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| **Title of the course**:  **Microbiology** | | **NEPTUN-code:**  **RKKMB1ABNE** | ***Weekly teaching hours:*** *l+cw+lw*  2+0+0/week | ***Credit*:** 2  ***Exam type****:* tm |
| ***Course leader:***  Prof. Dr. habil. Hosam Bayoumi Hamuda | | ***Position:***  Associate professor  Private university professor | ***Required preliminary knowledge: -*** | |
| ***Curriculum:*** | | | | |
| The task of the subject is to provide the fundamental of structure, bioprocesses ecology, genetics, biotechnology and relation of human and of microorganisms. Furthermore, to familiarize students with the role of microbes in nature, agriculture and the food economy. The topics: Introduction. General survey and outline of microorganisms. Viruses and other acellular microorganisms. Prokaryotic microorganisms: Bacteria and archaea. Eukaryotic microorganisms: General Survey of fungi, algae and protozoa. Visualization and structure of microorganisms: Methods of microbial observation. Organization and structure of microorganisms. Microbial Growth and Metabolism: Culture, nutrition and growth of microorganisms, microbial energetic and carbon flow, biosynthesis of macromolecules.  Microbial Genetics: Nucleic acids, replication and expression and protein synthesis, gene transfer in bacterial (transformation, transduction, conjugation, transfection, protoplast fusion, electroporation, restriction and modification of DNA, recombination and enzymes involved). Modern Techniques in Microbiology: PCR, LCR, RFLP, DNA foot and fingerprinting, gene sequencing and mapping and genetic variation. Microbial Ecology: Energy transfer and ecosystem management, microbe-microbe, microbe-plant and microbe-animal interactions. Methods of controlling the microbial growth. Environmental Microbiology: Influence of environmental factors on the growth and distribution of microorganisms, biogeochemical cycling and interactions among microbial populations. Agricultural Microbiology. Environmental Quality, Wastes and pollutants biodegradation, and bioremediation. Fermentation Industry. Food and Industrial Microbiology: Food Microbiology-Food spoilage, Food preservation methods, Microbiological food production. Human Microbiology. Microbial enhanced recovery of mineral resources. Biodeterioration (paper, wood, paint, textiles and metal corrosion). Microorganisms and energy production. Roles of microorganisms in biosphere. | | | | |
| **Detailed description of the subject, timetable** | | | | |
| **Weeks** | **Topics of lectures** | | | |
| 1. | **Lecture**: Introduction. General survey and outline of microorganisms.  Practical: | | | |
| 2. | **Lecture**: Viruses and other acellular microorganisms. Prokaryotic microorganisms: Bacteria and archaea.  Practical: | | | |
| 3. | **Lecture**: Eukaryotic microorganisms: General Survey of fungi, algae and protozoa. Visualization and structure of microorganisms: Methods of microbial observation. Organization and structure of microorganisms.  Practical: | | | |
| 4. | **Lecture**: Microbial Growth and Metabolism: Culture, nutrition and growth of microorganisms, microbial energetic and carbon flow, biosynthesis of macromolecules.  Practical: | | | |
| 5. | **Lecture**: Microbial Genetics: Nucleic acids, replication and expression and protein synthesis, gene transfer in bacterial (transformation, transduction, conjugation, transfection, protoplast fusion, electroporation, restriction and modification of DNA, recombination and enzymes involved).  Practical: | | | |
| 6. | **Lecture**: Modern Techniques in Microbiology: PCR, LCR, RFLP, DNA foot and fingerprinting, gene sequencing and mapping and genetic variation.  **1st written examination**  Practical: | | | |
| 7. | **Lecture**: Microbial Ecology: Energy transfer and ecosystem management, microbe-microbe, microbe-plant and microbe-animal interactions. Methods of controlling the microbial growth.  Practical: | | | |
| 8. | **Lecture**: Environmental Microbiology: Influence of environmental factors on the growth and distribution of microorganisms, biogeochemical cycling and interactions among microbial populations.  Practical: | | | |
| 9. | **Lecture:** Agricultural microbiology. Environmental quality, biological degradation and bioremediation of waste and pollutants.  Practical: | | | |
| 10. | **Lecture**: Fermentation industry. Food and industrial microbiology: Food microbiology-food spoilage, Food preservation methods, Microbiological food production.  Practical: | | | |
| 11. | **Lecture**: Human Microbiology  Practical: | | | |
| 12. | **Lecture**: Microbial enhanced recovery of mineral resources. Biodeterioration (paper, wood, paint, textiles and metal corrosion).  **2nd written examination**  Practical: | | | |
| 13. | **Lecture**: Microorganisms and energy production  Practical: | | | |
| 14. | **Lecture**: Roles of microorganisms in biosphere.  Practical: | | | |
| **Mid-term requirements** | | | | |
| **Participation in occupations:**  Participation in practical lessons and lectures is obligated.  Students should not absent more than 2 lectures and 2 practical lessons. If more, the course result is disable | | | | |
| **Mid-terms, protocols, reports, etc.:**  The activities of the student positively complete the course when the student send the homework, reports, etc. and succeed in 2 mid-term exams – at the 6th and 12th weeks- (theory + practice together). For the student who has miss any requirement can completed in the make-up examination will be in the 15th week. | | | | |
| **The method of obtaining a signature / mid-term mark:**  To pass the course: the student should pass 2 mid-term written examinations, (Dates: 1st exam will be on the 6th and the second on the 12th week) solving the homework questions and write essay (min. 5 pages) (sending Deadline: 17th of November 2024) as well as the practical final report of the practices.  Results: Total marks of the subject at the end of the semester is less than 50%, the student should go for correction opportunities are available according to 17§(6) of Education and Examination Regulations (TVSZ). The rewrite examination will be on the 15th week, in Lab 8 at 13:00 pmTerm marks: 85-100%: excellent (5), 75-84%: good (4), 65-74%: satisfactory (3), 50-64%: pass (2), 0-49%: fail (1). | | | | |
| **Professional competencies:** | | | | |
| From a practical point of view, student should know the microbiological complexity, organization, management in given environmental and economic conditions, as well as research, development and problem-solving opportunities. Knowledge of general and specific mathematical, natural and social scientific principles, rules, relations, and procedures as required pursuing activities in the special field of environment protection. Knowledge of the learning, knowledge acquisition, and data collection methods of the special fields of environment protection, their ethical limitations and problem-solving techniques from microbiological point of view. Comprehensive knowledge of the basic features and interrelations of environmental elements and the environmentally harmful substances affecting the microbial life. Able to cooperate with engineers involved in the development and application of production and other technologies to develop the given technology in terms of environment protection. Able to participate creatively in engineering work based on their multidisciplinary skills, and to adapt to continuously changing circumstances. Collaboration with civil organizations engaged in environment protection, but willing to argue to develop optimal solutions. Constantly upgrading their knowledge of using microorganisms in environment protection by attending organized professional development training courses. Sharing experiences with colleagues, thus promoting their development. Taking responsibility towards society for their decisions made in the scope of environment protection***.*** | | | | |
| **Literature*:*** | | | | |
| * PPT of lectures * Madigan, M. T, Martinko, J. M., Bender K., Buckley, D., Stahl, D (2015): Brock Biology * of Microorganisms, Benjamin Cumming, 14th edition, pp: 1030, ISBN 978-1-292- * 01831-7 * Richard Hunt et al. (2011): [Microbiology and Immunology On-line](http://www.freebooks4doctors.com/link.php?id=1099). The Board of Trustees of the University of South Carolina * Kenneth Todar (2008): [Todar’s Online Textbook of Bacteriology](http://www.freebooks4doctors.com/link.php?id=1427). University of Wisconsin * David M. Sander (2007): [Big Picture Book of Viruses](http://www.freebooks4doctors.com/link.php?id=1452). * Julie B. Wolf (2005): [Applied Molecular Biology](http://www.freebooks4doctors.com/link.php?id=1221). Beginning Laboratory Manual. University of Maryland, Baltimore County (UMBC). * Madigan, Martinko and Parker (2000): Biology of Microorganisms. 8th edition Southern Illinois University, Carbondale * Samual Baron et al. (1996): [Medical Microbiology](http://www.freebooks4doctors.com/link.php?id=1374). 4th edition University of Texas Medical Branch | | | | |
| **Comments**:  Attendance at the lectures is mandatory! Obligations of attendance can be fulfilled in case of a maximum of 4 absences. In case of 5th absence from the sessions, the course can no longer be completed. At least sufficient (50-64% = 2) completion of the med-term exams, preparation of practical reports, written of one essay and solving the homework questions. | | | | |