sc. J Tomac
07.05.202 4		<b>S11LP11</b> (9 <sup>15</sup> -11) Dept.of histology		Doc.dr. V Jelenčić
	<b>L 27</b> (11 <sup>15</sup> -12) Lecture room P7			Prof.dr.sc. J Tomac
	<b>L 28</b> ( 12 <sup>15</sup> -13) Lecture room P7			Prof.dr.sc. B Polić
08.05.202 4	<b>L 29,30</b> (9 <sup>15</sup> -11) Lecture room P7			Prof.dr.sc. B Polić
	<b>S22</b> (11 <sup>15</sup> -12) Lecture room P7			Prof.dr.sc. A Krmpotić
		<b>S12LP12</b> (12 <sup>15</sup> -13 <sup>45</sup> ) Dept.of histology		Doc.dr.sc. M Babić Čač
09.05.202 4	<b>L31,32</b> (12 <sup>15</sup> -13 <sup>45</sup> ) Lecture room 15			Prof.dr.sc. J Tomac
		<b>S13LP13</b> (14-15 <sup>30</sup> ) Dept.of histology		Doc.dr. V Jelenčić



10.05.202 4		<b>S14LP14</b> (9 <sup>15</sup> -10 <sup>45</sup> ) Dept.of histology	Doc.dr.sc. M Babić Čač
	<b>L33,S23</b> (11 <sup>00</sup> -12 <sup>30</sup> ) Lecture room P8		Prof.dr.sc. J Tomac
		<b>S15LP15</b> (13-14 <sup>30</sup> ) Dept.of histology	Doc.dr. V Jelenčić
13.05.202 4		<b>S16LP16</b> (9 <sup>15</sup> -12) Dept.of histology	Doc.dr. V Jelenčić
	<b>L34S24</b> (12 <sup>15</sup> -14) Lecture room P1		Prof.dr.sc. J Tomac
14.05.202 4	<b>L35</b> (9 <sup>15</sup> -10) Lecture room P6		Prof.dr.sc. A Krmpotić
	<b>L36S25</b> (10 <sup>15</sup> -11 <sup>45</sup> ) Lecture room P6		Doc.dr.sc. M Babić Čač
15.05.202 4	<b>L37</b> (9 <sup>15</sup> -10) Lecture room P5		Prof.dr.sc. J Tomac
	<b>L38,S26</b> (10 <sup>15</sup> -11 <sup>45</sup> ) Lecture room P5		Doc.dr. V Jelenčić
16.05.202 4	<b>L39S27</b> (8 <sup>30</sup> -10) Lecture room x		Prof.dr.sc. J Tomac
	<b>S28</b> (10 <sup>15</sup> -11) Lecture room x		Doc.dr. V Jelenčić
		<b>LP19</b> (11 <sup>15</sup> -12 <sup>45</sup> ) Dept.of histology	Doc.dr.sc. M Babić Čač
17.05.202 4	<b>L40</b> (9 <sup>15</sup> -10) Lecture room P1		Prof.dr.sc. J Tomac
		<b>S17LP17</b> (10 <sup>15</sup> - 11 <sup>45</sup> ) Dept.of histology	Doc.dr.sc. M Babić Čač
		<b>LP20</b> (12 <sup>15</sup> -13 <sup>45</sup> ) Dept.of histology	Doc.dr. V Jelenčić
20.05.202 4		<b>S18LP18</b> (8 <sup>30</sup> -11 <sup>30</sup> ) Dept.of histology	Prof.dr.sc. J Tomac
21.05.202 4		<b>S30</b> (13 <sup>30</sup> -15) Dept.of histology	Prof.dr.sc. J Tomac
22.05.202 4		<b>LP21</b> (8 <sup>30</sup> -10) Dept.of histology	Doc.dr. V Jelenčić
24.05.202 4		<b>S29</b> (11-12) Dept.of histology	Prof.dr.sc. J Tomac
27.05.202 4		<b>LP21</b> (8 <sup>30</sup> -10) Dept.of histology	Doc.dr.sc. M Babić Čač
28.05.202 4		<b>S29</b> (13 <sup>30</sup> -14 <sup>30</sup> ) Dept.of histology	Prof.dr.sc. J Tomac



29.05.202 4			<b>LP22 (9<sup>30</sup>-12)</b> Dept.of histology	Prof.dr.sc. J Tomac
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**List of lectures, seminars and practicals:**

	<b>LECTURES (Topics)</b>	<b>Teaching hours</b>	<b>Location/Lecture room</b>
L1	Importance of Histology	1	Dept.of histology
L2	Epithelial tissue	1	Dept.of histology
L3	Connective tissues 1.	1	Dept.of histology
L4	Blood	1	Dept.of histology
L5	Connective tissues 2.	1	P7
L6	Cartilage, Joints	1	P1
L7	Bone, Osteogenesis	1	P1
L8	Muscle tissue	1	P4
L9	Circulatory system	1	P4
L10	Nerve tissue	1	P4
L11	Urinary system	1	P7
L12	Male reproductive system	1	P7
L13	Female reproductive system	1	P7
L14	Female reproductive system	1	P7
L15	Embryology: Intro, Gametogenesis, Fertilization,	1	P1
L16	1 <sup>st</sup> and 2 <sup>nd</sup> week, Implantation, Gastrulation,	1	P1
L17	Neurulation, Derivatives of ectoderm	1	P1
L18	Differentiation of mesoderm	1	P7
L19	Derivatives of endoderm	1	P7
L20	Development of the head	1	P7
L21	Development of the head	1	P7
L22	Birth defects	1	P2
L23	Digestive system: Oral cavity	1	P8
L24	Digestive system: Alimentary canal	1	P8
L25	Digestive system: Associated organs	1	P8
L26	Immune system	1	P4
L27	Endocrine glands	1	P7
L28	Respiratory system	1	P7
L29	Development of the tooth	1	P7
L30	Development of the tooth	1	P7
L31	Dentin-Pulp Complex	1	P15
L32	Dentin-Pulp Complex	1	P15



L33	Dentinogenesis	1	P8
L34	Enamel	1	P1
L35	Cement	1	P6
L36	Development of the root	1	P6
L37	Gingiva	1	P5
L38	Eruption of the tooth	1	P5
L39	Sensory organs: Skin	1	P1
L40	Sensory organs: Eye	1	P1
<b>TOTAL TEACHING HOURS</b>		<b>40</b>	

	<b>SEMINARS (Topics)</b>	<b>Teaching hours</b>	<b>Location/Lecture room</b>
S1	Epithelial tissue	1	Dept.of histology
S2	Connective tissue, Blood	1	Dept.of histology
S3	Cartilage, Bone	2	Dept.of histology
S4	Muscle tissue, Circulatory system	2	Dept.of histology
S5	Nerve tissue	1	Dept.of histology
S6	Female reproductive system	1	Dept.of histology
S7	Urinary, male reproductive system	1	Dept.of histology
S8	Embryology I	2	Dept.of histology
S9	Embryology II	2	Dept.of histology
S10	Digestive system I: Oral cavity	1	Dept.of histology
S11	Digestive system II: Alimentary canal	2	Dept.of histology
S12	Immune system	1	Dept.of histology
S13	Endocrine glands	1	Dept.of histology
S14	Digestive system III: Associated organs	1	Dept.of histology
S15	Respiratory system	1	Dept.of histology
S16	Tooth development	1	Dept.of histology
S17	Skin, Ear	1	Dept.of histology
S18	Eye	1	Dept.of histology
S19	Osteogenesis	1	P1
S20	Nervous system	1	P4
S21	Fetal membranes and placenta	2	P7
S22	Dental pulp	1	P7
S23	Dentinogenesis	1	P8
S24	Amelogenesis	1	P1
S25	PDL, Bony socket	1	P6
S26	Age-related changes	1	P5



S27	Skin apendages	1	P1
S28	Sensory organs	1	P1
S29	Evaluation of knowledge	4	H
S30	Consultations	2	H
	<b>TOTAL TEACHING HOURS</b>	<b>40</b>	

	<b>PRACTICALS (Topics)</b>	<b>Teaching hours</b>	<b>Location/Lecture room</b>
1	Epithelial tissue	2	Dept.of histology
2	Connective tissue, Blood	2	Dept.of histology
3	Cartilage, Bone, Osteogenesis	2	Dept.of histology
4	Muscle tissue, Circulatory system	2	Dept.of histology
5	Nervous tissue and system	2	Dept.of histology
6	Female reproductive system	2	Dept.of histology
7	Urinary, male reproductive system	1	Dept.of histology
8	Embryology I	2	Dept.of histology
9	Embryology II	2	Dept.of histology
10	Digestive system I: Oral cavity	1	Dept.of histology
11	Digestive system II: Alimentary canal	2	Dept.of histology
12	Immune system	1	Dept.of histology
13	Endocrine glands	1	Dept.of histology
14	Digestive system III: Associated organs	2	Dept.of histology
15	Respiratory system	1	Dept.of histology
16	Tooth development	3	Dept.of histology
17	Skin, Ear	1	Dept.of histology
18	Eye	2	Dept.of histology
19	Tooth structure I	2	Dept.of histology
20	Tooth structure II	2	Dept.of histology
21	Slide repetition	3	Dept.of histology
22	Slide recognition	2	Dept.of histology
	<b>TOTAL TEACHING HOURS</b>	<b>40</b>	

	<b>FINAL EXAM DATES</b>
1.	03.06. 2024.
2.	04.07. 2024
3.	10.09. 2024



**Sveučilište u Rijeci**  
University of Rijeka



**Sveučilište u Rijeci Fakultet dentalne medicine**  
**University of Rijeka Faculty of Dental Medicine**

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	<b>Lectures</b>	<b>Seminars</b>	<b>Practicals</b>	<b>Total</b>
Total number	40	40	40	120
On-line				
Percentage				