



## Pomorski Uniwersytet Medyczny w Szczecinie

### SYLLABUS General information

Name of the subject: DENTAL MATERIAL SCIENCE AND EQUIPMENT	
Type of subject	Mandatory
Faculty of PMU	Faculty of Medicine and Dentistry
Field of study	dentistry
Speciality	-
Level of study	master's degree
Form of study	full-time
Year of study /semester	Year 2 / semester 3
Number of ECTS credits	5
Forms of teaching (number of hours)	Lectures 5/seminars 25/exercises 30
Ways of verifying and assessing learning outcomes *	<input type="checkbox"/> credit: <input type="checkbox"/> descriptive <input type="checkbox"/> test <input type="checkbox"/> practical <input type="checkbox"/> oral <input checked="" type="checkbox"/> pass/fail <input type="checkbox"/> final exam: <input type="checkbox"/> descriptive <input checked="" type="checkbox"/> test <input checked="" type="checkbox"/> practical <input type="checkbox"/> oral
Head of the Department	Danuta Lietz - Kijak, MD, PhD, Professor of PUM Tel. 91 466 17 29
Subject supervisor	<b>Lek. Dent. Lidia Kozłowska</b>
Name and contact details of the Department	Department of Propedeutics, Physical Diagnosis and Dental Physiotherapy PUM, al. Powstańców Wlkp. 72; 70 - 111 Szczecin; tel. 91 466 16 73
Department website	<a href="https://www.pum.edu.pl/uniwersytet/dydaktyka_and_treatment/clinics_cathedrals_and_workshops/wmis/academy_of_physical_diagnostics_and_physiotherapy_of_dentistry/">https://www.pum.edu.pl/uniwersytet/dydaktyka_and_treatment/clinics_cathedrals_and_workshops/wmis/academy_of_physical_diagnostics_and_physiotherapy_of_dentistry/</a>
Language of subject	English

**Detailed information**

Subject objectives	<ul style="list-style-type: none"> <li>○ Gain knowledge of basic dental instruments and appliances and the ability to recognise and use them in the specific field of dentistry.</li> <li>○ Gain knowledge of dental materials for temporary and permanent fillings in the restorative treatment of deciduous and permanent teeth.</li> <li>○ Gain knowledge of dental materials used in caries prevention, endodontic and cosmetic treatment and bonding systems.</li> <li>○ Acquire knowledge and skills regarding the mixing (manual and automatic) of materials, application techniques, curing methods for dental materials and adhesion techniques.</li> <li>○ Acquire knowledge and skills in the selection of restorative biomaterials and bonding, based on material properties and clinical conditions, and the use of ancillary equipment when placing fillings.</li> <li>○ To gain an understanding of the surface properties of hard tissues and dental materials and the mechanisms of their degradation in the oral environment.</li> </ul> <p>The learning objective will be met if the student is familiar with and appropriately uses dental instruments and materials in appropriate treatment procedures.</p>	
Prerequisites for the subject	Knowledge	<p>Knowledge of the anatomy of permanent teeth and deciduous teeth. Knowledge of the histological structure of the hard and soft tissues of the oral cavity. Knowledge of the physiology of the masticatory organ.</p>
	Skills	<p>Basic manual skills. Spatial imagination. Visual-motor coordination.</p>
	Social competence	<p>The habit of self-education Ability to work in a group Communication skills Ability to be precise and persistent</p>

**LEARNING OUTCOMES**

n/a learning outcome	A student who has completed the course knows/can:	Symbol	Means of learning outcomes verification*
W01	knows and understands the principles of operation of dental equipment	B.W13	ET, EPR, K, S, O, PS, W, PM, TW, TDO, UP
W02	knows and understands the basics of disinfection, sterilisation and aseptic management	C.W5.	ET, EPR, K, S, O, PS, W, PM, TW, TDO, UP
W03	knows and understands dental equipment and instrumentation used in dental procedures	C.W23	ET, EPR, K, S, O, PS, W, PM, TW, TDO, UP
W04	knows and understands the definition and classification of basic and auxiliary dental materials	C.W24	ET, EPR, K, S, O, PS, W, PM, TW, TDO, UP
W05	knows and understands the composition, anatomy, bonding, properties, purpose and use of dental materials	C.W25	ET, EPR, K, S, O, PS, W, PM, TW, TDO, UP
W06	knows and understands the surface properties of dental hard tissues and dental biomaterials	C.W26	ET, EPR, K, S, O, PS, W, PM, TW, TDO, UP
W07	knows and understands the phenomenon of adhesion and the mechanisms of adhesion formation and the procedures for adhesive surface preparation of enamel, dentine and dental biomaterials	C.W27	ET, EPR, K, S, O, PS, W, PM, TW, TDO, UP
W08	knows and understands the basic clinical procedures of dental hard tissue reconstruction and endodontic treatment and the methods and technical-laboratory procedures for restorations	C.W28	ET, EPR, K, S, O, PS, W, PM, TW, TDO, UP

W09	knows and understands the mechanisms of degradation (corrosion) of dental biomaterials in the oral cavity and their effect on the biological properties of the materials	C.W29	ET, EPR, K, S, O, PS, W, PM, TW, TDO, UP
W10	knows and understands the morphology of dental cavities and the principles of endodontic treatment and the instrumentation used in this treatment	F.W7.	ET, EPR, K, S, O, PS, W, PM, TW, TDO, UP
U01	can apply adhesive techniques	C.U10	ET, EPR, K, S, O, PS, W, PM, TW, TDO, UP
U02	is able to select restorative and adhesive biomaterials, based on material properties and clinical conditions	C.U11	ET, EPR, K, S, O, PS, UP
U03	can reconstruct missing hard tissue in a phantom/model tooth	C.U.9.	S, O, PS,
U04	can formulate research problems in dentistry	F.U12.	S,O,PS
K01	is ready to recognise and acknowledge his/her own limitations, make a self-assessment of his/her deficits and learning needs	K.5.	O, S, PS
K02	is willing to use objective sources of information	K.7.	O
K03	is prepared to form opinions on various aspects of professional activity	K.10.	O

n/a learning outcome	Learning outcomes	Form of classes		
		Lecture	Seminar	Exercises
W01	knows and understands the principles of operation of dental equipment			x
W02	knows and understands dental office equipment and instrumentation used in dental procedures		x	x
W03	knows and understands the definition and classification of basic and auxiliary dental materials	x	x	x
W04	knows and understands the composition, anatomy, bonding, properties, purpose and use of dental materials	x	x	x
W05	knows and understands the surface properties of dental hard tissue and dental biomaterials	x	x	x
W06	knows and understands the phenomenon of adhesion and the mechanisms of adhesion formation as well as the procedures for adhesive surface preparation of enamel, dentine and dental biomaterials	x	x	x
W07	knows and understands the basic clinical procedures of dental hard tissue reconstruction, endodontic treatment and technical-laboratory procedures for restorations	x	x	x
W08	knows and understands the mechanisms of degradation (corrosion) of dental biomaterials in the oral cavity and their effect on the biological properties of the	x	x	x
W09	knows and understands the basics of disinfection, sterilisation and aseptic management		x	
U01	can apply adhesive techniques			x
U02	is able to select restorative, prosthetic and bonding biomaterials, based on material properties and clinical conditions		x	x
U03	can reconstruct missing hard tissue in a phantom/model tooth			x
K01	is ready to recognise and acknowledge his/her own limitations, make a self-assessment of his/her deficits and learning needs		x	x
K02	is willing to use objective sources of information		x	x

K03	is prepared to form opinions on various aspects of professional activity		x	x
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TABLE OF CONTENTS OF THE PROGRAMME			
n/a curriculum content	Programme content	L.hours	Reference to learning outcomes for classes
<b>Winter semester</b>			
<b>Lectures</b>			
TK01	Introduction to materials science. Classification of dental materials.	1	B.W13 C.W23. C.W24. C.W25. C.W26. C.W27. C.W28. C.W29.; F.W7.
TK02	The course of changes in the hard tissues of teeth (carious, non-carious and age-related) and the restorative techniques and materials that can be used.	1	B.U1. B.U2. B.U3. C.W24. C.W25. C.W26. C.W27. C.W28. C.W29.
TK03	Knowledge of caries risk and prosthetic factors as a basis for prevention and the biomimetic action of materials and the correct choice of material depending on the patient's risk group.	1	B.U1. B.U2. B.U3. F.W3. F.W5. F.W11. F.W14. C.W24. C.W25. C.W26. C.W27. C.W28. C.W29.
TK 04	Basics of preparation techniques and diagnostic methods to facilitate the selection of the correct working technique and material for hard tissue reconstruction.	1	B.U1. B.U2. B.U3. F.U23. C.W24. C.W25. C.W26. C.W27. C.W28. C.W29.
TK05	Degradation of materials in the patient's oral environment and its impact on patient health and material properties. Scientific development in the field of dental materials. Nanoparticles in dentistry.	1	B.U1. B.U2. B.U3. F.W3. F.W7. F.W5. F.W11. F.W14. C.W24. C.W25. C.W26. C.W27. C.W28. C.W29.
<b>Seminars</b>			
TK01	GIC: classification, composition and its modifications, binding reactions, properties, application.	2	B.U1. B.U2. B.U3. C.W23.C.W24. C.W25. C.W26. C.W27. C.W28. C.W29. K.5. K.7. K.10; F.U12.
TK02	Adhesion to dentin and enamel - mechanism, bonding systems and their generations. Etching techniques (total and selective). Polymerisation phenomenon.	2	B.U1. B.U2. B.U3. C.W23.C.W24. C.W25. C.W26. C.W27. C.W28. C.W29. K.5. K.7. K.10.; F.U12.
TK03	Composites: classification, composition and its modifications, structure, mode of bonding, properties, purpose and method of use Optical properties: colour and its measurement, fluorescence, translucence, opacities, colour loss.	2	B.U1. B.U2. B.U3. C.W23.C.W24. C.W25. C.W26. C.W27. C.W28. C.W29. K.5. K.7. K.10.; F.U12.
TK04	The carious process and methods for its diagnosis. Principles of cavity preparation (according to Black and modern) including differences due to the type of material used. Pulp vitality diagnostic devices.	2	B.U1. B.U2. B.U3. C.W23.C.W24. C.W25. C.W26. C.W27. C.W28. C.W29. K.5. K.7. K.10.
TK05	Auxiliary equipment for placing fillings - types of moulds and their stabilisation. Retraction in the gingival area.	2	B.U1. B.U2. B.U3. C.W23.C.W24. C.W25. C.W26. C.W27. C.W28. C.W29. K.5. K.7. K.10.; F.U12.
TK06	Mechanical properties of tissues and materials. Occlusal forces, cutting and abrasion in the oral cavity.	2	B.U1. B.U2. B.U3. C.W23.C.W24. C.W25.

Z komentarzem [GH1]: Na English programie nie ma wykadów w ogóle wiec to trzeba jakos inaczej podzielic

			C.W26. C.W27. C.W28. C.W29. K.5. K.7. K.10.
TK07	Thermal properties and thermal conductivity. Coefficient of thermal expansion. Tissue and material preparation methods - cutting pattern and heat generated. Surface phenomena.	2	C.W23.C.W24. C.W25. C.W26. C.W27. C.W28. C.W29. K.5. K.7. K.10.; F.U12.
TK08	Materials and instruments used in orthodontic treatment.	2	C.W23.C.W24. C.W25. C.W26. C.W27. C.W28. C.W29. K.5. K.7. K.10.
TK09	CAD-CAM, intra- and extraoral scanning. 3D printing in dentistry.	2	C.W23.C.W24. C.W25. C.W26. C.W28. C.W29. C.U12. K.5. K.7. K.10.
TK10	Equipment and methods for disinfection and sterilisation of instruments and surfaces in the dental practice.	2	C.W5. C.W28. C.W29. K.5. K.7. K.10.
TK11	Materials and instruments used in endodontic treatment.	2	C.W23. C.W24. C.W25. C.W26. C.W27. C.W28. C.W29. K.5. K.7. K.10.; F.W7.
TK12	Selection of appropriate restorative and bonding techniques, instruments and biomaterials, based on material properties and clinical conditions. GROUP WORK. - Part I.	2	F.U15. C.U11. C.W23. C.W24. C.W25. C.W26. C.W27. C.W28. C.W29. K.5. K.7. K.10.; F.U12.
TK13	Selection of appropriate restorative and bonding techniques, instruments and biomaterials, based on material properties and clinical conditions. GROUP WORK. - part II.	1	F.U15 C.U11. C.W23. C.W24. C.W25. C.W26. C.W27. C.W28. C.W29. K.5. K.7. K.10.; F.U12.
<b>Exercises</b>			
TK01	Dental drills. Diagnostic kit. Tools used in dental specialities: conservative, periodontology, surgery, prosthetics, orthodontics.	2	C.W23. K.5.; K7; K10
TK02	Health and Safety procedures. Filling of Class V Black cavities using encapsulated GIC and modelling technique and transparent cervical matrices. GIC mixed by hand as a primer. Working on models.	2	C.W23. C.W24. C.W25. C.W26. C.W27. C.W28 C. U9. C.U11. K.5. K.7. K.10.
TK 03	Rotary instruments for the treatment of dental hard tissue and dental materials. Small dental equipment.	2	C.W23. K.5.; K7; K10
TK 04	Class I Black's cavity filling using glass/modified GIC hybrid and occlusal film. Compomers and composites as fissure sealers. Working on models.	2	C.W23. C.W24. C.W25. C.W26. C.W27. C.W28 C. U9. C.U11. K.5. K.7. K.10.
TK 05	Odontotropic materials and biological treatment techniques, Calcium hydroxide and calcium silicate preparations. Bioactive materials.	2	C.W23. C.W24. C.W25. C.W26. C.W27. C.W28 C. U9. C.U11. K.5. K.7. K.10.
TK 06	Class I Black's cavity filling using bulk composites and adhesion systems as well as the Essential Line technique and occlusal punch. Working on models.	2	C.W23. C.W24. C.W25. C.W26. C.W27. C.W28 C. U9. C.U11. K.5. K.7. K.10.
TK 07	Techniques and preparations for infiltration, whitening, fluoride preparations, desensitisers, calcifiers - composition, properties application.	2	C.W23. C.W24. C.W25. C.W26. C.W27. C.U9. C.U11. K.5. K.7. K.10.

TK 08	Reconstruction of the contact point in Class II Black cavities using composite moulds. Tools and techniques for finishing and polishing fillings. Working on models.	2	C.W23. C.W24. C.W25. C.W26. C.W27. C.W28 C. U9. C.U11. K.5. K.7. K.10.
TK 09	Reconstruction of worn out incisal edges and occlusal surfaces with injectable composites - composition, properties, application procedure.	2	C.W23. C.W24. C.W25. C.W26. C.W27. C.W28 C. U9. C.U11. K.5. K.7. K.10.
TK 10	Class II Black's cavity filling with composite using layering technique and variable viscosity technique and sectional matrix systems. Working on models.	2	C.W23. C.W24. C.W25. C.W26. C.W27. C.W28 C. U9. C.U11. K.5. K.7. K.10.
TK 11	Temporary fillings: hand-mixed and light- and chemically-cured dressings, surgical, periodontal, endodontic. Oxide-zinc-eugenol cement.	2	C.W23. C.W24. C.W25. C.W26. C.W27. C.U9. C.U11. K.5. K.7. K.10.
TK 12	Filling of a Class III Black cavity with composite using the dentin and enamel layering technique and introduction to Smart Chromatic technology. Working on models.	2	C.W23. C.W24. C.W25. C.W26. C.W27. C.W28 C. U9. C.U11. K.5. K.7. K.10.
TK 13	Endodontic instruments. Methods of root canal preparation and measurement of root canal length, root canal rinses, medicaments and sealants used.	2	C.W23. C.W24. C.W25. C.W26. C.W27. C.W28 C. U9. C.U11. K.5. K.7. K.10.
TK 14	Filling of a Class IV Black cavity with composite using the silicone key and shaper technique. Composite veneer. Working on models.	2	C.W23. C.W24. C.W25. C.W26. C.W27. C.W28 C. U9. C.U11. K.5. K.7. K.10.
TK 15	News summary. Final credit in the form of a practical exam.	2	C.W23. C.W24. C.W25. C.W26. C.W27. C.W28 C. U9. C.U11. K.5. K.7. K.10.

<b>Recommended literature:</b>	
Reference literature	
1.	Dental materials. Powers J.M., Wataha J.C. Elsevier Urban & Partner. Wrocław 2013, wyd.1
2.	Conservative Dentistry Vol. 1 and 2 by E.J. Swift Jr, H.O. Heymann, T.M. Robertson, Publisher: Czelej, 2009
Complementary literature	
1.	Essentials of Dentistry. Collection of tasks for students of dentistry. Part 1. Simińska, Aleksandra. Warsaw: PZWL, 2022, doi: <a href="https://doi.org/10.53270/2021.016">https://doi.org/10.53270/2021.016</a> IBUK LIBRA.
2.	Endodontics of the developmental and mature age - 3rd edition. vol 1-2, Barańska-Gachowska M, Czelej, 2021.
3.	Handbook for dental assistants and hygienists. Mielczarek A., Kowalik R., Najman N.: PZWL. Warsaw 2018.
4.	A practical dictionary of dentistry. Lipski M., Czelej 2016.

5. Conservative dentistry with endodontics - clinical outline: a textbook for dental students: Jańczuk Z, Kaczmarek U, Lipski M. PZWL, 2014.
6. Dental materials. Craig R., ed. by John M. Powers, Ronald L. Sakaguchi. In: Elsevier Urban & Partner, 2008.

Student workload	
Form of student workload (class participation, activity, report preparation, etc.).	Student workload [h]
	In the teacher's assessment (opinion)
Contact hours with the teacher	60
Preparation for exercise/seminar	20
Reading of designated literature	15
Preparation of the final presentation summarising knowledge from the seminars	5
Preparation for a colloquium/quiz	5
Preparation for the examination	20
Total student workload	125
ECTS credits	5
Comments	

\*Example ways to verify learning outcomes:

- EP - written exam
- EU - oral examination
- ET - test examination
- EPR - practical exam
- K - colloquium
- R – oral presentation
- S - test of practical skills
- O - assessment of student activity and attitude
- SL - laboratory report
- PS - assessment of ability to work independently
- W - entrance exam, test before the start of class
- PM - multimedia presentation
- TWDO - yes/no choice tests, matching answers (quiz)