SAN RAFFAELE INTERNATIONAL MD PROGRAM

YEAR 1
Academic Year 2012/2013

- Statistics and Bioinformatics
- Medical Physics
- Medical Humanities
- Chemistry and Biochemistry
- Cell and Molecular Biology
- Genetics and Developmental Biology

STATISTICS AND BIOINFORMATICS

Total Credits: 6
Lectures: 48
Practicals: 40
Scientific Discipline Sector: MED/01 – INF/01

Course Coordinator: Prof. Franco Merletti Email: franco.merletti@unito.it

Teaching Assistant: Prof. Carlotta Sacerdote Email: carlotta.sacerdote@unito.it

Goals:

Aim of the course is to introduce the fundamentals of statistics and epidemiology presenting the statistical techniques most frequently used in the biomedical literature. Such techniques will be presented as tools to enhance critical understanding and interpretation of the statistical and epidemiological contents of scientific articles.

Prerequisites:

None

Evaluation:

The final exam will cover the program of the course and will include multi-choice questions, practical exercises and open questions on interpretation of data analyses and study results.

Program:

1) Introduction to statistics and epidemiology
2) Measurements of exposures and outcomes
    - Measurements of exposures
    - Validity and reliability of measures
    - Inter- and intra-observer variability.
    - Measurement error
3) Describing and presenting data
    - Type of numerical data
    - Tables and graphs
    - Measures of central tendency and dispersion
4) Measures of occurrence of diseases
5) Population and sampling
    - Inference
    - Confidence Intervals
6) Hypothesis testing
7) Overview of study design
8) Causal models and causal inference
9) Measures of exposures effect
    - Relative measures of exposure effect

Absolute measures of exposure effect
Measures of impact

10) Bias and confounding

11) Sample size estimation
12) Introduction to survival analysis
13) Control of confounding
control of confounding in study design
control of confounding at analysis stage
14) Interpretation of epidemiological studies

Textbooks:

- Epidemiology: an introduction by Kenneth J. Rothman.
  Oxford University Press; 2nd edition. June 2012.
  ISBN: 978-0199754557

- Principles of Biostatistics by Marcello Pagano and Kimberlee Gauvreau.
  Cengage Learning, 2nd edition. March 2000.
  ISBN: 9780534229023

- Epidemiology: a very short introduction by Rodolfo Saracci.
  Oxford University Press 2010.
  ISBN: 9780199543335

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MEDICAL PHYSICS

Total Credits: 5
Lectures: 40
Practicals: 10

Scientific Discipline Sector: FIS/07 – MED/36

Teaching Staff:
Course Coordinator: Prof. Michele Arneodo Email: arneodo@to.infn.it
Prof. Monika Grothe Email: grothe@mail.cern.ch

The course covers the basic principles of Physics, with emphasis on subjects useful for understanding biological phenomena and biomedical instrumentation. Problem sessions are foreseen.

Prerequisites

Basic mathematics. Knowledge of calculus is not required.

Textbooks

Main reference: "Essentials of College Physics", by Raymond A. Serway and Chris Vuille, Ed. Brooks/Cole.

In addition:

"Physics" 2nd Edition or "General Physics", by Morton Sternheim and Joseph Kane, Ed. Wiley & Sons

"Fundamentals of Physics Extended", 9th Edition, by David Halliday, Robert Resnick, Jearl Walker , Ed. Wiley & Sons

Course Syllabus

Mathematical review
Cartesian coordinates, functions and their graphical representation. Linear and logarithmic scales. Significant figures. Scientific notation. Vectors and operations with them: sum, difference, scalar and vector product.

Physics quantities and their measurement
Units. Statistical and systematic uncertainties.

Mechanics
Velocity, acceleration. Uniform straight motion. Constant-acceleration motion. Falling objects. Motion in two and three dimensions. Circular motion: angular and tangential velocity, centripetal acceleration; uniform circular motion.

Force, mass, Newton's laws; inertial and non-inertial reference frames. Gravitational forces. Friction.

Work, kinetic and potential energy. Total mechanical energy and its conservation. Conservative forces, dissipative forces. Power. Impulse and linear momentum. Momentum conservation; collisions.

Simple harmonic motion; pendulums and springs. Elastic forces, elastic potential energy. Damped and forced oscillations; resonance.

Torque; couples. Equilibrium of rigid bodies. Levers. Centre of gravity. Stability.

Motion of the centre of mass; Newton's law for particle systems. Motion of rigid bodies: angular speed and acceleration. Moment of inertia. Angular momentum and its conservation.

Elasticity. Stress and strain. Young's modulus; Poisson's modulus; shear modulus; bending. Elastic limit, ultimate strength.

Fluids
Archimedes' principle. Flow rate. Equation of continuity. Conservation of energy and Bernoulli's equation. Viscosity; Hagen-Poiseuille's law; flow resistance; Stokes' law; sedimentation velocity; turbulent flow; Reynolds number.

Ideal gases; equation of state; kinetic theory. Real gases. Vapours and gases. Saturated vapour.

Thermodynamics
The first principle of thermodynamics. Specific heat capacity, heat capacity. Heat capacity of an ideal gas at constant pressure or constant volume. Metabolic rate. Second principle of thermodynamics; reversible and irreversible processes; entropy; thermodynamic cycles, Carnot's cycle, efficiency.

Electricity and Magnetism
Electric charge, Coulomb's law, electric field, electrostatic potential energy, potential; electron volt. Relation between field and potential difference. Electric dipole: field lines and behaviour in an electric field.

Conductors and insulators. Polarisation of a dielectric. Electric capacity; capacitor; effect of a dielectric. Relative dielectric constant. Energy stored in a capacitor. Capacitors in series and parallel.

Electric current. Drift velocity of the charge carriers. Electric resistance; resistivity. Ohm's law. Resistors in series and parallel. Electrical circuits. Power in electrical circuits, Joule's law. Ohmic and non-ohmic conductors; the diode.

Direct and alternating current circuits.

Effects of current through the human body. Grounding.

Magnetic field. Lorentz's force; force on a current-carrying wire. Biot-Savart law. Field generated by a wire, field generated by a circular current loop. Solenoid. Magnetic dipoles; magnetic dipole moment; behaviour of a magnetic dipole in a magnetic field. Ferromagnetic materials, permanent magnets.

Magnetic field flux. Faraday's law. Electric generators, transformers.

Cathode ray tube. Linac, cyclotron, synchrotron.

Periodic waves. Wave velocity; period and wavelength. Longitudinal and transverse waves. Fourier analysis. Electromagnetic waves. Antennas. Quantisation of energy in electromagnetic waves: the photon.

Generation of X rays: bremsstrahlung and characteristic lines.

Sound Waves
Nature of sound. Intensity of sound waves. Intensity level; decibels. Doppler effect. Ultrasounds. Reflection and absorption of ultrasounds. Principles of sonography and Doppler sonography.

Geometrical Optics
Refraction index. Reflection, refraction, Snell's law. Total internal reflection. Lenses. Lensmaker equation; thin-lens formula. Accommodation; near and far points.

Modern Physics, Nuclear Physics
The main concepts of special relativity. The main concepts of quantum mechanics (energy quantisation). Atomic structure; transitions between atomic orbitals.

Structure of the atomic nucleus. Stable and unstable nuclei. Alpha, beta and gamma decays. Activity; law of radioactive decay. The physics principles of PET.

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MEDICAL HUMANITIES

Total Credits: 13
Total Hours: 104
Scientific Discipline Sector: MED/02 – M-FIL/33 – M-FIL/03 – L-LIN/01 – L-LIN/12

Teaching staff

Course Coordinator Prof. Michael John john.michael@unisr.it
Prof. Donatella Lippi
Prof. Giuseppe Pantaleo
Prof. Michele Loi
Prof. William Cooke
Prof. Andrea Moro
Prof. Massimo Reichlin

Aim

The aim of the course is to help students understand that patients are people, and not just a mass of molecules, that not only have an illness, but are also suffering fear and anguish. Doctors must therefore strive to empathize with individuals and not simply distribute medication and drugs to faceless and nameless numbers.

Discussion and active student participation will be paramount to the overall success of the course.

Final evaluation

The students will receive a final mark based upon two **compulsory** end-of-term tests (made up of multiple choice exercises and open questions as defined by each professor at the beginning of the course) and classwork tasks, once again to be defined by each individual professor.

Course objectives

In today's frenetic, high-tech world, where medicine is evidence based and focuses on specialties of all possible kinds, doctors generally have little time to ponder the multifaceted problems of their patients. Indeed, there are innumerable horror stories told by sick people that stem from the uncaring attitudes and the lack of sensitivity shown by many health professionals. Yet medicine should be seen as a caring profession that requires doctors not only to provide valid clinical assistance but, above all, to empathize with patients and their families when they are at their most vulnerable and in need of understanding.

Nowadays, medical school students are encouraged to interact with patients virtually from the beginning of their training and an increasing amount of emphasis is being placed on the teaching of social sciences, ethics and communication skills to help create a new kind of doctor. One way of doing this is by introducing the study of the *Medical Humanities* (literature, music, visual arts, psychology, sociology, philosophy, ethics, history, language, religion etc.) into the medical curriculum. These subjects require imagination, close observation and understanding, which are all fundamental characteristics of a successful and caring doctor.

How otherwise might a 20-year-old medical or nursing student learn about the complexities of the human condition? How would they be able to understand the reactions and feelings of someone with a terminal illness or a crippling disability, let alone a parent who has just lost a child? They certainly will not learn these skills from standard clinical textbooks, where the words fear and anguish do not appear in the index. Yet fear and anguish are at the very center of how a patient faces up to and lives with an illness.

At the end of this course, students will have a greater understanding of:

• *empathy and patient-centered communication*

- *team work and the ability to interact with colleagues and other health professionals*
- *linguistics and use of language*
- *truth-telling and the delivery of bad news*
- *withdrawal of treatment*
- *euthanasia and assisted suicide*
- *treatment of violence and abuse*
- *ethical and legal problems linked to medical errors*
- *ethics committees*
- *conflict of interest and relationship with industries*
- *chronic illness*
- *old age, death and bereavement*
- *cross-cultural conflicts*
- *alternative and complementary health practices*
- *religion and spirituality*
- *ethical problems linked to stem cells, organ donation and transplantation*
- *re-pro ethics and new reproductive technologies*
- *history of medicine and medical education*

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MICHAEL JOHN - Coordinator *(20 hours)*
Email: john.michael@unisr.it
02.2643.3059
Scientific Discipline Sector: L-LIN/12
This is a two-semester course. There will be 10 hours of teaching in semester 1 and 10 hours in semester 2.

General aims and objectives

1. To develop the students' knowledge and understanding of basic doctor-patient-doctor communication skills
2. To focus on the language and communication skills that doctors need to make consultations more effective, focusing on five fundamentals: verbal communication, active listening, voice management, non-verbal communication, cultural awareness
3. DVD viewing to observe a range of doctor-patient encounters, exploring the importance of non-verbal communication.
4. Viewing of the movie *The Doctor* followed by extensive discussion
5. Reading of the novel *The Diving Bell and the Butterfly* followed by extensive discussion
6. An introduction to peer-to-peer communication in the biomedical context: papers, posters, presentations.
7. An examination of the language used in biomedical peer-to-peer communication

Course Schedule:

Semester 1 Doctor-patient communication

Lesson 1 – Introduction: I am not a number
Lesson 2 - The patient and the doctor-god
Lesson 3 - The aims of the consultation Lesson 4 – The Doctor Lesson 5 – The Diving Bell and the Butterfly

Semester 2 Peer-to-peer communication

Lesson 6 - Introduction to peer-to-peer communication
Lesson 7 - Papers

Lesson 8 - Posters
Lesson 9 - Presentations
Lesson 10 – Discussion and conclusions

Compulsory reading:

- The Diving Bell and the Butterfly – ISBN - 1-85702-794-9 Jean-Dominique Bauby
- English for the medical profession (Michael John: Masson 2006 ISBN 8821429105)

Recommended reading:

- Teaching and Learning Communication Skills in Medicine (second edition) - Suzanne Kurtz, Jonathan Silverman, Juliet Draper ISBN 1-85775-658-4

- Skills for Communicating with Patients (second edition) - Silverman, Kurtz, Draper ISBN 1-85775-640-1

- The Doctor's Communication Handbook - Peter Tate ISBN 978-1-84619-392-7

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DONATELLA LIPPI (2 hours) Introduction
DOMIZIA WEBER (14 hours)
E-mail: donatella.lippi@unifi.it; domiziaweber@libero.it
Scientific Discipline Sector: MED/02

This course on Medical Humanities will approach Medical Humanities as a social science and as a cultural tradition.
Attention will be given to the roots of medical knowledge in the ancient Mediterranean cultures, the birth the hospitals in the Middle Ages, the development of anatomy during the Renaissance, the rise of surgery in the Late Modern age and the first steps of nursing.

November 29
Lesson 1:
Part1: History of the History of Medicine: trends, sources, aims (The concept and evolution of Medicine according to Classical Authors; the current situation; Iconodiagnosis, Paleopathology, History of Medicine); 2 hours
Part 2: Mediterranean medicine: heart and brain (Egypt and Greece). The birth of western medical ethics. Hippocrates; 2 hours

December 6
Lesson 2:
Part 1: Italic medicine: *Italic cultures and Rome: Galen and the experimentalism; 2 hours*
Part 2: History of the concept of health-care (The notion of *hospitalitas* and the transformations of hospitals; a virtual trip in Florence); 2 hours

December 13
Lesson 3:
Part1: Anatomy and Renaissance (From Berengario da Carpi to Vesalio, passing through Michelangelo and Tiziano); 2 hours
Part 2: XVI Century: academies and experiments (The Accademia del Cimento and the Experimentalism; new instruments for "new" diseases); 2 hours

December 20
Lesson 4:

Part1: The French revolution and the triumph of surgery (From Ambroise Paré to Jospeh Lister); 2 hours
Part 2: Starting to calculate (I. Semmelweis, P. A. Louis and F. Nightingale- Evidence Based Medicine and Evidence Based Nursing); 2 hours

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GIUSEPPE PANTALEO *(20 hours)*
Email: pantaleo.giuseppe@hsr.it
Scientific Discipline Sector: L-LIN/12

Psychological aspects of social interaction in health-related contexts
Unique individuals or interchangeable group members? *Social identification*, *self-categorization* and the shape of social interaction
The intensity of positive/negative *emotions* and *motivations* in health-related and broader societal contexts

'Intensity' issues in compliance, health, and risky behaviors – the paradoxical role of *deterrents*

Perspective-taking and (mis-)communication: *Self-symbolizing* and the neglect of others' perspectives

'Physical/biological orienting' vs. '*multiple psychological perspectives'*

Consistency needs in doctor-patient communication

Static vs. *dynamic* thinking: Cognitive and motivational factors underlying doctor-patient communication

From "empathic resonance" to "empathic perspective-taking": The evolution of empathy.

"Multiple perspectives" and the complexities of the human condition: fear, anxiety, and anguish as instigators of the *orienting* response

Beyond the Age of Empathy?

Articles and reading materials will be given to the students at the beginning of each lesson

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MICHELE LOI *(10 hours)*
Email: loi.michele@hsr.it
Scientific Discipline Sector: M-FIL/03

Lecture I – *Introduction*, the concepts of health and disability
Readings:

1. Boorse, Christopher. 1975. "On the Distinction Between Disease and Illness." *Philosophy and Public Affairs* 5 (1): 49–68.
2. DeVito, Scott. 2000. "On the Value-Neutrality of the Concepts of Health and Disease: Unto the Breach Again." *Journal of Medicine and Philosophy* 25 (5): 539–567. doi:10.1076/0360-5310(200010)25:5;1-W;FT539.
3. Kahane, Guy, and Julian Savulescu. 2009. "The Welfarist Account of Disability." In *Disability and Disadvantage*, ed. Kimberly Brownlee and Adam Cureton, 14–53. Oxford: Oxford University Press. http://philpapers.org/rec/KAHTWA.
4. Amundson, R. (2005). Disability, ideology, and quality of life: a bias in biomedical ethics. In D. T. Wasserman, R. S. Wachbroit, & J. E. Bickenbach (Eds.), *Quality of Life and*

Human Difference: Genetic Testing, Health Care, and Disability (pp. 101–124). Cambridge, UK: Cambridge University Press.

Lecture II- *Justice*

The relationship between social justice and health care
The social determinants of health
Measurement of health outcomes, quality of life and disability
Readings:

- *The Cambridge textbook of bioethics:* 33. Priority setting
- *Social Determinants of Health:* Cap.1 Introduction (Michael Marmot);
- Sreenivasan, Gopal. 2009. "Justice, Inequality, and Health." In *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta. Spring 2009. http://plato.stanford.edu/archives/spr2009/entries/justice-inequality-health/

Lecture III – *Genetics*

Genetic testing and screening
Gene patenting
Direct to consumer genetic testing

Readings:

- *The Cambridge textbook of bioethics:* 22. Genetic testing and screening
- Matloff E, and Caplan A. 2008. "Direct to confusion: Lessons learned from marketing BRCA testing." *Am. J. Bioethics American Journal of Bioethics* 8 (6): 5–8.
- Gold, E. Richard, and Julia Carbone. 2010. "Myriad Genetics: In the Eye of the Policy Storm." *Genetics in Medicine: Official Journal of the American College of Medical Genetics* 12 (4 Suppl) (April): S39–S70. doi:10.1097/GIM.0b013e3181d72661.
- 23andMe. 2012. "Core Values". [on-line]. © *23andMe, Inc. 2007-2012*. https://www.23andme.com/about/values/
- 23andMe. 2012. "Terms of Service". [on-line]. © *23andMe, Inc. 2007-2012*. https://www.23andme.com/legal/tos/
- AnneW. 2012. "Announcing 23andMe's First Patent". Blog by the scientists, researchers, and writers of 23andMe. *The Spittoon*. http://spittoon.23andme.com/news/announcing-23andmes-first-patent/#comment-84888.

Lecture IV – Prenatal selection and enhancement of normal traits

Prenatal testing and newborn screening
Pre-implantation genetic diagnosis
Human enhancement
Readings:

- *The Cambridge textbook of bioethics:* 15. Pre-natal testing and newborn screening
- Schwarz, Alan. 2012. "Seeking Academic Edge, Teenagers Abuse Stimulants." *The New York Times*, June 9, sec. Education. http://www.nytimes.com/2012/06/10/education/seeking-academic-edge-teenagers-abuse-stimulants.html.
- Greely, Henry, Barbara Sahakian, John Harris, Ronald C. Kessler, Michael Gazzaniga, Philip Campbell, and Martha J. Farah. 2008. "Towards Responsible Use of Cognitive-enhancing Drugs by the Healthy." *Nature* 456 (7223): 702–705. doi:10.1038/456702a.
- Brock, Dan W. "Genetic Engineering". In in R.G. Frey, C.H. Wellman (eds.), A Companion to Applied Ethics, cit., pp. 356-368.

Lecture V – Research ethics and *Bioethics in the global context*

Research ethics
Clinical trials
Clinical trials in third world countries

Readings:
- *The Cambridge textbook of bioethics*. 25. Research Ethics
- *CTB*. 27. Clinical trials;
- *CTB*. 43. Global health ethics and cross-cultural considerations in bioethics

Books cited:
Singer, Peter A., e Adrian M. Viens. *The Cambridge textbook of bioethics*. Cambridge University Press, 2008
Marmot, Michael G. 2011. *Social Determinants of Health*. Oxford: Oxford University Press.

Useful Websites:
http://www.thehastingscenter.org/BioethicsForum/
http://blog.bioethics.net/
http://www.practicalethics.ox.ac.uk/
http://blog.practicalethics.ox.ac.uk/
http://ns.memberclicks.net/
http://moraliaontheweb.com

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WILLIAM COOKE *(20 hours)*
Email: William@maptraining.it
Scientific Discipline Sector: L-LIN/12

Can the pen be mightier than the scalpel?	
1	Why, How and What Doctors Write
2	Deductive Communication, from Roman Oratory to Quentin Tarantino
3	Mindset: (i) Writing is Writing, (ii) No Place for Narcissism, (iii) Content Expertise is not Enough
4	The Science of Science Writing: Five Golden Rules for Reader-Friendly prose
5	Clarity in the expression of Who (subject/actor) does What (verb/action). Practice and Peer Review

Materials consist in a pdf file + "The Science of Science Writing",
Gopen and Swan, American Scientist, Volume 78, 1990, a copy of which will be made available on intranet.

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ANDREA MORO *(10 hours)*
Email: andrea.moro@iusspavia.it
Scientific Discipline Sector: L-LIN/01

On the biological foundations of language: the linguistics perspective
1 &2. A short history of linguistics
3.The XX century: language(s), machines and children
4.The architecture of human language
5.Recursion or the specific differences with respect to other animals' codes
6.Grammar like a crystal: the universals of language (syntax)
7.Grammar like a crystal: the universal of language (semantics)
8.The brain and the mystery of impossible languages
9.Does the structure of the world influence the structure of language (and viceversa)?

10.Language, genetics and evolution

Coursebooks:

- The Generative Enterprise Rivisited, [selected parts]
  Noam Chomsky (2004)

- The Boundaries of Babel
  Andrea Moro (2010, paperback edition) [chapter 1 and 2]

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REICHLIN MASSIMO *(10 hours)*
Email: reichlin.massimo@unisr.it
Scientific Discipline Sector: M-FIL/03

This course will deal with some of the main issues in a very important area of bioethics, *i.e.* end-of-life ethics. The problems that will be discussed include: a) those relative to the treatment of patients in a persistent vegetative state, also referring to the issue of advance directives for treatment; b) those relative to the definition of death and the present debate on the limits of the whole brain criterion, also with reference to the practice of organ transplantation. Lessons will start from the discussion of the suggested literature, and there will be much room for discussing the different approaches.

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CHEMISTRY AND BIOCHEMISTRY

Total Credits: 12
Lectures: 96
Practicals: 96 (divided in groups)
Scientific Discipline Sector: BIO/13- BIO/10

Course Coordinator: Prof. Massimo Degano
Email: degano.massimo@hsr.it
40 hours

Collaborators:
Prof. Mauro Freccero
Email: mauro.freccero@unipv.it
40 hours

Prof. Angelo Corti
Email: corti.angelo@hsr.it
16 hours

Tutorials: 96 hours to be divided in groups/tutors
Dr. Barbara Corsi - Dr. Claudia Minici - Dr. Francesca Giannese -

Type of subject: Traditional medical discipline
Field: General discipline for the preparation of a doctor: Structure, function and metabolism of molecules of medical interest.

Course objectives:
The Chemistry and Basic Biochemistry course is one of fundamental importance, in which students are presented with the notions of the chemical and biochemical mechanisms necessary to understand the regulation of biological processes of the cell and of the organism.
This course covers classical molecular and cellular biochemistry, cellular physiology, and molecular genetics. Metabolic interrelationships as they occur in the individual will be stressed and related to disturbances in disease states.
The knowledge and understandings provided by the course constitute the foundations for the following semesters both for the molecular analysis of physiological processes and those of pathogenetic mechanisms in disease. The specific field of Chemistry and Basic Biochemistry will focus on the principles of general and organic chemistry with a description of the fundamental chemical reactions for the understanding of biological processes, the structure and function of organic molecules that constitute the building blocks of living matter, and the analysis and structure and function of principle biological polymers, with particular emphasis on the processes of catalytic enzymes.

At the end of this course, students should be able to:
- Solve problems in diagnosis and treatment of human disease by application of biochemical principles.
- Use primary medical and scientific literature as a resource for learning and problem-solving.
- Define, describe and contrast functions of genes and macromolecules in normal and pathologic contexts.
- Define and describe systemic metabolic biochemistry in terms of genes and molecules.
- Deduce therapeutic mechanisms from established molecular mechanisms.
- Interpret new medical discoveries in terms of fundamental principles of biochemistry

- Explain the molecular basis of diseases that affect cellular function or development.

The course is a prerequisite for:
Foundation for "Cellular and Molecular Biology" and "Genetics and developmental Biology".

No.Theme

1 Introduction to the course. Chemistry and biochemistry in human physiology
2 Atomic Structure. Electron Configuration and the Aufbau Principle. Atomic and Molecular Orbitals. Chemical Bonding - Covalent, Ionic and Metallic Bonds.
3 Intermolecular Forces - Dipole-Dipole Forces, Hydrogen Bond, London Forces. Periodic System of Elements. Trends in the Periodic Table. Nomenclature of Inorganic Compounds. Characterization of sp-, d- and f-Elements and their Compounds.
4 Classification of Chemical Reactions. Chemical Thermodynamics -the Laws of Thermodynamics, Enthalpy, Entropy, Free Energy. Spontaneity of Chemical Change. Chemical Equilibrium. Equilibrium Constant. Le Chatelier´s Principle.
5 Chemical Kinetics. Reaction Rates and Factors that Influence them. Activation Energy and the Activated Complex. Catalysts and Mechanism of their Effect.
6 Solutions and their Properties. Solubility, Concentration of Solutions. Solutions of Electrolytes, Ionization Constant. Activity (effective concentration). Acids and Bases. The Dissociation of Water. The pH Scale. Salts, Hydrolysis of Salts, Solubility Product. Buffers, Characterization, pH, Capacity. Buffers of the Blood.
7 Oxidation-Reduction Processes. Hydrogen and Oxygen in these Processes. Standard Reduction Potentials. Osmosis. Osmotic Pressure. Colligative properties. Importance in Medicine.
8 Scope of Organic Chemistry. Formulas, Naming and Classification of Organic Compounds. Resonance, delocalization, conjugation, and aromaticity
9 Hydrocarbons and their Derivatives. Alkanes, Alkenes, Alkynes, Cycloalkanes.
10 Alcohols
11 Ethers, epoxides, and sulfides
12 Amines
13 Ketones and aldehydes
14 Carboxylic acids, esters, amides
15 Amino Acids and their Properties. Important Peptides.
16 Lactones, lactames and antibiotics
17 Phosphoric acids, inorganic and organic phosphates
18 Aromatic compounds
19 Alpha substitution and condensation of enols and enolate ions
20 Synthetic reactions in bioorganic chemistry
21 Proteins - Amino Acid Composition, Conformation of Proteins -
22 Monosaccharides - Classification, Configuration, Optical Activity, Anomers, Epimers. The Haworth Formulas. Reactions of Monosaccharides. Glycosidic Linkage, Reducing and non-Reducing Disaccharides. Polysaccharides and Glycosaminoglycans, Composition, Properties.
23 Types of Bonds and Interactions. Physical and Chemical Properties. Classification of Proteins.
24 Carbohydrates.
25 Myoglobin and Hemoglobin
26 Lipids and Steroids. Classification, Structure, Properties, Chemical Reactions.
27 Enzymatic catalysis
28 Introduction to the cell, compartments and cellular biochemistry.
29 Cell membranes. Introduction to metabolism.
30 Enzyme regulation
31 Overview of Intermediary Metabolism. Biological Oxidation and Bioenergetics. The Respiratory Chain and its Components. The Mechanism of Oxidative Phosphorylation. Oxygenases and Hydroperoxidases. Free Radicals.
32 The Citric Acid Cycle and its Regulation. The Pyruvate Dehydrogenase Complex.

33 Protein folding
34 Metabolism of Carbohydrates - Metabolism of Glucose and its Regulation. The Pentose Phosphate Pathway. Other Pathways of Hexose Metabolism. Gluconeogenesis. Metabolism of Glycogen and its Regulation. Metabolism of Glycosaminoglycans.
35 Protein purification and characterization
36 Antibodies
37 Metabolism of Lipids and Steroids - Digestion, Resorption and Transport. Lipoproteins and their Metabolism. Biosynthesis and Degradation of Saturated and Unsaturated Fatty Acids. Ketogenesis. Eicosanoids. Metabolism of Acylglycerols and Sphingolipids. Metabolism of Cholesterol. Biosynthesis of Bile Acids and Steroid Hormones.
38 Metabolism of Proteins and Amino Acids -Digestion, Resorption and Transport. Transamination, Oxidative Deamination and Decarboxylation of Amino Acids. Catabolism of the Carbon Skeleton of Amino Acids. Ammonia Formation and its Removal. Biogenic Amines.
39 Nucleosides, Nucleotides and Nucleic Acids. DNA and RNA structure and properties. DNA sequencing.
40 Metabolism of Pyrimidine and Purine Nucleotides.
41 Protein Synthesis.
42 Metabolism of Porphyrins and Bile Pigments. Biosynthesis of Heme and Hemoglobin and their Catabolism. Jaundice.
43 Components of the Blood. Water and Ions Metabolism. Acid-Base Balance. The Lungs and the Kidney in Acid-Base Balance. Disorders of Acid-Base Balance.
44 Metabolism of Erythrocytes. Haemostasis and Blood Clotting.
45 Contractile and Structural Proteins. Mechanism of Muscle Contraction and its Energy Supply.
46 Metabolism of Connective Tissue. Connective Tissue Proteins, Proteoglycans. Process of Mineralization.
47 Metabolism of Adipose Tissue.
48 Metabolism of Liver.
49 Receptors. Hormones.
50 Extracellular and Intracellular Communication. Second Messengers, Protein Kinases.

Suggested textbooks

- Timberlake – General, Organic, & Biological Chemistry. Pearson ed.,
- Voet & Voet – Biochemistry. Wiley eds.

- Voet & Voet – Biochemistry. Wiley eds.

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CELL AND MOLECULAR BIOLOGY

Total Credits: 11
Total Hours: 88
Scientific Discipline Sector: BIO/11 – BIO/12 – INF/01

Course Coordinator: Prof. Roberto Sitia
Email: sitia.roberto@hsr.it
18 hours

Collaborators:
Prof. Marco Bianchi
Email: bianchi.marco@hsr.it
10 hours
Prof. Anna Rubartelli
Email: *annarubartelli@istge.it*
10 hours
Prof. Eelco Van Anken
Email: vananken.eelco@hsr.it
30 hours
Prof. Simone Cenci
Email: cenci.simone@hsr.it
10 hours

Tutorials: 5 groups for 15 hrs tutorials each.
Tutors: Drs. Orsi Andrea, Celine Schaeffer, Jose Garcia Manteiga, Edgar Yoboue, Iria Medrano Fernandez.

Students will be divided into 4 groups for about 15 hours of tutorials, including the 2 hours of presentation to the class.
Each group will be given a scientific paper to read, understand, put in context, summarize and present to the whole class.
The four interactive lectures are part of the programme. Student will be asked about their content and significance in the final exam.
This part of the programme is meant to show how scientific knowledge is created and disseminated, and to stimulate a critical attitude in our students.

Attending lectures

We *encourage students to attend to all lectures*, as teachers will cover aspects that are absent or hard to find in textbooks. However, attending a lecture means much more than the mere physical presence in the class.
Students are encouraged to read the topics that will be covered in class *before* attending lectures, so that they can raise questions and focus onto the most relevant or controversial issues. Topics are often tackled in a transversal, multidisciplinary manner.
Unfair behaviour will not be tolerated, such as clocking for others. Those found to do so will not be admitted to the exam.
Attending tutorials is mandatory. For those failing to do so, the maximal final grade will be 20/30.

Introduction to the Course of Molecular and Cell Biology

Structure of the Course, a voyage between Systematic teaching and Problem Based Learning
what are genes and how they work
genetic and epigenetic mechanisms
what are cells
how cells divide
how cells die
how cells know where they are and where to go
how they interact with the environment
how cells differentiate molecular bases of disease
What is life?
Where do we come from?
Introduction to our cells
Membranes, cytoskeleton, organelles.

Cytoskeleton and adhesion molecules
Adhesion molecules
Integrins
Tissue organization

Intracellular transport and cell movements
Microtubules, microfilaments, molecular motors
Polarity
Axonal transport
Cytoskeleton
Muscular contraction
Cilia and flagella
Microvilli

Evolution, Darwin and the adaptable cell structure
Prokaryotes, eukaryotes, multicellular organisms.
The evolution of specialized tissues.
Homeostasis.

Intracellular transport
Three main mechanisms of macromolecular transport:
To and from the nucleus
Membrane translocation
Vesicular transport
Exo, endo, pino, phagocytosis
Transcytosis
Mechanisms of cell polarity

Cell compartmentalization
Specific signals target macromolecules to different organelles.

Protein folding, the second genetic code
Anfinsen's demonstration of the central dogma
Chaperones and protein evolution

Protein degradation
Proteasomes, lysosomes and autophagy

Protein quality control and homeostasis
Stress responses in development and disease

Proteostasis as a signal and pathogenetic mechanism.
Mechanisms of proteotoxicity.
Molecular and cellular aging

Conformational diseases
Prions, Amyloidoses, Alzheimer & Parkinson.

Nuclear structure
Nuclear "organelles". Chromosome territories. Nuclear membrane and lamins. Nuclear pores and transport

Chromatin
Nucleosomes. Histones and histone variants. Histone post-translational modifications, and enzymes that effect them.

Transcription in eukaryotes
RNA polymerases. Promoters & enhancers. General transcription factors. Specific transcription factors. Coactivators and corepressors. How nucleosome position and histone modifications affect gene expression

Gene expression decisions:
Examples of transcriptional regulation and signal transduction
The NF-kB system
Liver specification

Retroviruses, the genome and RNAi
Retroviruses
miRNA, siRNA, heterocromatin and centromeres

Membrane Structure
Architecture, composition, membrane proteins .

Energy conversion I
Mitochondria

Energy conversion II
Chloroplasts, genetics of mitochondria & plastids, evolution of electron transport chains.

Cell signaling I
Principles of cell communication

Cell signaling II
G protein coupled cell surface receptors.

Cell signaling III
Enzyme coupled cell surface receptors.

Cell signaling IV
Unfolded Protein Response, determining cell shape.

Manipulating proteins & DNA I
Cloning, cDNA libraries, tagging, PCR.

Studying gene function & expression I
Function prediction, genetic screens, tagged libraries, reporter genes.

Studying gene function & expression II
Reverse genetics, knock-out libraries, RNAi, complementation, epistasis & EMAP, microarray.

Cell cycle 1
Phases and logics of the cell cycle. Experimental approaches. The Cell Cycle Control System. Engineering checkpoints. Significance of G phases. Molecular players: cyclins, cyclin-dependent kinases, Cdk inhibitors.

Visualizing cells I
Standard microscopy techniques.

Cell cycle 2
Regulatory strategies: cyclic degradation, post-translational modofocations, de novo synthesis. Checkpoints in G1 and G2. Preventing DNA re-replication. Cdc25 and regulation of M-Cdk activity. Rb and E2F: the restriction point and the Skp2 autoinduction loop. The DNA damage checkpoints. p53 and p14/19ARF. Cancer as a cell cycle disease.

Mitosis
Phases and mechanics. Cohesins and condensins. Centrosome, microtubules and the mitotic spindle. Role of motor proteins. Mechanisms of high-fidelity segregation: centromere and kinetochore. Mechanics of anaphase. Functions of chromokinesins. Cytokinesis. Drugs targeting mitosis and their clinical relevance.

Intercellular communication

Cytokines

Unconventional secretion

Inflammation

Inflammation

Visualizing cells II
Advanced microscopy techniques
A historical perspective
The Luria-Delbruck experiment .

Apoptosis - I
Functional significance: apoptosis vs. necrosis. Methods to study and monitor apoptosis. Functions in physiology and disease. Mechanisms: extrinsic vs. intrinsic apoptosis. Caspases: redundancy, efficiency, velocity. Death receptors and the Death-Inducing Signaling Complex (DISC). Mitochondria as signal integrators and death executors. The Apoptosome. Mitochondrial Outer Membrane Permeabilization (MOMP). The Bcl2 family: sensors/transducers, brakes, and effectors. Inhibitors of Apoptosis (IAPs).

Apoptosis - II
Apoptosis and the **i**ntegrated stress response. Stress specificity of BH3-onlies. The other functions of Bcl2 proteins: daily jobs of night killers. Mitochondria and ER cross-talk. ER calcium homeostasis and apoptosis. Regulation by the unfolded protein response and heat shock proteins. Proteotoxic apoptosis.

Apoptosis- III
Integrating Cell Cycle, Apoptosis, and Cancer. Apoptotic escapes from the cell cycle. Apoptosis from cytotoxic vs. genotoxic stress. Maladaptive thresholds: implications for cancer pathogenesis and therapy. Alternative forms of eukaryotic cell death: autophagy, paraptosis, pyroptosis. Autophagy in physiology and disease.

A DNA driven world

COURSEBOOKS:
Textbooks
Alberts, Bray, et al. *Molecular biology of the cell*
Alberts, Bray, et al. *Essential cell biology* www.garlandscience.com/text**books**/081533480X.asp
Lewin, Cassimeris et al. *Cells*
Lodish et al. *Molecular cell biology* www.whfreeman.com/**lodish**4
Pollard & Earnshaw *Cell Biology* www.us.elsevierhealth.com/.../**book**/.../Cell-Biology/ -
The above books contain all the essential notions, differing primarily in the style of presentation.

Suggested readings
We encourage our students to read on science, medicine and society. Below are a few tips.
M. Perutz. *Is science necessary?* and/or *I wish I made you angry before.*
Two lovely series of essays on science and scientists.
J. Diamond. *Germs, guns and steel.*
A brief summary of the last 13000 years of humans… Why did some civilisations prevail?
J. Monod *Chance and necessity.*
A Nobel Prize winner in Medicine tackles fundamental philosophical issues
J.D. Watson. *The double helix.*
Watson tells the story of how the structure of DNA was solved, with the pace of a crime fiction novel.
P. Medawar. *Advice to a young scientist.*
A few useful tips, should you decide to become a physician scientist. A thoroughly enjoyable

USMLE REQUIREMENTS
Biology of cells
• adaptive cell responses and cellular homeostasis
• intracellular accumulations
• mechanisms of injury and necrosis
• apoptosis
• mechanisms of dysregulation
- cell biology of cancer, including genetics of cancer
- general principles of invasion and metastasis, including cancer staging
• cell/tissue structure, regulation, and function, including cytoskeleton, organelles, glycolipids, channels, gap junctions, extracellular matrix, and receptors
Molecular biology
• gene expression: DNA structure, replication, exchange, and epigenetics
• gene expression: transcription
• gene expression: translation, post-translational processing, modifications, and disposition of proteins (degradation), including protein/glycoprotein synthesis, intra/extracellular sorting, and processes/functions related to Golgi complex and rough endoplasmic reticulum
• structure and function of proteins and enzymes
• energy metabolis

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GENETICS AND DEVELOPMENTAL BIOLOGY

Total Credits: 12
Total Hours: 96
Scientific Discipline Sector: BIO/13 – MED/03

Course Coordinator: Prof. Giorgio Casari
Email: casari.giorgio@hsr.it
32 hours

Collaborators:
Prof. Giangiacomo Consalez
Email: consalez.giangiacomo@hsr.it
32 hours

Prof. Luca Rampoldi
Email: rampoldi.luca@hsr.it
32 hours

Tutorials: 5 groups for 15 hrs tutorials each.
Tutors: Drs. Maltecca Francesca, Vago Riccardo, Croci Laura, Cassina Laura.

Topics covered by the course

Mendelian and non-Mendelian genetics
Course introduction_ The Human Genome Project.
Mendelian Inheritance (I)_Definition of gene, locus, allele. The first Mendel's law.
Mendelian Inheritance (II)_The second and third Mendel's laws. Segregation and independent assortment.
Exceptions to Mendelian inheritance_Incomplete dominance, co-dominance. Penetrance and expressivity.
Exceptions to Mendelian inheritance_Sex-related effects. Pleiotropy. Pedigree design_2
Chromosomes/mitosis/meiosis_Chromosome structure (telomeres, centromere) and segregation during mitosis and meiosis. Crossing-over.
Chromosome structure. Chromatin structure and function. Histones and nucleosomes. Chromatin remodelling.
Recombination/mapping (I)_Molecular basis of recombination.
Recombination/mapping (II)_Recombination as a measure of genetic linkage. Mapping in bacteria and Drosophila.
Non-Mendelian inheritance (I)_Gene conversion.De-novo mutations.Mosaicism (X-inactivation).
Non-Mendelian inheritance (II)_Epigenetic control of gene expression. Imprinting.
Dynamic mutations (I)
Dynamic mutations (II)
Mitochondrial Inheritance
Chromosome mutations
Cytogenetics
CGH
DNA/RNA structure
Transcription/translation_Gene structure and transcription. The genetic code, structure of tRNA and ribosome.
Translation. Mechanisms of splicing
RNA interference_miRNA, siRNA, shRNA. Discovery and applications.
Point mutations and repair_Spontaneus and induced mutations. Repair of mutations and recombination.

Nonsense mediated decay
Complex mutations/polymorphisms/CNVs
Mutation detection techniques
Deep sequencing
Effect of mutations (gain/loss-of-function)_Gain-of-function and loss-of-function effect of mutations. Negative dominance.
Effect of mutations (ESE)
Genetic markers_DNA markers (microsatellites, SNPs). Genetic maps. Haplotype maps (the HaploMap project).
Genetic Mapping (I)_Linkage analysis in human pedigrees. LOD score calculation.
Genetic Mapping (II)_Linkage analysis in human pedigrees. Haplotype analysis.
Probability_Bayes' theorem, application for risk calculation in human pedigrees.
Examples of linkage/positional cloning
Examples of functional cloning
Quantitative Trait Loci
Population genetics_1
Population genetics_2
Molecular Evolution (I)
Non-parametric linkage analysis/association studies
Jolly

Embryology and developmental biology
This part of the course will cover the essentials of normal human development and of its main aberrations, providing information on some recognizable patterns of human malformation.

General Embryology
Gametogenesis: Conversion of Germ Cells into Male and female gametes
First Week of Development: ovulation to implantation
Second Week of Development: Bilaminar Germ Disc
Third Week of Development: Trilaminar, Germ Disc
Third to Eighth weeks: The Embryonic Period
Third Month to Birth: The Fetus and Placenta

Systems-based Embryology
Skeletal System
Muscular System
Body Cavities
Digestive System
Cardiovascular System
Respiratory System
Urogenital System
Head and Neck
Central Nervous System
Ear and eye development
Tegumentary System

COURSEBOOKS:

Langman's Medical Embryology / Edition11,
Thomas W.Sadler, ED. Lippincott Williams & Wilkins ISBN: -13: 9780781790697

Human Molecular Genetics 3rd Edition,
Tom Strachan, Andrew Read **-** ED: Garland Science - ISBN:0-8153-4184-9

USMLE REQUIREMENTS

Human development and genetics

• principles of pedigree analysis
- inheritance patterns
- occurrence and recurrence risk determination
• population genetics: Hardy-Weinberg law, founder effects, mutation-selection equilibrium
• principles of gene therapy
• genetic testing and counselling
• genetic mechanisms

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SAN RAFFAELE INTERNATIONAL MD PROGRAM

YEAR 2
Academic Year 2012/2013

- Human Morphology
- Physiology
- Principles of Pharmacology
- Introduction to Surgery

HUMAN MORPHOLOGY

Total Credits: 30
Lessons: 240 h
Practicals:44 h

SSD BIO/16, BIO/17, MED/36, MED/37, MED/33

Course Coordinator: Ottavio Cremona
Email: ottavio.cremona@unisr.it

Professors Teaching:

Stefano Cappa	Email: cappa.stefano@hsr.it
Giuliano Cerulli	Email: g_cerulli@tin.it
Giangiacomo Consalez	Email: consalez.giangiacomo@hsr.it
Michele De Palma	Email: michele.depalma@epfl.ch
Andrea Falini Email:	Email: falini.andrea@hsr.it
Piercarlo Marchisio	Email: marchisio.piercarlo@hsr.it
Luigi Naldini	Email: naldini.luigi@hsr.it
Giuseppe Peretti	Email: giuseppe.peretti@hsr.it
Mario Rende	Email: rende@unipg.it
Marco Vitale	Email: marco.vitale@unipr.it

Tutors:

Di Giacomo Giuseppina	Email: digiacomo.giuseppina@hsr.it
Cantore Alessio	Email: cantore.alessio@hsr.it

Goals

Aim of the course is to provide the morphological foundations of the various functions and pathologies affecting our organism. Approaches to morphological education include the acquisition of foundational knowledge in microscopic observation and in dissection with the aim of correlating structure with function and clinical relevance. The human morphology course of the "San Raffaele MD Program" puts a wide emphasis on clinical applications by means of integration of imaging techniques and interpretation, effective peer teaching and the use of electronic resources to facilitate the understanding and memorization of morphological data. The study of tissue and organ architecture by different microscopic techniques is organized to provide the structural basis for tissue and organ function; principles of tissue development and homeostasis, cellular turnover, isolation and properties of stem cells will be given as a priming for tissue pathology.

Pre-Requisites

Although there are no formal restrictions to the access to the final exam, we strongly advise students to have solid foundations in:

- Cell Biology and Cytology
- Developmental Biology

Knowledge of these disciplines was acquired during the 2nd semester of the past academic year.

Evaluation

The final score will be calculated as a results of a number of in-course and end-of-course exams, including:

- An oral histology exam including an observation test at the microscope
- A multiple-choice exam on "Dynamics of Movement"
- A final written exam covering the remaining part of the program

Program
1st semester:

INTRODUCTORY MORPHOLOGY

1. Introduction to Tissues
2. Epithelial Tissue .
3. Connective Tissues
4. Adhesion & Matrix
5. Cell Migration
6. Anatomical Position & Terminology

MORPHOLOGY OF ORGAN SYSTEMS

- *Support and Movement*
  - *i. Skin*
  - *ii. Skeletal Tissues*

1. Histology of the skeletal muscle
2. Histology of Muscle, Bone & Cartilage
3. Bone remodeling
4. Dynamics of Movement

Upper limb
Lower limb
Thorax
Rachis

- *Transportation & Defense*
  - *i. Blood*

1. Blood.
2. Hematopoiesis

ii. Cardiovascular system

3. Heart.
4. Structure of Vessels
5. Major Vessels. General Organization.
6. Major Vessels.

Head and neck.
Thorax.
Abdomen.

iii. Lymphatic system

7. Overview and structure of the system
8. Major lymphatic vessels

iv. Immune system

9. General overview of the Immune system
10. Immune organs (MV)

- *Respiratory System*

1. Nasal Cavity & pharynx
2. Larynx, trachea & bronchi
3. Lung & Pleura

- *Digestive System*

1. Oral Cavity.
2. Teeth

3. Esophagus & topography of the mediastinus
4. Peritoneum
5. Stomach
6. Small Intestine
7. Large intestine & rectum
8. Gut stem cells
9. Liver
10. Gallbladder & Pancreas

- *Urinary System*

1. Kidney
2. Urinary tract
3. Topography of the abdomen.
4. Topography of the pelvis
5. Perineum

- *Endocrine System*

1. Pituitary gland
2. Thyroid & Parathyroid glands
3. Adrenal glands
4. Topography of head and neck

- *Reproductive Systems*

i. Male reproductive system

1. Testis
2. Reproductive tract
3. Accessory reproductive glands & Supporting structures

ii. Female reproductive system

4. Ovaries & Uterine tubes (OC)
5. Uterus & placenta (OC)
6. Vagina, Vulva & Breast (OC)

Human Morphology book list

One between:
Gray's Anatomy for Students by Richard L. Drake, A. Wayne Vogl and Adam W. M. MitchellISBN: **978-0443069529**
Atlas of Human Anatomy by Frank H. Netter ISBN: **978-1416059516**
Neuroanatomy: An Atlas of Structures, Sections, and Systems by D.H. Haines. **ISBN**: 978-0781763288
Clinical Neuroanatomy and Neuroscience: M. J. T. FitzGerald, Gregory Gruener and Estomih Mtui. 978-0702037382

Gray's Anatomy: The Anatomical Basis of Clinical Practice by Susan Standring. ISBN: 978-0443066849
Clinically Oriented Anatomy by Keith L. Moore ISBN-13: 978-0781775250
Neuroanatomy through Clinical Cases by Hal Blumenfeld **ISBN:** 978-0878930586
Atlas of Anatomy (Thieme Anatomy) by Anne Gilroy, Brian MacPherson, Lawrence Ross and Michael Schuenke **ISBN:** 978-1604060621
Histology: A Text and Atlas by Michael H. Ross and Wojciech Pawlina **ISBN**: 978-0781772006

Junqueira's Basic Histology: Text & Atlas by A. Mescher ISBN: 978-0071630207
Neuroanatomy: Text and Atlas by John Martin **ISBN:** 978-0071381833

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PHYSIOLOGY

Total Credits: 17
Lessons: 136 hrs
Practicals: 130 hrs
SSD: BIO/09

Course Coordinator: Antonio Malgaroli

Professors Teaching:

Fausto Baldissera	Email: fausto.baldissera@unimi.it
Carley Benton	Email: benton.carley@hsr.it
Jacopo Lamanna	Email: lamanna.jacopo@hsr.it
Antonio Malgaroli	Email: malgaroli.antonio@hsr.it
Maddalena Ripamonti	Email: ripamonti.maddalena@hsr.it
Eugenio Rapisarda	Email: rapisarda.eugenio@hsr.it
Vincenzo Zimarino	Email: zimarino.vincenzo@hsr.it

Tutors

Alessandro Arena	Email: arena.alessandro@hsr.it
Sara Spadini	Email: spadini.laura@hsr.it
Gabriella Racchetti	Email: racchetti.gabriella@hsr.it

COURSE INTRODUCTION

The purpose of this course is to provide a complete training in biophysics and human physiology. This course is designed to promote learning by practice, with a particular emphasis on stimulating student experimental creativity and interdisciplinary approaches. We all know that *Physiology* is the investigation of cell and body functions, hence the major goal is to understand and be able to predict the acute and adaptive responses of the body to external stimuli but also to understand how the body can maintain a stable set of internal conditions while the external environment is constantly changing. Physiology can be studied at many different levels including biophysics, cell physiology, organ physiology and systems physiology. In this course you will be exposed to all of these levels, initially to the biophysical and cellular physiology level, then quickly moving up to the organ and system levels. In the mainframe of this M.D. program, clearly Physiology and Anatomy must be closely related subjects. To fully appreciate the physiology of a given system it is necessary to first know its anatomy, therefore much coordination work has gone into ensuring that each topic will be presented sequentially, first in the Anatomy and then in the Physiology Course. Indeed, in most cases true understanding of physiology can only take place if structure and function are concurrently learned. A complete and in depth understanding of physiology would be essential to appreciate in subsequent courses how the human body might be functionally altered by diseases (pathophysiology) and also to predict the response of the body to pharmacological therapies or drugs.

SPECIFIC GOALS AND OBJECTIVES

The goals of this M.D. Course in Physiology are to train students to:

1. be able to demonstrate comprehensive understanding of biophysics and physiology as well as the integration of these with basic and applied disciplines;

2. understand the molecular and cellular mechanisms of physiological processes, in order to provide a foundation for understanding pathophysiology and therapeutics in subsequent courses;
3. integrate knowledge and concepts from cellular physiology and organ physiology to understand the integrative body functions, e.g., maintenance of blood gas levels; responses to stresses; regulation of fluid volumes and compositions; digestion; reproduction, etc.;
4. use and develop adequate knowledge of the most current developments in basic and medical sciences as related to biophysics and physiology;
5. acquire skills in research methodologies used in biophysics and physiology to be able to understand experimental research more effectively;
6. plan and run simple biophysics and physiology experiments utilizing standard equipments, including the evaluation and interpretation of experimental results; demonstrate competence in basic concepts of research methodology; effectively use the statistical methods for data analysis;
7. develop communication skills by frequent in-class discussions;
8. understand scientific papers dealing with physiological results;
9. function as a productive member of a student team engaged in learning and designing experimental strategies to understand structure-function problems;

DETAILED PROGRAM

Biophysics and Cell Physiology

1. Historical grounds of physiology; Units and Scales in physiology; The concept of homeostasis
2. Cellular Membranes and Transmembrane Transport of Solutes and Water
3. Thermodynamics of membrane transport
4. Mechanisms of carrier-mediated transport: facilitated diffusion, cotransport, and countertransport. Sodium pump function, Na+ - Ca2+ exchange currents
5. Diffusion and permeability
6. Osmosis and regulation of cell volume
7. Intracellular pH Regulation
8. Ionic Equilibria and the concept of equilibrium potential.
9. Origin of resting membrane potentials. The driving force for ionic-fluxes.
10. Gibbs-Donnan equilibrium potentials. Intracellular chloride regulation
11. Patch-clamp techniques and analysis of cell currents and ion channels
12. Ion channel families
13. Structure-function of voltage-gated ion channels
14. Electrogenesis of membrane excitability
15. Generation and conduction of action potentials
16. Cable properties and propagation of action potentials
17. Derivation of the Cable Equation and the AC length constant
18. Effects of toxins, drugs, genetic diseases of ion channels and variation in extracellular ions concentration on resting membrane potential and membrane excitability

Muscle Physiology

19. Introduction to Skeletal muscle physiology

20. Membrane excitability of skeletal muscle cells
21. Excitation-contraction coupling in skeletal muscle; regulation of Ca2+ release from sarcoplasmic reticulum
22. Muscle metabolism and energetics
23. Role of muscle mitochondria and regulation of ATP production
24. Response to exercise and muscle fatigue
25. Smooth Muscle Physiology
26. Smooth muscle metabolism and signalling
27. Introduction to Cardiac Muscle Physiology

Renal Physiology

28. Elements of Renal Function
29. The Nephron; The ultrafiltration process
30. Solute and Water Transport Along the Nephron. Tubular Function
31. Feedback mechanisms and autoregulation of the kidney function
32. Control of Body Fluid Osmolality and Extracellular Fluid Volume
33. Potassium, Calcium, and Phosphate Homeostasis
34. Intracellular pH Regulation and role of the Kidneys in Acid-Base Balance

Physiology of the Respiratory System

35. Overview of the Respiratory System
36. Mechanical Properties of the Lung and Chest Wall
37. Ventilation, Perfusion, and Their Relationship
38. Oxygen and Carbon Dioxide Transport
39. Control of Respiration
40. Nonrespiratory Functions of the Lung

Physiology of the Cardiovascular System

41. Overview of the Circulation, Blood, and Hemostasis
42. Electrical Activity of the Heart
43. Natural Excitation of the Heart and the pacemaker ion channels
44. Cardiac Pump
45. Regulation of the Heartbeat
46. Hemodynamics
47. Arterial System
48. Microcirculation and Lymphatics
49. Peripheral Circulation and Its Control
50. Control of Cardiac Output. Coupling of the Heart and Blood Vessels
51. Special Circulations
52. Interplay of Central and Peripheral Factors in Control of the Circulation

Physiology of the Digestive System

53. Introduction to the digestive system

54. Nutrition and energy metabolism
55. The enteric nervous system
56. Motility of the Gastrointestinal Tract
57. Gastrointestinal Secretions
58. Digestion and Absorption for lipids, carbohydrates, proteins

Physiology of the Nervous System

59. Cellular and functional organization of the nervous system
60. The functional organization of cerebral cortex
61. Introduction to synapses
62. Synaptic transmission and ligand-gated ion channels
63. Synaptic transmission and release of neurotransmitter molecules
64. Synaptic transmission and transporters for neurotransmitter molecules
65. Quantal analysis of synaptic transmission
66. Synapses as targets for toxins, drugs, and genetic diseases
67. Associative and non-associative forms of synaptic plasticity
68. The organization of the sensory nervous system
69. The visual system
70. The auditory system
71. The central organization of the motor system and the motor pathways
72. The spinal reflex and locomotor activity centers in the spinal cord
73. Motor function and the role of brainstem, basal nuclei and cerebellum
74. Activation of the brain, sleep and wakefulness; EEG recordings
75. Higher Functions of the Nervous System: memory, consciousness, language, emotions.
76. The autonomic nervous system and its control

Physiology of the Endocrine System

77. General Principles of Endocrine Physiology
78. Whole-Body Metabolism
79. Hormones of the Pancreatic Islets
80. Endocrine Regulation of the Metabolism of Calcium and Phosphate
81. Hypothalamus and Pituitary Gland
82. Thyroid Gland
83. Adrenal Cortex
84. Adrenal Medulla
85. Overview of Reproductive Function
86. Male Reproduction
87. Female Reproduction

FORMATIVE ASSESSMENT AND EXAMS

The assessment is continuous as well as end-of-term. The former is based on the feedback from teachers and tutors and a series of theory exams (eight written tests on theory, one at the end of each section of the course). End-of-term assessments are held at the end of each semester. The performance of students during theoretical lectures and experimental sessions will monitored

throughout the course and duly recorded in log books as evidence of the ability and daily work of the student. Final marks should be allotted out of 100 as follows:

Continuous Formative Assessment (20):

1. Personal Attributes (10)

   Behavior and emotional stability, motivation and initiative, honesty and integrity, interpersonal skills in the class and leadership quality.

2. Homeworks (10)

   Punctual and prompt response to home assignments, dedicated, hardworking, competent in practical work.

Intermediate and end of term theory examinations (80)

The format of the intermediate test and end of term examination will be multiple choice and/or multiple-multiple choice which might include numerical questions or small exercises (a pocket calculator with log and exp is needed). The students are expected to know the proper names and spelling of channels, transporters, receptors, reactions, structures, cells, currents, etc. as presented in class or in textbooks. Regarding the exercises, not only the procedures but also the final results should be accurate.

SUGGESTED BOOKS AND READINGS

1) Course Syllabus and other reading material provided on the intranet (course page)
2) E. R. Kandel,J.H.Schwartz e T.M.Jessel:Principles of neural science V ed. McGrawHill, 2012
3) Berne & Levy Physiology, Bruce M. Koeppen and Bruce A. Stanton , Mosby-Elsevier VI edition, 2010

OTHER BOOKS

Aidley D.J. The Physiology of Excitable Cells. Cambridge Univ Press, IV ed., 1998.
Hille,B. Ionic channels of excitable membranes. III Edition, Sinauer, Sunderland, 2001
Johnston D., S. Miao_Sin Wu, S. Maio_Sin Wu. Foundations of Cellular Neurophysiology. MIT, 1995.
Katz, B. Nerve, Muscle and Synapse, McGraw Hill, 1966
Sheperd G.M. The synaptic organization of the brain. Oxford, V edition, 2004
Sperelakis N. Cell Physiology Source Book: Essentials of Membrane Biophysics. III edition, Academic Press 2001

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PRINCIPLES OF PHARMACOLOGY

Total Credits: 9
Lessons: 72 hrs
Practicals: 44

Scientific Discipline Sector: BIO/14

Teaching Staff
Course Coordinator: Prof. Daniele Zacchetti Email: zacchetti.daniele@hsr.it
Riccardo Fesce Email: riccardo.fesce@uninsubria.it
Maria Pennuto Email: Maria.Pennuto@iit.it

Tutors:
Barbara Bettegazzi Email: bettegazzi.barbara@hsr.it
Romina Macco Email: macco.romina@hsr.it
Ilaria Pelizzoni Email: pelizzoni.ilaria@hsr.it
Ilaria Prada Email: prada.ilaria@hsr.it

Seminars:
Addis Antonio Email:agmaddis@googlemail.com

Giulia Chiesa Email:giulia.chiesa@unimi.it

The course of Principles of Pharmacology, offered to the students already at the IV semester, is one of the unique features of our MD course. Pharmacology is the science that studies the effects of the exogenous substances to the physiology and pathology of the organism. Within the traditional Italian MD curriculum, pharmacology is proposed after the other basic science disciplines, being thought to introduce concepts and instruments not emendable to the practical use of drugs (in diagnostics, anesthesia and, most importantly, therapy). For this reason this course in the other Italian Universities is still offered at the IV year, being addressed to the students already being exposed to Clinics and that have already acquired topics such as General Pathology and Microbiology. In the last years, however, this way of teaching has started to show its limitations. On one side the comprehension of the mechanisms of drug actions and the new therapeutic perspectives have been developed in an extraordinary way thanks to the knowledge at the molecular, cellular, genetic and physiological levels; on the other side the relationship between pharmacology and the clinics has tightened, due to the fact that drugs are not anymore "magic bullets", rather disease-modifying instruments and tools to understand pathology. The aim of our discipline has now widened in both operative and didactic-cultural terms. Teaching pharmacology at the boundary between basic topics and clinical courses is not anymore suitable for a modern School of Medicine. For this reason at the "Vita-Salute" San Raffaele University Pharmacology has been divided in two parts. This course, Principles of Pharmacology (coordinator Prof. Daniele Zacchetti), is offered together the other basic science courses and allows to recall and highlight, under a different point of view, information and basic biological concepts, opening them to problems that lead to clinics and therapeutics. The specific pharmacological issues known as Therapeutics (responsible Prof. Flavia Valtorta) is now integrated within the clinical courses and allows to put the pharmacological topics in the specific issues as a fundamental tool for the approach to the patient. This is an important example of the integration, between basic and clinical teaching, that is a specific feature of our MD course. The two aspects of Pharmacology are so tethered that they make use to the same textbook, i.e. the Goodman and Gilman's, the classical compendium, known to all the physicians and that, not by chance, is entitled 'The Pharmacological Basis of Therapeutics'.

How is the course organized?

The aim of the course on Principles of Pharmacology is to provide the tools to understand drugs and their effects, answering a long list of questions such as 'why a drug has got one (or several) effect(s) and another molecule, possibly almost identical at the molecular level, has got a completely different profile of action?' up to "How a new drug is being developed?". Most of the concepts that will be provided are somehow new for the students of the second year, in the sense that they will be proposed from a different perspective; moreover, the topic of drugs is by itself comprehensive since it involves the entire organism. For this as well as several other reasons academic lessons are being held aimed to the explanation of concepts and issues. Presentation from groups of students might be also organized on specific topics. Last, the course is implemented with an experimental part represented by tutorials in which the techniques employed in pharmacological research are presented and explained. Pharmacology does not have its own techniques but, rather, employs the methods of the other disciplines. The point of view of Pharmacology is anyway often specific and there is always a lot to discuss, to critically analyze and to understand.

DIDACTIC MATERIAL

The textbook of reference is the Goodman e Gilman's, XII edition, published in English at the end of 2010 (mind! Of this book there are obviously 11 editions before this one, published every 5 years, approximately; Pharmacology is a discipline in fast development!).

Goodman & Gilman's
The Pharmacological Basis of Therapeutics, XII Edition
Ed. McGraw Hill, 2010

Meetings with students

Meetings with the coordinator of the course on Principles of Pharmacology can be organized by appointment organized by email (zacchetti.daniele@hsr.it) or calling the 02-2643.4817

Evaluation procedures

The exam is based on two steps: a test with 8-10 open questions, to be completed within 30 min and aimed to highlight students still far from an adequate knowledge of the discipline; then, an oral exam based on the critical discussion of wide and important topics, all included in then teaching program, on the basis of which the final grade will be established.

Program of the course

The Course is organized in the following topics. In details we will deal with

1. Introduction to the course, definitions, drugs and their molecular and biological properties.
2. Pharmacokinetics, i.e. the journey of the drug within the organism, the time-dependence of drug effects and the process that are responsible for them:
- Absorption and distribution of drugs: way of administration, proteins of the plasma;
- Drug elimination: drug metabolism, excretion, kinetic aspects.
3. Pharmacodynamics, i.e. the features and the quantification of the drug effects:
- Drug effects, dose-dependency
- Dose-effect curves.
4. Pharmacogenetics, pharmacogenomics and mechanisms of resistance.
5. Molecular targets of drugs – the receptors and their transduction mechanisms:
- Surface receptors;
- Circulation of receptors;
- Intracellular receptors.
6. Effects of drugs on cellular signaling:
- Second messengers – spatial coordination;
- Cross-talk among transduction pathways.
7. Pharmacology of the peripheral nervous system as a paradigm for the drug action:
- Sympathetic system; α and β adrenergic receptors;
- Direct and indirect agonists, receptor antagonists;
- Parasympathetic system and neuromuscular transmission;
- Muscarinic e nicotinic receptors;
- Cholinergic agonists; cholinesterase blockers;
- Antagonists: ganglioplegics and curare.
8. Autacoids, specific endogenous factors that act locally, and their pharmacology:

- the arachidonic acid cascade;
- the nitric oxide;
- histamine, serotonin, bradykinin, cytokines;
- ATP; adenosin.

9. General pharmacology of the central nervous system:
- neurons and glia, the synaptic signalling;
- excitatory and inhibitory transmissions; drugs of abuse;
- neurodegeneration.

10. Introduction to chemotherapy (bacteria, viruses, tumors):
- introduction to antibacterial drugs;
- introduction to antiviral drugs;
- growth and death of cells. antitumoral drugs.

11. Principles of pharmacognosy, toxicology and biologic therapy.
12. Principles of Pharmacovigilance and Pharmacoeconomy
13. Development of new drugs: history, rules and future of pharmacology.

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INTRODUCTION TO SURGERY

Total Credits: 3
Lessons: 24 hrs
Practicals: 30 hrs
Scientific Discipline Sector: MED/18 – MED/19

Course Coordinator: Prof. Braga Marco

Professors Teaching:
Braga Marco Email: braga.marco@hsr.it
Gianotti Luca Email: Gianotti.luca@hsr.it

Tutors:
Stratta Gregorio Email: stratta.gregorio@hsr.it
Pecorellii Nicolo Email: pecorelli.nicolo@hsr.it
Capretti Giovanni Email: Capretti.giovanni@hsr.it

Course aims

Course aims

Many surgical skills – except operating skills – are part of general medicine. A doctor has to deal with health problems on a daily basis, for which the solution implies the knowledge of illnesses pertaining to surgical subjects, but also the ability to carry out diagnostic and treatment procedures.
The course represents an approach to these issues, which will be followed consistently and completed in the other surgery courses.
The aim of the course is to learn about some pathological situations, know about some simple surgical procedures and know about performance and hospital issues in the surgical field.

Introduction to Surgery book list: Texbook of Surgery - Sabiston

SAN RAFFAELE INTERNATIONAL MD PROGRAM

YEAR 3

Academic Year 2012/2013

SEMESTER 1

- Basic Pathology and Immunology
- Microbiology and Mechanisms of Infectious Diseases
- Clinical Laboratory Medicine
- Basic Pathology and Immunology
- Microbiology and Mechanisms of Infectious Diseases
- Clinical Laboratory Medicine

SEMESTER 2

- Cardiovascular Diseases
- Principles of Surgery
- Digestive System Diseases
- Respiratory, Ear, Nose and Throat Diseases
- Clinical Rotations

Basic Pathology and Immunology

Total Credits: 13
Total hours: 104
Scientific Discipline Sector: MED/04 - MED/08 – MED/09

Teaching staff

Course Coordinator: Prof. Guido Poli Email: poli.guido@hsr.it
Prof. Ruggero Pardi Email: pardi.ruggero@hsr.it
Dr. Matteo Iannacone Email: iannacone.matteo@hsr.it
Dr. Anna Mondino Email: mondino.anna@hsr.it
Dr. Maurilio Ponzoni Email: ponzoni.maurilio@hsr.it
Dr. Patrizia Rovere-Querini Email: rovere.patrizia@hsr.it

Course Description

The BPI course will be articulated in two parts. The first part (composed of 32 frontal lessons) aims at providing the fundamental knowledge on the most relevant aspects of human pathology and immunology, including cell and tissue pathology, the mechanisms underlying acute and chronic inflammation, wound repair and the process of neoplastic transformation. Immunology lessons will provide state of art information on both innate and adaptive immune responses to pathogens and transformed cells as well as on key immunologically mediated diseases, such as immunodeficiencies, allergy and autoimmunity.

In the second part of the course, the student will be directly involved in interactive modules (IM) revolving around theoretical or actual clinical cases. Each IM will start form the medical and histopathological description of a clinical case with the goal of identifying its etiology and reconstructing the fundamental pathogenic steps leading to overt clinical disease. This inductive process will be enriched by elements of epidemiology, genetics and pre-clinical models (when available). Since, on average, each module will span over two lessons (i.e. 4 h), the second part of the course foresees 10 IM covering the main areas of human pathology.

Overall, the course aims at providing a solid base on the fundamental principles underlying human pathology while training the students to exert their creativity and acquired knowledge to probe the field of human diseases.

Textbooks:

Robbins Basic Pathology: with STUDENT CONSULT Online Access, 9e (Robbins Pathology)

Cellular and Molecular Immunology: with STUDENT CONSULT Online Access, 7e (Abbas, Cellular and Molecular Immunology)

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Microbiology and Mechanism of Infectious Diseases

Total Credits: 7
Total hours: 56
Scientific Discipline Sector: MED/07 - VET/06 – BIO/14

Teaching staff
Course Coordinator: Prof. Massimo Clementi Email: clementi.massimo@hsr.it
Prof. Nicasio Manciini Email: mancini.nicasio@hsr.it
Prof. Pistello Mauro Email: mauro.pistello@med.unipi.it
Prof. Solforosi Laura Email: solforosi.laura@hsr.it

Course Description
Bacteriology
The purpose of this course is to give to students a thorough grounding in the comprehension of microbial structure, physiology and in the interplay between humans and microbes in different body
sites and conditions. This will be achieved by studying microbial resident flora (microbiota), with
particular attention to its composition, its changes during infectious diseases and to its role in the
diffusion of resistance to antibiotics.
Following this perspective, students will be introduced to all of the basic structural, physiological and
metabolical principles of medical bacteriology including the following points:
- Cell structure of prokaryotes
- Structure and function of endospores
- Microbial metabolism
- Microbial genetics
- Virulence and pathogenicity of bacteria
- Transmission of bacterial infection
- The immune response to bacteria
- Techniques for the diagnosis of bacterial infections
- Novel techniques for the study of resident flora (the “human microbiome project”)
The detailed knowledge of the microbiota and its composition will also allow a better comprehension
of the role played by specific bacterial genera and species, important in medical microbiology, that will
be studied in details. Here it follows a punctual list of the bacterial genera and species that students
should understand by the end of the course:
- *Staphylococcus* spp
- *Staphylococcus aureus*
- Coagulase-negative staphylococci
- *Streptococcus* spp
- *Streptococcus pyogenes*
- *Streptococcus agalactiae*
- *Streptococcus pneumoniae*
- Viridans streptococci
- *Enterococcus* spp
- *Enterococcus faecalis*
- *Enterococcus faecium*
- *Bacillus* spp

- *Bacillus anthracis*
- *Bacillus cereus*
- *Clostridium* spp
- *Clostridium difficile*
- *Clostridium perfringens*
- *Clostridium botulinum*
- *Clostridium tetani*
- *Corynebacterium* spp
- *Corynebacterium diphteriae*
- *Corynebacterium striatum*
- *Listeria monocytogenes*
- *Actinomyces* spp
- *Nocardia* spp
- *Enterobacteriaceae*
- *Escherichia coli*
- *Klebsiella pneumoniae*
- *Proteus mirabilis*
- *Enterobacter* spp
- *Serratia marcescens*
- *Salmonella* spp

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- *Shigella spp*
- *Pseudomonas aeruginosa*
- *Stenotrophomonas maltophilia*
- *Burkholderia* spp
- *Acinetobacter* spp
- *Vibrio cholerae*
- *Campylobacter* spp
- *Helicobacter pylori*
- *Haemophilus* spp
- *Haemophilus influenzae*
- *Moraxella catarrhalis*
- *Bordetella pertussis*
- *Brucella* spp
- *Francisella tularensis*
- *Yersinia pestis*
- *Yersinia enterocolitica*
- *Pasteurella multocida*
- *Neisseria* spp
- *Neisseria meningitidis*
- *Neisseria gonorrhoeae*
- *Legionella pneumophila*
- *Bartonella* spp
- *Bacteroides* spp
- Mycobacteria
- *Mycobacterium tuberculosis*
- *Mycobacterium avium* complex
- Spirochetes
- *Mycoplasma* and *Ureaplasma*
- Rickettsia, *Ehrlichia, Anaplasma* and *Coxiella*
- *Chlamydia* and *Chlamydophila*

The microbiota-oriented perspective will also be followed in the study of the available prophylactic and therapeutic anti-bacterial approaches:

- Sterilization, Disinfection and Antisepsis

- Modes of action of the main biocides used for disinfection and antisepsis
- Mechanisms of resistance to biocides
- Antibiotics: bacterial targets of available molecules and mechanisms of resistance
- Genetic bases of antibiotic resistance
- Genetic bases of the diffusion of antibiotic resistance
- Multi-drug resistant bacteria
- Passive immunoprophylaxis
- Anti-bacterial vaccines

Virology

The general purpose of this course is to give a robust introduction to basic medical virology, correlating the molecular features of each viral agents to the associated clinical syndromes. The dramatic advances in the comprehension of the different phases of the viral replicative cycle and pathogenesis will be directly correlated to the practical possibility of developing novel antiviral strategies or of improving the available diagnostic tools.

At the end of the course, the students should be familiar with the following general topics:

- Structure and chemical composition of viruses
- Phases of viral replication
- Transmission of viral infection
- Different types of viral infection
- Pathogenesis of viral diseases according to different sites of replication

- Viral carcinogenesis
- The immune response to viruses
- Techniques for the diagnosis of viral infections
- Antiviral agent and mechanisms of viral resistance
- Passive immunoprophylaxis
- Antiviral vaccines

These general concepts should be specifically correlated to the specific features of each of the following groups of viruses:

- Parvoviruses
- Adenoviruses
- Herpesviruses
- Poxviruses
- Picornaviruses
- Papillomaviruses and polyomaviruses
- Hepatitis viruses
- Rotaviruses
- Caliciviruses
- Arthropod-borne and rodent-borne viruses
- Orthomyxoviruses
- Paramyxoviruses
- Rubella virus
- Coronaviruses
- Rabies virus
- Human retroviruses
- Lentiviruses
- Non-conventional non-viral pathogens (Prions)

Mycology

At the end of the course, the students will be familiar with the following topics regarding medical
mycology:

- Structure of fungal cell
- Yeasts and moulds
- Fungal genera and species present in the human microbiota
- Virulence and pathogenicity of fungi
- Immune control of fungal agents
- Causative fungal agents of superficial, cutaneous and subcutaneous mycoses
- Causative fungal agents of endemic mycoses
- Causative fungal agents of opportunistic mycoses
- Diagnostic laboratory techniques of fungal infections
- Antifungal agents: targets of available molecules and mechanisms of resistance

The students should also be familiar with the main features regarding the following fungal genera and
species of medical interest:

- *Candida* spp
- *Candida albicans*
- *Candida glabrata*
- *Candida krusei*
- *Cryptococcus neoformans*
- *Aspergillus* spp
- *Aspergillus fumigatus*
- *Aspergillus terreus*

- *Fusarium* spp
- Zygomycetes
- *Pneumocystis jiroveci*
- *Histoplasma capsulatum* and other
dimorphic fungi

Parasitology

By the end of the course, students should be familiar with the following protozoan and helminthic
parasites of medical importance, with particular attention given to associated clinical syndromes and
diagnostic laboratory techniques:

- *Giardia lamblia*
- *Cryptosporidium* spp and *Cyclospora* spp
- *Entamoeba histolytica*
- *Trichomonas vaginalis*
- *Trypanosoma* spp
- *Leishmania* spp
- Tissue amebae (i.e. *Acanthamoeba* spp)
- *Plasmodium* spp
- *Babesia microti*
- *Toxoplasma gondii*
- *Enterobius vermicularis*
- *Trichuris trichiura*
- *Ascaris lumbricoides*
- *Ancylostoma duodenale*
- *Strongyloides stercoralis*
- *Trichinella spiralis*
- *Taenia* spp
- *Diphyllobotrium latum*
- *Anisakis simplex*

- *Schistosoma* spp
- Filariae
- *Echinococcus granulosus*

Suggested textbooks

1) Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller – Medical Microbiology – 6th ed. Mosby
Elsevier.
2) Jawetz, Melnick & Adelberg's Medical Microbiology – 25 ed. McGraw-Hill.

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Clinical Laboratory Medicine

Total Credits: 4
Total hours: 32
Scientific Discipline Sector: MED/05 - MED/07 – BIO/12

Course Coordinator: Prof. Maurizio Ferrari Email: ferrari.maurizio@hrs.it
Prof. Ferruccio Ceriotti Email: ceriotti.ferruccio@hsr.it

Course Description
Clinical Biochemistry

The purpose of the course is to give to students an overview on the most relevant aspects of clinical laboratory medicine. The course will describe the pathophysiological aspects that influence the results of clinical laboratory tests, the interpretation of tests results and will give some insights on the technologies used in clinical laboratory.
Part of the course will be dedicated to the pre-analytical phase to provide the necessary information on variables that could influence and exert a confounding effect on the analytical results.

The following topics will be covered:

- Pre-analytical phase: description of the laboratory process, sources of pre-analytical variability (patient preparation, specimen collection, processing, transportation and storage)
- Statistical methods in laboratory medicine. Internal Quality control, external quality assessment.
- Laboratory report, units of measurement, reference intervals, decision limits, reference change value
- Analytical Techniques: spectrophotometry, mass spectrometry, immunoassays
- Proteins analysis and interpretation
- Lipids and lipoproteins
- Blood gas and critical care testing,
- Water and electrolyte balance
- Calcium biology and disorders
- Carbohydrate disorders
- Uric acid and iron metabolism
- Methods for DNA amplification
- Methods to detect known mutations
- Methods to detect unknown mutations
- New advanced molecular technologies
- Clinical applications of molecular tests

Clinical Molecular Biology

Suggested textbooks

- Contemporary Practice in Clinical Chemistry, 2nd edition. Edited by William Clarke. 2011. ISBN: 9871594251023
- Tietz textbook of Clinical Chemistry and molecular diagnostics, fifth edition, Burtis, Ashwood, Bruns, Elsevier Saunders, ISBN:9781416061649

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Cardiovascular Diseases

Total Credits: 9
Total hours: 72
Scientific Discipline Sector: MED/11, MED/22, MED/23, MED/36, BIO/14

Teaching staff
Course Coordinator: Prof. Paolo Camici Email: camici.paolo@hsr.it
Dr. Domenico Cianflone Email: cianflone.domenico@hsr.it
Prof. Flavia Valtorta Email: valtorta.flavia@hsr.it

Teaching Assistant:
Dr. Azeem Latib Email: alatib@gmail.com
Dr. Franco Cecchi Email: francocecchi337@gmail.com
Dr. Paolo Della Bella Email: dellabella.paolo@hsr.it
Dr. Yamume Tshomba Email: tshomba.yamume@hsr.it
Dr. Francesco Maisano Email: maisano.francesco@hsr.it
Dr. Roberto Spoladore Email: spoladore.roberto@hsr.it

Course Description
The course is organised in 7 modules:

Cardiac physiology and principles of echocardiography and ECG

This module will provide the basis of cardiac and coronary pathophysiology necessary for the understanding of cardiovascular syndromes. In addition, the module will cover the principles of echo- and electro-cardiography with practical examples.

Ischaemic heart disease (IHD)

The pathophysiology and clinical acute and chronic syndromes caused by coronary artery disease will be discussed. Furthermore, this module will provide knowledge relative to the main diagnostic techniques/criteria for establishing the diagnosis of IHD. Finally, both pharmacologic and interventional treatment strategies will be discussed.

Myocardial Diseases

In this module both primary/genetic and secondary forms of cardiomyopathy will be presented along with inflammatory disease of the heart, i.e. myocarditis and pericarditis. Diagnosis and treatment of these conditions will also be discussed.

Arrhythmias

The pathophysiology, diagnosis and treatment of rhythm and conduction disturbances will be presented including illustrative clinical cases.

Valvular heart disease

Congenital, degenerative and inflammatory diseases of the cardiac valves will be presented along with diagnostic and treatment strategies.

Heart Failure

The pathophysiology and clinical features of heart failure of ischemic and non ischemic origin will be presented along with the relevant diagnostic techniques and treatment options.

Congenital heart disease, pulmonary embolism and disease of the large vessels

This module will cover the above topics in conjunction with a special lecture on cardiology in the emergency department.

A questions and answers (Q&A) session will close the course.
Students are expected to demonstrate in depth knowledge of all the topics treated in the 7 modules.
Copies of lessons' slides in addition to reference papers will be made available on the University website. The text suggested is "Harrison's-Principles of Internal Medicine" McGraw-Hill. Finally, we strongly advise to download and consult the European Society of Cardiology practical guidelines available at www.escardio.org.

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Principles of Surgery

Total Credits: 3
Total hours: 24
Scientific Discipline Sector: MED/18

Teaching staff
Course Coordinator: Prof. Carlo Staudacher Email: staudacher.carlo@hsr.it
Prof. Ferla Gianfranco Email: ferla.gianfranco@hsr.it
Dr Luca Aldrighetti Email: aldrighetti.luca@hsr.it
Dr Paola De Nardi Email: denardi.paola@hsr.it
Dr Elena Orsenigo Email: orsenigo.elena@hsr.it

Course Description
The aim of this course is to provide the essential theoretical knowledge to deal with the surgical patient. The student will focus on the epidemiological and physiopathological aspects of the main surgical diseases, on its diagnostic and treatment algorithms. In this course, the basic diseases concerning general surgery will be systematically introduced and discussed in a multidisciplinary setting, including medical, radiological and surgical technical features.

Course Program

Perioperative management
- Preoperative assessment, analysis of risk factors
- Intraoperative factors influencing recovery
- Postoperative care, enhanced recovery after surgery protocols

Transplant Surgery
- History and definitions.
- Matching of donor and recipient, principles of immunosuppression.
- Organ preservation.
- Organ transplants (heart, liver, kidney, pancreas, intestine).
- Living donor.

Metabolic surgery
- **Bariatric surgery:** indications, principles of surgical technique, metabolic results, prognosis.

Abdominal wall surgery
- Abdominal wall hernias and incisional hernias

Thyroid and Parathyroids
- **Surgical anatomy of thyroid and parathyroid**
- **Thyroid nodule and multinodular goiter:** symptoms, differential diagnosis, treatment algorithm.
- **Thyroid tumors:** epidemiology, pathology classification, symptoms, diagnosis, surgical therapy and principles of technique, treatment algorithms, prognosis.

- **Parathyroid tumors:** epidemiology, pathology classification, symptoms, diagnosis, surgical therapy and principles of technique, treatment algorithms, prognosis.

Breast

- **Surgical anatomy of the breast and axilla**
- **Benign breast disease:** epidemiology, pathology classification, symptoms, diagnosis, surgical therapy and principles of technique, treatment algorithms, prognosis.
- **Breast cancer:**epidemiology, pathology classification, symptoms, diagnosis, surgical therapy and principles of technique, treatment algorithms, prognosis.

Esophagus

- **Gastro-esophageal reflux disease and hiatal hernia:** symptoms, diagnosis, surgical therapy and principles of technique, treatment algorithm.
- **Esophageal diverticula:** definitions, epidemiology, classification, physiopathology, symptoms, diagnosis, treatment algorithm.
- **Achalasia:** surgical therapy and principles of technique, endoscopic therapy.
- **Esophageal cancer:** epidemiology, pathology classification, symptoms, diagnosis, surgical therapy and principles of technique, endoscopic palliation, treatment algorithms, prognosis.

Stomach

- **Surgical anatomy of the stomach**
- **Peptic ulcer:** symptoms, diagnosis, treatment algorithms.
- **Stomach cancer:** epidemiology, pathology classification, symptoms, diagnosis, surgical therapy and principles of technique, endoscopic palliation, treatment algorithms, prognosis.

Small intestine

- **Surgical anatomy of the small intestine**
- **Small bowel obstruction:** causes, symptoms, diagnosis, surgical therapy and principles of technique.
- **Inflammatory bowel disease (IBD)**
  - Crohn's disease: symptoms, diagnosis, complications, surgical therapy, treatment algorithm, prognosis.
  - Ulcerative colitis: symptoms, diagnosis, complications, surgical therapy, treatment algorithm, prognosis.

Colon and Rectum

- **Surgical anatomy of the colon and rectum**
- **Diverticular disease:** symptoms, diagnosis, complications, surgical therapy, treatment algorithm.
- **Colorectal cancer:** epidemiology, pathology classification, symptoms, diagnosis, surgical therapy and principles of technique, endoscopic therapy and palliation, treatment algorithms, prognosis.

Anus

- Hemorrhoids
- Fistula in ano
- Anal fissure
- Rectal prolapse

Spleen

- **Surgical anatomy of the spleen**
- **Spleen trauma:** epidemiology, symptoms, diagnosis, treatment algorithm, surgical therapy and principles of technique.
- **Spleen lesions:** epidemiology, pathology classification, symptoms, diagnosis, surgical therapy and principles of technique, treatment algorithms, prognosis.

Adrenal glands

- **Surgical anatomy of the adrenal glands**
- **Adrenal gland disease:** epidemiology, pathology classification, pathophysiology, symptoms, diagnosis, surgical therapy and principles of technique, medical therapy, prognosis.

Biliary tract

- **Surgical anatomy of the biliary tract**
- **Cholelithiasis and choledocholithiasis:** symptoms, diagnosis, complications surgical therapy and principles of technique, endoscopic and percutaneous approaches, treatment algorithms.
- **Biliary tract tumors:** epidemiology, pathology classification, symptoms, diagnosis, surgical therapy and principles of technique, endoscopic and percutaneous palliation, treatment algorithms, prognosis.

Liver

- **Surgical anatomy of the liver**
- **Benign tumors of the liver:** epidemiology, pathology classification, predisposing factors, symptoms, diagnosis, surgical therapy and principles of technique, treatment algorithms, prognosis.
- **Primary malignant liver tumors:** epidemiology, pathology classification, predisposing factors, symptoms, diagnosis, medical therapy, percutaneous approaches, surgical therapy and principles of technique, treatment algorithms, prognosis.
- **Metastatic liver disease:**clinical scenarios, diagnosis, medical therapy, surgical therapy and principles of technique, treatment algorithms, prognosis.
- **Portal Hypertension:** definitions, classification, pathophysiology, symptoms, complications, diagnosis, medical therapy, endoscopic and percutaneous treatment, surgical therapy and principles of technique, treatment algorithms, prognosis.

Pancreas

- **Surgical anatomy of the pancreas**
- **Acute pancreatitis:** definitions, epidemiology, symptoms, diagnosis, severity classification, complications, surgical therapy, treatment algorithm.
- **Exocrine and endocrine tumors of the pancreas:** epidemiology, pathology classification, symptoms, diagnosis, endoscopic and percutaneous palliation, surgical therapy and principles of technique, treatment algorithms, prognosis.

Surgical emergencies

- **Gastrointestinal bleeding:** epidemiology, symptoms, diagnosis, endoscopic, percutaneous and surgical therapy, treatment algorithms.
- **Acute abdomen:** causes, symptoms, diagnosis, surgical therapy and principles of technique, treatment algorithm.
- **Appendicitis:** classification, symptoms, diagnosis, surgical therapy and principles of technique, treatment algorithm.

Suggested textbooks:

1) Sabiston Textbook of Surgey, 19 edition
2) J. Tjandra Textbook of Surgery, 3rd edition

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Digestive System Diseases

Total Credits: 8
Total hours: 64
Scientific Discipline Sector: MED/12 – MED/18 – MED/29 – MED/36 – BIO/14

Teaching staff
Course Coordinator: Prof. Pier Alberto Testoni
email: testoni.pieralberto@hsr.it

Prof. Giulia M.Cavestro	Gastroenterology	email: cavestro.giuliamartina@hsr.it
Dr Mario Guslandi	Gastroenterology	email: guslandi.mario@hsri.it
Dr Paolo Giorgio Arcidiacono	Gastroenterology	email: arcidiacono.paologiorgio@hsr.it
Dr Paola De Nardi	Gastroenterology	email: denardi.paola@hsr.it
Prof. Francesco De Cobelli	Diagnostic Imaging	email: decobelli.francesco@hsr.it
Prof. Flavia Valtorta	Pharmacology	email: valtorta.flavia@hsr.it
Prof. Claudio Doglioni	Human Pathology	email: doglioni.claudio@hsri.it
Prof. Marco Braga	Surgery	email: braga.marco@hsr.it
Prof. Gianfranco Ferla	Surgery	email: ferla.gianfranco@hsr.it
Prof. Carlo Staudacher	Surgery	email: staudacher.carlo@hsr.it
Dr Giuseppe Cardaropoli	Odontology	email: giuseppe.cardaropoli@mac.com
Dr Paolo Capparè	Maxillofacial surgery	email: paolocappare@gmail.com

Teaching Assistant: (Gastroenterology Unit)
Dr Alberto Mariani
Dr Edi Viale
Dr Lorella Fanti
Dr Maria Chiara Petrone

Course Description
The course has been designed as a multidisciplinary teaching module and aims to give to students a thorough grounding in the comprehension of diseases of the entire digestive system, including mouth, gastrointestinal tract, liver, biliary system, and pancreas.
The integrated course has the purpose to provide to students a general practitioner level knowledge in gastrointestinal, pancreas, and liver diseases.
This will be achieved by including in the course, beside gastroenterology, some notions of odontology and maxillofacial surgery, pharmacology, radiology, human pathology, surgery, and laboratory testing in an integrated fashion.
As regards surgery, the digestive system diseases course will run head-to- head with the course of general surgery, that will include a number of topics specifically addressed to gastroenterological surgical problems, complementary to the gastroenterology.
As regards the specific gastroenterology program, students will be introduced to basic physiology of the systems and organs, and physiopathology, clinical presentation, natural history, diagnostic work-up, and basic therapeutic notions of the diseases.
Within the course four clinical case presentation sessions will be included, allowing an interactive discussion between teachers and students in a practical approach to outpatients.

At the end of the course, the students should be familiar with the following topics:

Esophagus:
- normal motility and primary motility disorders
- gastroesophageal reflux disease (typical and atypical symptoms)
- complications of gastroesophageal reflux disease, with particular focus on Barrett's esophagus
- esophageal cancer
- surgical approach to functional disorders and cancer

Stomach and duodenum:
- gastric secretion, motility, gastric barrier
- functional dyspepsia
- chronic gastritis, with particular focus on Helicobacter pylori infection
- peptic ulcer disease
- precancerous condition and cancer
- oncological management and surgery

Small bowel:
- digestion, absorption and motility
- celiac disease and other enteropathies, including food intolerance and hypersensitivity
- motility disorders, including obstruction
- definition and classification of diarrhea

Colon and rectum:
- chronic inflammatory bowel diseases and their complications
- diverticular disease and its complications
- irritable bowel syndrome
- precancerous conditions and cancer
- oncological management and surgery
- diseases of anus and functional disorders of pelvic floor

Liver and biliary tract:
- metabolism and laboratory testing
- bile secretion, cholestasis and jaundice
- chronic cholestatic diseases
- bile stone disease and its complications
- Vater's papilla organic and functional diseases
- non alcoholic fatty liver disease
- chronic hepatitis, with particular focus on virus-related infections
- hepatic cirrhosis and hemocromatosis
- portal hypertension and its complications
- tumors of liver and biliary system

Pancreas:
- exocrine and endocrine secretion
- acute pancreatitis
- local and systemic complications of acute pancreatitis
- chronic pancreatitis and its complications
- cystic lesions and neuroendocrine tumors
- cancer

Gastrointestinal bleeding

Suggested textbooks

1) Harrison's Principles of Internal Medicine – 18th edition
McGraw-Hill
2) Sleisenger and Fordtran's Gastrointestinal & Liver Disease – 8th edition
Saunders
3) Yamada T. Textbook of Gastroenterology – 4th edition
Lippincott Williams & Wilkins

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Respiratory, Ear, Nose and Throat Diseases

Total Credits: 7
Lessons: 28 (2 hours every lesson)
SSD: MED/10, MED/36, MED/31, MED/21

Course Coordinator: Piero Zannini
Email: piero.zannini@hsr.it

TEACHERS

Mario Bussi	email: bussi.mario@hsr.it
Angelo Carretta	email: carretta.angelo@hsr.it
Paola Ciriaco	email: ciriaco.paola@hsr.it
George Cremona	email: cremona.george@hsr.it
Antonio Esposito	email: esposito.antonio@hsr.it
Giulio Melloni	email: melloni.giulio@hsr.it
Giampiero Negri	email: negri.giampiero@hsr.it
Piero Zannini	email: zannini.piero@hsr.it

TUTORS

Alessandro Bandiera	email: bandiera.alessandro@hsr.it
Antonio Foresi	email: antonio.foresi@aovimercate.org
Gabriella Gambaro	email: gambaro.gabriella@hsr.it
Armando Puglisi	email: puglisi.armando@hsr.it
Matteo Trimarchi	email: trimarchi.matteo@hsr.it

COURSE INTRODUCTION

"Respiratory, Ear, Nose and Throat Diseases" is a course that provides information on the morphology, physiology, pathophysiology, clinical aspects, diagnosis and principles of treatment of the diseases of the upper aerodigestive tract, and of the respiratory and auditive system.
During the course the morphology and physiology of the upper aerodigestive tract and of the respiratory and auditive system will be reviewed in order to introduce the students to the pathophysiology and pathogenesis of potential diseases. Clinical aspects, semeiotics and diagnostic procedures will be explored in depth and the principles of management will be presented. Students will have the opportunity to attend clinical Departments in order to gain practical experience of the diagnostic features and clinical evolution of the diseases.

SPECIFIC GOALS AND OBJECTIVES

The goals of the M.D. Course in Respiratory, Ear, Nose and Throat Diseases are to enable the students:

1) to deepen their knowledge of the macroscopic and microscopic morphology of the upper and lower respiratory system and of the ear, nose and throat.
2) to deepen their knowledge of the physiology of the upper and lower respiratory system and of the ear, nose and throat.
3) to learn about the pathophysiology of the diseases of the upper and lower respiratory system and of the ear, nose and throat.
4) to learn the techniques of collecting patients' medical history and of carrying out a physical examination of the upper and lower respiratory system and of the ear, nose and throat.

5) to gain knowledge of the most frequent diseases of the upper aerodigestive tract, the lower respiratory system, the ear, nose and throat including aetiology, pathogenesis, pathophysiology and relevant medical treatment.

DETAILED PROGRAM SECTIONS

Respiratory Medicine
Teacher: Prof. George Cremona
Respiratory Medicine is one of the systems-based courses covering all of the systems of the body. This course covers basic physiological, pharmacological and pathophysiological aspects of diseases of the respiratory system. Faculty from the Units of Respiratory Medicine, Pharmacology, Radiology and Surgery teach in the course. By the end of the course students will be able to describe the pathology and pathophysiology of infectious inflammatory and immunologic, metabolic and systemic disorders, trauma, and neoplasms affecting the respiratory system. Students will be able to recognize the differences between the normal and disease states, select diagnostic tests, and understand the pharmacological and non-pharmacological therapies. The course uses lectures to present material, case-based tutorials to reinforce key concepts, and a simulation exercise to link basic science material to clinical medicine. Assessment will consist of written multiple choice test and oral examination at the end of the course.

Radiology
Teacher: Antonio Esposito
1. Introduction to imaging of the upper and lower respiratory system:
   the first and second level techniques for the assessment of respiratory system will be presented remarking the principles at the basis of image formation and the main indication for each technique.

2. Imaging in the inflammatory disease of the respiratory system:
   the role of imaging in the diagnosis, clinical assessment and management of inflammatory disease will be discussed differentiating upper airways from lungs and pleura

3. Imaging of interstitial lung diseases/pulmonary fibrosis/Chronic Obstructive Pulmonary Disease:
   the role of HRCT (high resolution computed tomography) in the assessment of diffuse lung diseases will be explain showing the most common patterns of disease

4. Imaging of throat tumours:
   role of imaging techniques in the diagnosis and staging of pharynx and larynx tumors will be presented

5. Imaging of lung cancer:
   detection of lung cancer; differential diagnosis; screening programs; lung cancer staging

6. Imaging of pleural tumours:
   detection; differential diagnosis; staging

7. Imaging of pulmonary thromboembolism
   Imaging techniques involved and main signs of PE

8. Imaging of thoracic trauma
   Role of imaging in the assessment of blunt chest trauma or penetrating thoracic lesions in emergency

Otorhinolaryngology
Teacher: Prof. Mario Bussi
Tutor: Matteo Trimarchi

1. Anatomy and physiology of the upper aerodigestive tract: nose and paranasal sinuses, oral cavity, pharynx, larynx, salivary glands, external and middle ear.
2. Pathophysiology of the nose and paranasal sinuses: classification, symptomatology, diagnosis and treatment of the sinonasal diseases (acute and chronic flogoses, benign and malignant neoplasms, traumas, epistaxis).
3. Pharynx pathophysiology: acute and chronic flogoses, tonsillitis, pharynx tumors (symptomatology, diagnoses, treatment).
4. Salivary glands pathophysiology: acute and chronic flogoses, syaloadenoses and tumors.
5. Pathophysiology of the larynx: acute and chronic laryngitis, benign lesions, benign and malignant neoplasms (symptomatology, diagnoses, treatment).
6. Main aspects and clinical features of neck pathologies.
7.Pathology of the external and middle ear: symptoms, diagnosis and treatment of otitis, otosclerosis, congenital malformations.

Thoracic Surgery
Teachers: Prof. Piero Zannini, Prof. Giampiero Negri, Dr Giulio Melloni, Dr Angelo Carretta, Dr Paola Ciriaco
Tutors: Armando Puglisi, Alessandro Bandiera

1. Pleura. Spontaneous pneumothorax and pleural effusion
Pleural effusion: definition, incidence, classification, pathogenesis, pathophysiology, symptoms and signs, treatment. Pleural mesothelioma: epidemiology, pathology, diagnosis and management.
Pleural Empyema: definition, incidence, classification, pathogenesis, pathophysiology, symptoms and signs, treatment.
Spontaneous pneumothorax: definition, incidence, classification, pathogenesis, pathophysiology, symptoms and signs, treatment.

2. Lung cancer.
Epidemiology, risk factors, pathology, diagnosis and staging, symptoms and signs, surgical principles and management.

3. Trachea.
Endoscopic and surgical treatment of benign and malignant diseases.
Post-intubation stenosis, idiopathic stenosis, primary and metastatic tumours, trauma: symptoms and signs, diagnosis, surgical principles and management. Tracheoesophageal fistula: definition, pathogenesis, diagnosis, surgical principles and management.

4. Trauma
Trauma to the chest wall and to the lung: incidence, diagnosis, symptoms and signs, management.

PRACTICAL SESSIONS AND LABS

I. Activities in Thoracic Endoscopy Service: diagnostic and operative fiberoptic endoscopy
II. Activities in Thoracic Surgery Department: chest drainage (indications to, positioning and management)
III. Activities in ENT department: pre-operative and post-operative patient's management
IV. Activities in ENT practice: vestibular and audiologic evaluation, diagnostic endoscopy, oncologic follow-up,
V. Activities in ENT operating theatre

FORMATIVE ASSESSMENT AND EXAMS

Multiple choice questions and clinical cases discussion.

SUGGESTED BOOKS AND READINGS

Sabiston Textbook of Surgery Saunders Company
Pearson's Thoracic and Esophageal Surgery Churchill Livingstone Elsevier 2008
Grillo Surgery of the trachea and bronchi BC Decker
Gibbons's Surgery of the Chest, Saunders Company
Renzo Dionigi Chirurgia Masson Elsevier

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Università Vita Salute San Raffaele – San Raffaele International MD Program

Medical Semiotics
Internal Medicine I – 3 Credits
Internal Medicine and Surgery - 5 credits

Sixth Semester AY 2012/2013 – Class of 2016

Course coordinator: Prof. Lorenzo DAGNA, MD, FACP
lorenzo.dagna@unisr.it - 02-2643-6096/4683

"The true mystery of the world is the visible, not the invisible." (Oscar Wilde, 1854-1900)
"He who studies medicine without books sails an uncharted sea, but he who studies medicine without patients does not go to sea at all." (William Osler, 1849-1919)

Aims

The practice of modern medicine is a balanced combination of science and art. The role of science in medicine is clear: science-based technology and deductive reasoning are the basis for the solution of most clinical problems. The scientific advances in the basic sciences, genetics, biochemistry, imaging, laboratory medicine and therapeutics provide the physician of the third millennium with unprecedented tools. In addition to sound scientific basis, however, there is a medical art which is a combination of medical knowledge, intuition, observation and critical judgment which is equally needed by the doctor to practice of medicine.
The most striking example of these nearly artistic skills that the doctor should have is medical semiotics, the ability of understanding and describing physical signs and symptoms. With careful observation, with appropriate and timely questions, with simple gestures, the expert physician can reach incredibly precise deductions about the disease of a patient. For centuries, doctors diagnosed diseases using only their senses, observing, palpating, percussing, listening. Modern technology has undoubtedly radically changed all this. However it is not at all unusual that complex and expensive tests or imaging studies are performed to get the same information that a well performed thorough physical examination and a proper and well conducted history taking could provide.

The course of General Semiotics aims to provide students with the theoretical and practical bases necessary to effectively collect a thorough history and perform a complete physical examination. At the end of the course there will be a short rotation in the medical wards of the hospital to put into practice what students have learned during the course. The results reached during these activities will be strengthened in the following semesters, thanks to more and more prolonged periods of rotation in clinical departments, and as a result of systematic study of different medical subspecialties/blocks.

Objectives

This practical/theoretical course is designed first to provide the student with the correct medical terms and the general signs and symptoms of disease. Then we will analyze the most typical signs and symptoms of the different organs and systems.

At the end of the course the student will be able to take a thorough history and perform a physical examination and to detect the most frequent pathological findings.

Interactive teaching activities

Since this course will be the first direct contact of the students with sick patients admitted to an hospital wards, the course will begin with a seminar to explain all the procedures that are needed in order to preserve their own health and patients' safety.
Then interactive lectures will be held in which, starting from the physiology and pathophysiology of each organ/system, the normal and more common abnormal findings will be analyzed and discussed, in order to provide students with all the skills needed to perform a complete physical examination. Time will be spent to discuss specific techniques commonly used to collect a complete and thorough medical history.
During classes a lot of time will be given for interaction and discussion. The last class of the theoretical part of the course will be devoted entirely to review what was discussed in class and clarify any doubts of the students.
In the practical part of the course (last 2 weeks), students will be attending the general medical wards of our hospital in wards, dealing with real patients, collecting their histories and practicing in physical examination under the supervision of the clinic's doctors. REMEMBER THAT, DUE TO PATIENT ETHNICITY, INTERACTION WITH PATIENTS WILL BE IN ITALIAN.

Teaching materials

Suggestions on possible textbooks will be provided at the first lesson of the course.
Slides used in classes will be uploaded in the course on-line folder after each class.

Final assessment / exam

Student MUST ATTEND the INTRODUCTORY SEMINAR and ALL THE PRACTICALS. Attendance to lectures will be checked and recorded electronically (badge scanning) and/or with roll calls. At the end of the course there will a written test (20 short open questions). Passing the written test will be necessary in order to sit for the subsequent practical test. The practical test will be done in the clinic, at the bedside of a real patient, checking for the ability to interact with patients, to collect history and to perform a complete physical examination. The combined evaluation of these tests will result in passing/failing the course.

Course program

General principles of the history taking and physical examination

History taking

Reason for assessment
Past medical history
History of present complaint
Family history
Physiological
Work history
History taking in special situations

Evaluation of the general parameters and vital signs

Assessment of the behavior and mental status

Physical examination of skin, hair and nails

Physical examination of the head and neck (eyes, eyelids, visual acuity, ears, the auditory acuity, Weber and Rinne tests, sinuses, mouth, lips, oral mucosa, tongue, pharynx, neck, thyroid)
Chest examination (inspection, palpation, percussion, auscultation)

Physical examination of the cardiovascular system (inspection, palpation, auscultation)

Physical examination of the breast and axillae

Physical examination of the abdomen (inspection, palpation, percussion, auscultation, Giordano's, Blumberg's, Murphy's, McBurney's, Rovsing's signs)

Physical examination of the vascular peripheral (pulse features, Raynaud's phenomenon, Allen test, deep vein thrombosis and Homans' and Bauer's signs, signs of venous insufficiency, Trendelenburg's and Perthes' tests)

Physical examination of the lymphatic system and lymphnodes

Physical examination of the male genitalia and evaluation of hernias

Physical examination of the female genital

Physical examination of the perineum, rectum and prostate

Physical examination of the musculoskeletal system

Brief neurological physical examination (mental status, cranial nerves, muscle tone and strength, coordination tests, Romberg's test, examination of sensory system, skin and deep tendon reflexes, Lasegue's, Babinski's, Kernig's, Brudzinski's signs)

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