

GENERAL INFORMATION		
Course name	Anesthesiology, Reanimatology and Intensive Care	
Course director	Prof. Slavica Kvolik, MD, PhD	
Assistants	Assoc. Prof. Ivan Radoš, MD, PhD	
Study program	Integrated undergraduate and graduate university study program Medical Studies in German	
Course status	Mandatory	
Year of study, semester	3 rd year, 7 th semester	
Credits allocated and form of instruction	ECTS student workload	8
	Number of teaching hours (L+S+E)	105 (40+30+35)
COURSE DESCRIPTION		
Course objectives		
History and theories of anesthesia. Pathophysiology of the failure of individual organs and organ systems. Reanimatology and intensive treatment of people with severe illness or injury due to various causes. Anesthesia procedures. Pharmacology of the agents used in anesthesia, intensive treatment and pain management. Fundamental information on organ donation. Foundations of pain management.		
Course requirements		
There are no specific requirements for this course except those defined in the study program curriculum.		
Learning outcomes relevant to the study program		
1.1., 1.2., 2.1, 2.2., 2.3., 3.1., 3.3., 3.4., 3.5., 4.1., 4.2.		
Expected learning outcomes (5-10 learning outcomes)		
Knowledge		
<ol style="list-style-type: none"> 1. Explain the procedures for preoperative patient preparation and define the operative risk assessment 2. Understand the techniques for performing general and regional anesthesia 3. Describe the basic properties of drugs used in anesthesiology (opiates and opioids, muscle relaxants, inhalational anesthetics, local anesthetics) 4. Describe individual types of life support machines for patients during anesthesia and in intensive care units 5. Define basic and advanced life support procedures 6. Explain the basic principles of approaching the patients with multiple injuries in outpatient and hospital emergency services 7. Explain the techniques for the care of patients with unstable circulation 8. Define sepsis and learn the most common causes and treatments for patients with sepsis 9. Define shock and understand different types of shock 10. Describe the principles of machine ventilation and define ARDS 		
Skills		
<ol style="list-style-type: none"> 1. Perform basic and advanced life support procedures 2. Identify a patient with high anesthesia risk 3. Master the handling of basic vital signs monitors for patients during anesthesia and in intensive care units 4. Independently insert a venous line 		

5. Establish and maintain the airway
6. Master the cardiopulmonary resuscitation

Course content

History of anesthesia, general anesthesia, drugs, accessories and techniques. A brief overview of the general anesthesia history, with a focus on the history of Croatian anesthesia. Basic definitions of general anesthesia and its characteristics: selectivity, reversibility and specificity. Types of anesthetics per group, method of administration and basic equipment for the administration of drugs by injection, inhalation, rectal, oral and intramuscular route.

Intravenous anesthesia, hypnotics. Muscle relaxation. Administration of anesthetics by intravenous route, altered state of consciousness and analgesia in administering intravenous anesthetics, other effects of intravenous hypnotics. Hypnotics groups: Benzodiazepines (midazolam, diazepam), etomidate, ketamine, propofol, total intravenous anesthesia (TIVA). The mechanisms of action of relaxants on the neuromuscular junction. Division of muscle relaxants: non-depolarizing and depolarizing, long-acting and short-acting; monitoring of neuromuscular block, relaxation recovery, clinical recovery indicators. Inhalational anesthetics and medical gases. General anesthesia stages according to Guedel, Inhalational anesthetics ether, halothane, isoflurane, sevoflurane and desflurane: dosing modes and monitoring of the effect of inhalational anesthetics.

Evaluation of the effects of inhalational anesthetics. Medical gases: nitrogen oxide, entonox, helium, carbon dioxide. Preoperative preparation and premedication. Patient examination: preoperative physical examination, indications for requesting laboratory and other diagnostics prior to ASA operation. Continuous therapy and its adjustment to the perioperative period: glycemic control, substitution hormone therapy in the perioperative period.

Basic medicines in premedication: analgesics, sedatives and preoperative stress control.

Monitoring in anesthesia. Physical monitoring methods: observation of changes in the effect of anesthetics, non-invasive monitoring methods: perioperative ECG, non-invasive pressure measurement, pulse oximetry. Invasive pressure measurement, central venous pressure, pulmonary arterial pressure, cardiac output. Assessment of fluid balance based on intake, loss and clinical status. Assessment of the patient's cardiological condition before surgery. Physical examination of cardiac patients before surgery. Principal classifications when assessing cardiac function: NYHA and MET.

Cardiac therapy in the perioperative period, use of antihypertensives and pressure management, Indications and contraindications for surgery in cardiac patients. Allergic reactions and anesthesia. Procedure for identifying previous allergies during the preoperative examination, clinical picture of allergy to anesthetics and allergy to anesthesia, Differential diagnosis in allergic reactions. Procedures for allergic reactions. Reporting drug reactions. Regional anesthesia and analgesia. Local anesthetics in clinical practice, indications and method of administering drugs in regional anesthesia. Spinal anesthesia, epidural anesthesia and analgesia, caudal anesthesia; combined spinal-epidural anesthesia (CSE). Methods of performing nerve block. Complications in local and regional anesthesia – systemic complications of local anesthetic administration: neurotoxic and cardiotoxic reactions, hypotension. Local and regional anesthesia local complications, nerve damage, epidural hematoma. Hypotension treatment: use and dosing of vasoconstrictor, volume recovery, monitoring of patients.

Special anesthesia (in morbidly obese, elderly, disturbances of consciousness). Characteristics of patients with altered pharmacodynamics and drug pharmacokinetics (elderly and morbidly obese).

Changes in the effect of anesthetics in morbidly obese, sleep apnea. Anesthesia characteristics and preoperative preparation of patients with a head injury, conditions with disturbances of consciousness;

Anesthesia, administration of sedatives and narcotics, postoperative analgesia and demyelinating diseases. Anesthesia and analgesia in labor; Anesthesia in emergency situations in gynecology.

Epidural analgesia in labor, selective onset of the epidural block, patient-controlled analgesia. Preparation for surgery in case of massive gynecological hemorrhage, anesthesia and

hypertensive crisis in pregnancy (preeclampsia, eclampsia), HELLP syndrome and anesthesia. Resuscitation of pregnant women; Anesthesia in case of children; Anesthesia in emergency interventions involving children. Characteristics of pharmacodynamics in individual child age groups; newborn and infant airway. Characteristics of anesthesia equipment for children, tubes, masks and systems for the insertion of the venous route. Inhalation in anesthesia for children. Preoperative preparation of children for anesthesia in program and emergency interventions. Polytraumatized child, pain management for children. Anesthesia in daily surgery, discharge criteria after general anesthesia. Selection of appropriate anesthesia regarding the duration of surgery; preparation of patients and communication after anesthesia in day surgery; Postoperative monitoring: sedation scale, pain evaluation, Aldrette score for patient release. Resuscitation and care of a polytraumatized patient. Fundamental features of diagnosis of vitally endangered traumatized patients, care of injured people, fundamental differences in resuscitation of polytraumatized patients relative to patients with cardiac arrest, initial treatment of polytraumatized patients in intensive care units. Intensive treatment of surgical and traumatized patients. Volume status, volume replacement, laboratory assessment of the condition of a traumatized patient, Abdominal compartment syndrome, Assessment and monitoring of the nutritional status of a traumatized patient, parenteral and enteral nutrition in the intensive care unit. Hospital-acquired infection.

Characteristics of patients in ICUs that are conducive to hospital-acquired infections; definition and monitoring of hospital-acquired infections. Main causes of hospital-acquired infections. Hospital-acquired infection treatment, use of antibiotics and evaluation of the effects of therapy of hospital-acquired infections. Sepsis, ARI, ARDS, MOF. Renal insufficiency in the ICU. Definition of sepsis, severe sepsis, adult respiratory distress syndrome, renal and multi-organ failure. Mortality in case of sepsis and multi-organ failure. New guidelines for the treatment of septic patients in intensive care units. Management of acute pain, acute postoperative pain, acute post-traumatic pain.

Drugs for the treatment of acute pain: non-steroidal anti-rheumatic drugs, paracetamol, opioids, supplements.

Treatment of chronic pain. Complex regional pain syndrome type 1 and 2, nociceptive pain, visceral pain, superficial and deep somatic pain. Non-invasive treatment of low back pain and other painful syndromes, Education of patients. Neuropathic pain, postamputation (phantom) pain, cancer pain. Drugs in the treatment of chronic pain: NSAIDs; opioids, gabapentinoids, other drug therapy. Acupuncture, magnetotherapy, TENS and other complementary (non-pharmacological) pain management methods, Invasive procedures for pain management. Definitions of invasive procedures, diagnostic nerve blocks, Invasive pain management by infiltration of facet joints of the spine, ganglion blocking, nerve blocking. Circulatory and respiratory failure; BLS, ALS. Causes and epidemiology of cardiac arrest, assessment of respiratory status and consciousness, resuscitation involving one or two rescuers using a defibrillator: external heart massage, mouth-to-mouth, mouth-to-mask, mouth-to-nose, use of self-inflating bag, tools for advanced airway maintenance: mouthpiece, tubes, laryngeal mask, mechanical devices for artificial respiration. Venous route in resuscitation, peripheral and central veins used for emergency venous access, intraosseous route. Drugs used in resuscitation.

First aid in cases of poisoning, suffocation, drowning and other accidents. Assessment of the patient's cardiac condition prior to surgery. Seminar paper in which students independently analyze ECG abnormalities in different pathological conditions and determine the necessary treatment of these disorders with the help of teachers; Hemodynamic optimization of patients before surgery.

Mechanical ventilation, assisted breathing. Assessment of respiratory status and indications for mechanical ventilation, clinical and laboratory indicators of insufficient breathing. Assisted respiration – using the CPAP mask. Determining respiration volume, determining respiratory frequency; Mechanical ventilation types: pressure-controlled ventilation, volume-controlled ventilation, other assisted respiration methods. Oxygen therapy; carbon monoxide poisoning, Clinical and laboratory assessments of oxygen therapy status, Oxygen concentration in individual body parts, oxygen carriers; oxygen concentration measurement in respiratory

gases of the patient, determining the need for oxygen therapy; Oxygen therapy methods: use of equipment for oxygen therapy, adjusting oxygen concentration; Hyperbaric oxygen therapy – therapeutic indications and techniques; Carbon monoxide poisoning: mechanisms of toxic effect of carbon monoxide, clinical and laboratory assessment, need for mechanical ventilation and/or hyperbaric oxygen. Acid-base status (ABS).

Analysis of the acid-base status in case studies, evaluation of the functionality of compensation mechanisms; correction of ABS. Enteral diet in ICUs; Parenteral nutrition in ICUs; Indications for the use of enteral nutrition; Procedures and checks of gastrointestinal system function prior to the start of enteral nutrition; methods of performing enteral nutrition, Preparations used in enteral nutrition, complications of enteral nutrition, Indications for partial or total parenteral nutrition (TPN), Solution administration systems; Protein, lipid, carbohydrates and oligoelements supplementation in the parenteral nutrition. Complications in total parenteral nutrition in ICUs. Peripheral nerve blocks. Peripheral nerve blocks of upper limbs: scalene block, supraclavicular and axillary blocks. Blocks of lower limbs, femoral nerve block, extremity blocks. Use of neurostimulators and ultrasound in performing brain blocks. Determining brain death; Management of brain-dead persons. Determining brain death using clinical tests: motor function test, oculovestibular test, atropine test, karine test, apnea test. Brain perfusion test by using ultrasound, angiography, perfusion scintigraphy, Circulatory support, thermoregulation and respiration support in the brain-dead person, Organ donation system. Indications and contraindications for organ explantation. General anesthesia complications. Definition of complications in anesthesia and differences from anesthesia complications; Nerve injury, transient and permanent disorders of consciousness as a general anesthesia complication, coma vigil and brain death. Case study of a claim due to anesthesia complications. Acute postoperative pain.

In the seminar paper, students will compare the methods of anti-inflammatory drug administration in pain management. The students will calculate equianalgesic doses for non-opioid and opioid drugs for one patient. The students will be familiarized with patient factors and types of surgery that may modify the need for medicinal products.

Form of instruction	<input checked="" type="checkbox"/> lectures	<input type="checkbox"/> individual assignments
	<input checked="" type="checkbox"/> seminars and workshops	<input type="checkbox"/> multimedia and internet
	<input checked="" type="checkbox"/> exercises	<input type="checkbox"/> laboratory
	<input type="checkbox"/> distance learning	<input type="checkbox"/> mentoring activities
	<input type="checkbox"/> field course	<input type="checkbox"/> other

Student obligations

Come to class prepared by studying the recommended literature for each unit and actively participate in all forms of instruction. The student must participate in at least 70% of classes to pass the course.

Monitoring student learning

Attendance	x	Active participation	x	Seminar paper		Experimental work	
Written exam	x	Oral exam		Essay		Research	
Project		Continuous assessment		Paper		Practical work	x
Portfolio							

Assessment and evaluation of students during class and on the final exam

Students' performance will be evaluated during class and on the final exam. Students are evaluated numerically and descriptively (insufficient (1), sufficient (2), good (3), very good (4), excellent (5)). During classes, a student can earn a maximum of 100 points. Students can earn a maximum of 20 points during classes through different types of activities. On the final exam, students can earn a maximum of 80 points. The final grade represents the sum of the points earned during classes and on the final exam.

Mandatory reading

1. Bause H, Kochs E, Scholz J, Schulte am Esch J, Standl T. Anästhesie, Intensivmedizin, Notfallmedizin, Schmerztherapie - Duale Reihe. Thieme; 2011

Additional reading

1. Wetsch WA, Hinkelbein J, Spöhr F. Kurzlehrbuch Anästhesie, Intensivmedizin, Notfallmedizin und Schmerztherapie. Thieme; 2014
2. Töpfer L, Vater J, Boldte M, Keppeler P. BASICS Anästhesie, Intensivmedizin und Schmerztherapie. Urban & Fischer; 2016

The number of copies of mandatory reading in proportion to the number of students currently taking this course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Bause H, Kochs E, Scholz J, Schulte am Esch J, Standl T. Anästhesie, Intensivmedizin, Notfallmedizin, Schmerztherapie - Duale Reihe. Thieme; 2011	A purchased license for online textbooks shall be used https://bfdproxy48.bfd-online.de/login.htm?back=http%3a%2f%2fpartner.bfd-online.info/bfdproxy48.bfd-online.de%2fameos%2fbfdAboGateway%3fabold%3d264117 Access will be granted to all students enrolled in the study program	

Quality monitoring methods ensuring the acquisition of knowledge upon completion, skills and competences

The quality of course performance is monitored through an anonymous student survey on the quality of the organization and conduction of classes, the course content and the work of professors. The usefulness of the lectures from the students' perspective, the curriculum content, the professor preparedness, the clarity of the presentation, the amount of new content and the quality of the presentation are evaluated. The curriculum and its execution are administratively compared. The participation of students in lectures and exercises, as well as the excuses for missing classes, are controlled and analyzed.