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| **Course Title-Course Code: METALLODRUGS- CHEM 430** | | | | | | **CHEMISTRY DEPT.** | | |
| **Semester** | **Methods of Education** | | | | | | **Credits** | |
| **Lecture** | **Recite** | **Lab.** | **Field Study** | **Other** | **Total** | **Credit** | **ECTS Credit** |
| 7-8 | 28 |  |  | 30 | 22 | 80 | 2 | 3 |
| **Language** | Turkish | | | | | | | |
| **Compulsory / Elective** | Elective | | | | | | | |
| **Prerequisites** | - | | | | | | | |
| **Course Contents** | The history of metal therapeutics, The use of metals in medicine, The anticancer metallodrugs, Metal complexes used for treating disease and their reactions in biological systems, Metal nanoparticles in diagnosing disease. | | | | | | | |
| **Course Objectives** | To learn the metallotherapeutic drugs and metal-based diagnostic agents used in diseases as cancer and others. | | | | | | | |
| **Learning Outcomes and competences** | To learn the use of metals in medicine as diagnosing and treating agents, and also investigate the interaction of metals with biological molecules. | | | | | | | |
| **Textbook and /or References** | 1. Dabrowiak JC, Metals in Medicine (2009) John Wiley & Sons, Ltd, Department of Chemistry, Syracuse University, New York-USA  2. Gielen M., Tiekink RT, Metallotherapeutic Drugs and Metal-Based Diagnostic Agents (2005) John Wiley & Sons, Ltd, West Sussex, England  3. Housecroft, C.E., Inorganic Chemistry, Pearson Education Limited, Harlow-England | | | | | | | |
| **Assessment Criteria** |  | | | | | If any, mark as (X) | | Percentage |
| Midterm Exams | | | | | X | | 30 |
| Quizzes | | | | |  | |  |
| Homeworks | | | | | X | | 10 |
| Projects | | | | |  | |  |
| Term Paper | | | | |  | |  |
| Laboratory Work | | | | |  | |  |
| Other | | | | |  | |  |
| Final Exam | | | | | X | | 60 |
| Social Sciences | | | | |  | | |
| **Prepared by** | Prof. Dr. Nurcan KARACAN, Assist.Prof. Ayla BALABAN GÜNDÜZALP | | | | | | | |
| **Weeks** | Subject | | | | | | | |
| **1**  **2**  **3**  **4**  **5**  **6**  **7**  **8**  **9**  **10**  **11**  **12**  **13**  **14** | The Use of Metals in Medicine  Metallo-Drugs And Their Action  Biology of Lithium: Targets and Therapeutics  Metallotherapeutic Arsenic Compounds  Antimony in Medicine  The Use of Iron-Based Drugs in Medicine  Ruthenium, Titanium and Gallium for Treating Cancer  **MIDTERM EXAM**  Gold Compounds for Treating Arthritis, Cancer and Other Diseases  Vanadium, Copper and Zinc in Medicine  Metal Complexes for Diagnosing Disease  Cobalt Complexes as Potential Pharmaceutical Agents  The Use of Palladium and Cisplatin Complexes as Anticancer Agents  Nanomedicine | | | | | | | |

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| Course Title-Course Code: Supramolecular chemistry  CHEM 464 | | | | | | Name of the Programme: CHEMISTRY DEPT | | | | | |
| Semester | Teaching Methods | | | | | | | | | Credits | |
| Lecture | Recite | Lab. | Field Study | | Homework | Other | | Total | Credit | **ECTS Credit** |
| **7-8** | 28 | - | - | - | | 30 | 22 | | 80 | **2** | **3** |
| Language | Turkish | | | | | | | | | | |
| Compulsory / Elective | Elective | | | | | | | | | | |
| Prerequisites | - | | | | | | | | | | |
| Course Contents | [Control of supramolecular chemistry](http://en.wikipedia.org/wiki/Supramolecular_chemistry#Control_of_supramolecular_chemistry) ([Thermodynamics](http://en.wikipedia.org/wiki/Supramolecular_chemistry#Thermodynamics), [environment](http://en.wikipedia.org/wiki/Supramolecular_chemistry#Environment)). [Concepts in supramolecular chemistry](http://en.wikipedia.org/wiki/Supramolecular_chemistry#Concepts_in_supramolecular_chemistry) [(Molecular self-assembly](http://en.wikipedia.org/wiki/Supramolecular_chemistry#Molecular_self-assembly), [Molecular recognition and complexation](http://en.wikipedia.org/wiki/Supramolecular_chemistry#Molecular_recognition_and_complexation) [Biomimetics](http://en.wikipedia.org/wiki/Supramolecular_chemistry#Biomimetics),  [Imprinting](http://en.wikipedia.org/wiki/Supramolecular_chemistry#Imprinting), [Molecular machinery](http://en.wikipedia.org/wiki/Supramolecular_chemistry#Molecular_machinery)) Supramolecular organic chemistry, Supramolecular inorganic chemistry, Supramolecular polymer chemistry, [Building blocks of supramolecular chemistry](http://en.wikipedia.org/wiki/Supramolecular_chemistry#Building_blocks_of_supramolecular_chemistry) ([Synthetic recognition motifs](http://en.wikipedia.org/wiki/Supramolecular_chemistry#Synthetic_recognition_motifs), [Macrocycles](http://en.wikipedia.org/wiki/Supramolecular_chemistry#Macrocycles), [Structural units](http://en.wikipedia.org/wiki/Supramolecular_chemistry#Structural_units)). Dendrimers and supramolecular chemistry, Supramolecular Assembly of Dendrimers, [Applications](http://en.wikipedia.org/wiki/Supramolecular_chemistry#Applications) | | | | | | | | | | |
| **Course Objectives** | To understand the role of supramolecular chemistry in organic and inorganic chemistry, biochemistry and materials science. The course includes discussion of the design, synthesis, investigation of the behaviour of, and applications of supramolecular compounds to areas such as molecular electronics, molecular recognition and the mimicking of biological systems. | | | | | | | | | | |
| **Learning Outcomes and Competences** | The lesson is objected to provide students with an basic level of understanding regarding the principles of supramolecular chemistry and applications of supramolecular systems in bio-, nano- and materials science. | | | | | | | | | | |
| References | **--** Supramolecular Chemistry (Oxford Chemistry Primers, 74),Paul D. Beer, Philip A. Gale, David K. Smith  -Core Concepts in Supramolecular Chemistry and Nanochemistry, Jonathan W. Steed, David R. Turner, Karl Wallace - | | | | | | | | | | |
| **Assessment Criteria** |  | | | | **If** any, mark **as (X)** | | | **Percent (%)** | | | |
| **Midterm Exams** | | | | X | | | 40 | | | |
| **Quizzes** | | | |  | | |  | | | |
| **Homeworks** | | | | X | | | 20 | | | |
| **Projects** | | | |  | | |  | | | |
| **Term Paper** | | | |  | | |  | | | |
| **Laboratory Work** | | | | X | | |  | | | |
| **Other** | | | |  | | |  | | | |
| **Final Exam** | | | | X | | | 40 | | | |
| **Prepared by** | Associate Prof. Dr. Nurşen SARI | | | | | | | | | | |
| **Hafta** | **Konular** | | | | | | | | | | |
| **1…………**  **2, 3………**  **4……………**  **5……………**  **6, 7…………**  **8……………**  **9……………**  **10………….**  **11………….**  **12………….**  **13.…………**  **14………….** | General Overview, Control of supramolecular chemistry  Self-Assembly in Nature, Self-Assembly in Synthetic Chemistry  In the Supramolecular chemistry, self-assembly, complexation, synthesis  Supramolecular organic chemistry  Supramolecular inorganic chemistry  Supramolecular polymer chemistry  Midterm Exam  In the Supramolecular chemistry mechanically-interlocked molecular architectures  Biomimetics, Molecular machinery  Buildig blocks of supramolecular chemistry  Dendrimers and supramolecular chemistry  Supramolecular Assembly of Dendrimers, applications | | | | | | | | | | |

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| Course Title-Course Code: Bioinorganic Chemistry CHEM-406 | | | | | Name of the Programme: Department of Chemistry | | | | | |
| Semester | Teaching Methods | | | | | | | Credits | | |
| Lecture | Recite | Lab. | Project/Field study- | Ödev | Other | Total | Credit | | **AKTS Credit** |
| **7-8** | 28 |  |  |  | 40 | 12 | 80 | **2** | | **3** |
| Language | Turkish | | | | | | | | | |
| Compulsory / Elective | **Elective** | | | | | | | | | |
| Prerequisites | **-** | | | | | | | | | |
| Course Contents | Role of Metals in Biological Systems, Oxygen and electron carrier complexes, Investigation of the Porphyrins as iron complexes, Role of Zinc and copper in enzymes , inorganic medicinal compound, Role of Nonmetals in biological systems | | | | | | | | | |
| **Course Objectives** | to teach the relationship between biochemistry and inorganic chemistry, to explain role of metals and nonmetals in biological systems, to teach metal containing drugs used in medicine | | | | | | | | | |
| **Learning Outcomes and Competences** | The student will understand the relationship between biochemistry and inorganic chemistry. The student will learn the properties of metal and nonmetal that make them vital to natural systems with an emphasis on basic inorganic chemistry | | | | | | | | | |
| **Textbook and /or References** | 1-G.L. Miessler, D.A. Tarr, Inorganic Chemistry, PrenticeHall  2-D.F.Shriver, P. W. Atkins, C. H. Langford, Inorganic Chemistry, Oxford Chem  3- Roat-Malone, Rosette M.Bioinorganic chemistry : a short course, John Wiley & Sons, (2002)  4-Stephen j. Lippard, Jeremy m. Berg, Principles of Bioinorganic chemistry, University Science Boks, California,(1994) | | | | | | | | | |
| **Assessment Criteria** |  | | | | | **If any,mark *as (X)*** | | | **Percent (%)** | |
| **Midterm Exams** | | | | | X | | | 40 | |
| **Quizzes** | | | | |  | | |  | |
| **Homeworks** | | | | |  | | | 20 | |
| **Projects** | | | | |  | | |  | |
| **Term Paper** | | | | |  | | |  | |
| **Laboratory Work** | | | | |  | | |  | |
| **Other** | | | | |  | | |  | |
| **Final Exam** | | | | | X | | | 40 | |
| **Instructors** | **Assoc. Prof. Dr. Ümmühan Özdemir Özmen , ummuhan@gazi.edu.tr** | | | | | | | | | |
| **Week** | Subject | | | | | | | | | |
| 1  2  3  4  5  6  7  8  9  10  11  12  13  14 | - Role of Metal ions in Biological Systems  - Oxygen and electron carrier complexes  -Investigation of the hemoglobin and myoglobin as iron complexes  - Investigation of the porphyrins as iron complexes  - Other iron compounds  - Investigation of the Chlorophyll as magnesium complexes  - The Structure of Cobalt complex in Cobalamin (Coenzyme B12)  - Midterm  - Role of Zinc and copper in enzymes  - Nitrogen fixation  - Platinum-Containing Anticancer Agents  - İnvestigation of Gold complexes used in arthritic treatment  - Some toxic metals in biological systems  - Role of Nonmetals in biological systems | | | | | | | | | |

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| Course Title-Course Code: Archaeology for Chemist KIM 473 | | | | | | Name of the Programme: CHEMISTRY DEPT | | | | | |
| Semester | Teaching Methods | | | | | | | | | Credits | |
| Lecture | Recite | Lab. | Field Study | | Homework | Other | | Total | Credit | **ECTS Credit** |
| **7-8** | 28 | - | - | - | | 30 | 20 | | 78 | **2** | **3** |
| Language | Turkish | | | | | | | | | | |
| Compulsory / Elective | Elective | | | | | | | | | | |
| Prerequisites | - | | | | | | | | | | |
| Course Contents | Early investigations, The Growth of scientific archaeology in the 20th century. Analytical techniques applied to archaelogy (Tecniques based on optical wavelengths, X-ray techniques using, mass spectrometric techniques, chromatographic techniques, infrared and raman spectroscopy). Origin and formation of obsidian, sources of obsidian in the eastern Mediterranean and neighboring regions, archaeological implications. The structure and chemistry of archaeological glass, the color of glass, the decay of medieval window glass, radiogenic isotopes and the provenance of glass. The production methods of brass in antiquity, the early history of brass and zinc, the chemical analysis of metal objects. Resins: definition and uses, Chemistry of resin, analysis of resin and archaeological contexts. The structure of bone, aminoacid racemization dating of the Paleo-Indian. The trace element approach to metal provenance, natural radioactivity and the stable isotopes of lead, lead isotopes in archaeology. The chemistry of human bone: diet, nutrition status and mobility. Trace elements in bone mineral, other isotopes. The archaeological relevance of chemical application. | | | | | | | | | | |
| **Course Objectives** | Students in this course will learn the methods and theories of archaeology. Students will learn that basics of laboratory techniques necessary for the final analysis and interpretation of field data. | | | | | | | | | | |
| **Learning Outcomes and Competences** | Students will be able to understand the nature of archaeology and how it can aid in understanding the human past. Students will learn to evaluate the quality of interpretations of archaeological remains presented in both scholarly and popular journals, magazines, movies, and newspapers. | | | | | | | | | | |
| References | 1. Archooelogical Chemistry; AM Pollard, Carl Heron, Rotal Society of Chemistry.  Thomas Graham House, Science Park, Milton Road. Cambridge CB4 OWF, UK  2. Archaeological Chemistry: Analytical Techniques and Archaeological Interpretation  M.D.Glascock,R.J.Speakman,R.S.Popelka-Filcoff, American Chemical Society: Washington, D.C. | | | | | | | | | | |
| **Assessment Criteria** |  | | | | **If any, mark** **as (X)** | | | **Percent (%)** | | | |
| **Midterm Exams** | | | | X | | | 40 | | | |
| **Quizzes** | | | |  | | |  | | | |
| **Homeworks** | | | | X | | | 20 | | | |
| **Projects** | | | |  | | |  | | | |
| **Term Paper** | | | |  | | |  | | | |
| **Laboratory Work** | | | | X | | |  | | | |
| **Other** | | | |  | | |  | | | |
| **Final Exam** | | | | X | | | 40 | | | |
| **Prepared by** | Associate Prof. Dr. Nurşen SARI | | | | | | | | | | |
| **Hafta** | **Konular** | | | | | | | | | | |
| **1…………**  **2, 3………**  **4……………**  **5……………**  **6, 7…………**  **8……………**  **9……………**  **10………….**  **11………….**  **12………….**  **13.…………**  **14………….** | The development of archaelogical chemistry  Analytical techniques applied to archaelogy  Obsidion characterization in the Eastern Mediterranean  The geochemistry of clays and the provenance of ceramics.  The chemistry corrosion and provenance of archaeological glass.  The Chemical Study of Metals  Midterm Exam  The chemistry and use of resinous substances  Amino acid stereochemistry.  Lead Isotope Geochemistry and the trade in metals.  The chemistry of human bone, trace elements in bone mineral.  Whither Archaeological Chemistry | | | | | | | | | | |

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| **Cou Course Title-Course Code: Chemistry of Nonmetals – CHEM 408** | | | | | | | **Name of the Programme: Science-Art Faculty** | | | | |
| **Semester** | **Teaching Methods** | | | | | | | | **Credits** | | |
| **Lecture** | **Recite** | **Lab.** |  |  | **Other** | **Total** | | **Credit** | **ECTS Credit** | |
| 7-8 | 28 | - | - | - | - | 40 | 68 | | 2 | 3 | |
| **Language** | Turkish | | | | | | | | | | |
| **Compulsory / Elective** | Elective | | | | | | | | | | |
| **Prerequisites** | - | | | | | | | | | | |
| **Course Contents** | Classification of Elements and Trends in Periodic Table; Occurrence, Preparation and Production of Nonmetals; Atomic and Molecular Structures; Physical and Chemical Properties; Applications and Uses of  Nonmetals | | | | | | | | | | |
| **Course Objectives** | To teach the properties of nonmetals and their compounds, and applications | | | | | | | | | | |
| **Learning Outcomes and Competences** | To learn the properties of nonmetals and their compounds, and applications | | | | | | | | | | |
| **Textbook and /or References** | Main Group Chemistry, W.Henderson, Royal society of chemistry, 2000.  Chemistry of the Elements, N,N Greenwood and A Earnshaw, Butterworth Heinemann, 2002.  F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry, Interscience Publishers | | | | | | | | | | |
| **Assessment Criteria** |  | | | | | | | **If any,mark**  **as (X)** | | | **Percent**  **(%)** |
| Midterm Exams | | | | | | | X | | | 40 |
| Quizzes | | | | | | | - | | |  |
| Homeworks | | | | | | | X | | | 10 |
| Projects | | | | | | | - | | |  |
| Term Paper | | | | | | | - | | |  |
| Laboratory Work | | | | | | | - | | |  |
| Other | | | | | | | - | | |  |
| Final Exam | | | | | | | X | | | 50 |
| **Prepared by** | **Prof.Dr.Nurcan KARACAN, Yrd.Doç.Dr. Ayla BALABAN GÜNDÜZALP** | | | | | | | | | | |
| **Week** | **Subject** | | | | | | | | | | |
| **1**  **2**  **3**  **4**  **5**  **6**  **7**  **8**  **9**  **10**  **11**  **12**  **13**  **14** | General Properties of Elements  Hydrogen and its compounds  Application field of hydrogen  Properties of Group IIIA Elements  Properties of Group IVA Elements  Applications of Group IIIA-IV Elements  Properties of Group VA Elements  Properties of Group VIA Elements  Applications of Group VA-VIA Elements  **Midterm Exam**  Production of Group VIIA Elements and Properties of their Compounds  Applications of Group VIIA Elements  Properties of Group VIIIA Elements and Trends in Group  Applications of Group VIIIA Elements | | | | | | | | | | |

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| Course Title-Course Code:  REDOX PROPERTIES OF ELEMENTS KIM 423 | | | | | | Name of the Programme:  CHEMISTRY DEPARTMENT | | | | | | |
| Semester | Teaching Methods | | | | | | | | | Credits | | |
| Lecture | Recite | Lab. |  |  | | Other | Total | | Credit | **ECTS Credit** | |
| **7-8** | 28 | - | - | - | - | | 40 | 68 | | **2** | **3** | |
| Language | Turkish | | | | | | | | | | | |
| Compulsory / Elective | Elective | | | | | | | | | | | |
| Prerequisites | No | | | | | | | | | | | |
| Course Contents | Abundance and origin of elements, production of metals, physical and chemical properties of metalic compounds, industrial applications | | | | | | | | | | | |
| **Course Objectives** | To teach the metals, their chemical properties and industrial applications | | | | | | | | | | | |
| **Learning Outcomes and Competences** | To learn the metals, their chemical properties and industrial applications | | | | | | | | | | | |
| **Textbook and /or References** | Main Group Chemistry, W.Henderson, Royal society of chemistry, 2000  Chemistry of the Elements, N,N Greenwood and A Earnshaw, Butterworth Heinemann, 2002  d- and f- Block Chemistry, C.J. Jones, Royal society of chemistry, 2000 | | | | | | | | | | | |
| **Assessment Criteria** |  | | | | | | | | If any,mark ***as (X)*** | | | **Percent**  **(%)** |
| **Midterm Exams** | | | | | | | | **X** | | | **40** |
| **Quizzes** | | | | | | | | **-** | | | **-** |
| **Homeworks** | | | | | | | | **-** | | | **-** |
| **Projects** | | | | | | | | **-** | | | **-** |
| **Term Paper** | | | | | | | | **-** | | | **-** |
| **Laboratory Work** | | | | | | | | **-** | | | **-** |
| **Other** | | | | | | | | **-** | | | **-** |
| **Final Exam** | | | | | | | |  | | | **60** |
| **Instructors** | Prof. Dr. Nurcan KARACAN | | | | | | | | | | | |
| **Week** | **Subject** | | | | | | | | | | | |
| **1**  **2**  **3**  **4**  **5**  **6**  **7**  **8**  **9**  **10**  **11**  **12**  **13**  **14** | Origin of elements  Abundances of elements in the universe  Production and preparation of metals  Metalic Bonding (Band Theory)  Alloys  Alkaline metals  Alkaline earth metals  p-block metals  Midterm exam  Comparison of transtion metals and main group metals  Transtion metals (3-8 groups)  Transtion metals (9-12 groups)  Inner transtion metals (lanthanides)  Inner transtion metals (actinides) | | | | | | | | | | | |

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| Course Title-Course Code:  INORGANIC REACTION MECHANISM . KİM 457 | | | | | | Name of the Programme:  CHEMISTRY DEPARTMENT | | | | | | |
| Semester | Teaching Methods | | | | | | | | | Credits | | |
| Lecture | Recite | Lab. |  |  | | Other | Total | | Credit | **ECTS Credit** | |
| **7-8** | 28 | - | - | - | - | | 40 | 68 | | **2** | **3** | |
| Language | Turkish | | | | | | | | | | | |
| Compulsory / Elective | Elective | | | | | | | | | | | |
| Prerequisites | No | | | | | | | | | | | |
| Course Contents | Basic concepts, Stabilty and inertness, Energy profiles, Replacement reactions at tetrahedral and square planer, Kinetic of reaction and mecanism, Affects of some factors on the Substitution reaction, Π bonding concept, σ bonding concept, Affects of cis and trans, Influence of the entering group, Substitution reactions of octahedral complexes, Replacement of coordinated water, Stereochemical, change in replacement react, Synthesis of coordination compounds by substitution reactions, Thermodynamic stabilty of coordination compounds | | | | | | | | | | | |
| **Course Objectives** | The aim of this course is to teach the basic concepts and affects on the substitution reaction in inorganic reaction mechanism. | | | | | | | | | | | |
| **Learning Outcomes and Competences** | On the basis of inorganic reaction mechanism concepts and models thought during the course, the students will be learn importance of the substitution reaction in the coordination chemistry and apply their knowledge to various mechanism methods. | | | | | | | | | | | |
| **Textbook and /or References** | Anorganik kimya, N.KTunalı ve S. Özkar, Gazi Kitabevi, Ankara 2005  Anorganik kimya,3. Baskı, Çeviri, S. Özkar, B. Çetinkaya, A. Gül, Y. Gök, Bilim yayıncılık, Ankara (DF. Shriver, PW. Atkins 3.th edition Oxford Universty Press)  Inorganic Reaction Mechanism, Martin L. Tobe | | | | | | | | | | | |
| **Assessment Criteria** |  | | | | | | | | If any,mark ***as (X)*** | | | **Percent**  **(%)** |
| **Midterm Exams** | | | | | | | | **X** | | | **40** |
| **Quizzes** | | | | | | | | **-** | | | **-** |
| **Homeworks** | | | | | | | | **-** | | | **-** |
| **Projects** | | | | | | | | **-** | | | **-** |
| **Term Paper** | | | | | | | | **-** | | | **-** |
| **Laboratory Work** | | | | | | | | **-** | | | **-** |
| **Other** | | | | | | | | **-** | | | **-** |
| **Final Exam** | | | | | | | |  | | | **60** |
| **Instructors** | Assit. Prof. Dr.Nurşen SARI;nursens@gazi.edu.tr, Prof. Dr. Perihan GUKAN; pgurkan@gazi.edu.tr, Prof. Dr. Nurcan KARACAN, nurcan@gazi.edu.tr. | | | | | | | | | | | |
| **Week** | **Subject** | | | | | | | | | | | |
| **1**  **2**  **3**  **4**  **5**  **6**  **7**  **8**  **9**  **10**  **11**  **12**  **13**  **14** | Basic concepts, Stabilty and inertness,  Energy profiles  Replacement reactions at tetrahedral and square planer  Kinetic of reaction and mecanism  Affects of some factors on the Substitution reaction  Π bonding concept, σ bonding concept  Affects of cis and trans on replacement reactions at square planer  Influence of the entering group  Quiz  Substitution reactions of octahedral complexes  Replacement of coordinated water  Stereochemical change in replacement react.  Synthesis of coordination compounds by substitution reactions  Thermodynamic stabilty of coordination compounds | | | | | | | | | | | |

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| Course Title-Course Code:  POİNT GROUPS AND APPLICATİONS CHEM 437 | | | | Name of the Programme: CHEMISTRY DEPT. | | | | | | |
| Semester | Methods of Education | | | | | | | Credits | | |
| Lecture | Recit | Lab. | | Other | Total | | Credit | ECTS Credit | |
| **7-8** | 28 |  |  | | 40 | 68 | | **2** | **3** | |
| Language | Turkish | | | | | | | | | |
| Compulsory / Elective | Optional | | | | | | | | | |
| Prerequisites | - | | | | | | | | | |
| Catalog Description | Symmetry, symmetry elements and symmetry operations, point croups, character tables, Symmetry Adapted Linear Combinations, Direc Product. Applications- Hybrit orbitals, Molecular Vibrations, Ligand Field Theory | | | | | | | | | |
| **Course Objectives** | To teach the point grups, character tables and their applications. | | | | | | | | | |
| **Course Outcomes** | To learn the point grups, character tables and their applications. | | | | | | | | | |
| **Textbook and /or References** | Symmetry through the Eyes of a Chemist, M. Hargittai, I. Hargittai, Springer, 2008  Chemical Applications of Groups Theory, F.a. Cotton, Wiley-Intersciense, 3ed. | | | | | | | | | |
| ***Assessment Criteria*** |  | | | | | | Quantity | | | **Percentage** |
| **Midterm Exams** | | | | | | 1 | | | 40 |
| **Quizzes** | | | | | | - | | | - |
| **Homeworks** | | | | | | - | | | - |
| **Projects** | | | | | | - | | | - |
| **Term Paper** | | | | | | - | | | - |
| **Laboratory Work** | | | | | | - | | | - |
| **Other** | | | | | | - | | | - |
| **Final Exam** | | | | | | 1 | | | 60 |
| **Course Category by Content (%)** | **Mathematics and Basic Sciences** | | | | | | 70 | | | |
| **Engineering Science** | | | | | | 30 | | | |
| **Engineering Design** | | | | | | - | | | |
| **Social Sciences** | | | | | | - | | | |
| **Instructors** | **Prof.Dr.Nurcan KARACAN, Yrd.Doç.Dr. Ayla BALABAN GÜNDÜZALP** | | | | | | | | | |

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| **Course Title-Course Code: Molecular Modelling with Computer KİM 432** | | | | | | **Name of the Programme: Chemistry Dep.** | | | | | | |
| **Semester** | **Teaching Methods** | | | | | | | | | **Credits** | | |
| **Lecture** | **Recite** | **Lab.** |  |  | | **Other** | **Total** | | **Credit** | **ECTS Credit** | |
| 7-8 | 28 | - | - | - | - | | 40 | 68 | | 2 | 3 | |
| **Language** | **Turkish** | | | | | | | | | | | |
| **Compulsory / Elective** | **Elective** | | | | | | | | | | | |
| **Prerequisites** | **-** | | | | | | | | | | | |
| **Course Contents** | Introduction to Molecular Modeling and applications of Gaussian 03 software | | | | | | | | | | | |
| Course Objectives | To teach how to use Gaussian 03 software and its applications with various computational methods | | | | | | | | | | | |
| **Learning Outcomes and Competences** | To learn how to use Gaussian 03 software and its applications with various computational methods | | | | | | | | | | | |
| **Textbook and /or References** | J. Foresman & A. Frisch **Exploring Chemistry with Electronic-Structure Methods, 2nd Edn.** (2003)., Gaussian Inc., Pittsburg PA. | | | | | | | | | | | |
| **Assessment Criteria** |  | | | | | | | | ***If any,mark***  ***as (X)*** | | | **Percent**  **(%)** |
| **Midterm Exams** | | | | | | | | x | | | 40 |
| **Final Exam** | | | | | | | | x | | | 60 |
| **Instructors** | Prof. Dr. Nurcan Karacan | | | | | | | | | | | |
| Week | Subject | | | | | | | | | | | |
| Week #1 | Introduction to Molecular Modelling | | | | | | | | | | | |
| Week #2 | Molecule Building | | | | | | | | | | | |
| Week #3 | Single Point Energy Calculation | | | | | | | | | | | |
| Week #4 | Geometry Optimization | | | | | | | | | | | |
| Week #5 | Frequency Calculations | | | | | | | | | | | |
| Week #6 | Conformation analysis | | | | | | | | | | | |
| Week #7 | Potential energy surface diagrams (PES) | | | | | | | | | | | |
| Week #8 | First exam | | | | | | | | | | | |
| Week #9 | Molecular Orbitals and Orbital Energies | | | | | | | | | | | |
| Week #10 | NMR magnetic shielding values | | | | | | | | | | | |
| Week #11 | UV Electronic Transitions | | | | | | | | | | | |
| Week #12 | Thermochemistry (atomization energy, electron affinity, ionisation potential..) | | | | | | | | | | | |
| Week #13 | Chemical Reactions | | | | | | | | | | | |
| Week #14 | Reactivity | | | | | | | | | | | |

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| **Course Title-Course Code: ORGANOMETALLIC CHEMISTRY - CHEM. 433** | | | | | | | | | | | | | **Name of the Programme:**  **CHEMISTRY** | | | | | | | | | | | |
| **Semester** | | **Teaching Methods** | | | | | | | | | | | | | | | | | **Credits** | | | | | |
| **Lecture** | | **Recite** | | **Lab.** | |  | | |  | | **Other** | | **Total** | | | | **Credit** | | | **ECTS Credit** | | |
| 7-8 | | 42 | |  | |  | |  | | |  | | 38 | | 80 | | | | 2 | | | 3 | | |
| **Language** | | Turkish | | | | | | | | | | | | | | | | | | | | | | |
| **Compulsory / Elective** | | Compulsory | | | | | | | | | | | | | | | | | | | | | | |
| **Prerequisites** | | - | | | | | | | | | | | | | | | | | | | | | | |
| **Course Contents** | | General properties and important ligands of organometallic compounds , organometallic reactions, bonding between metal atoms and organic pi systems and organometallic catalysts | | | | | | | | | | | | | | | | | | | | | | |
| **Course Objectives** | | To teach general properties of organometallic compounds and industrial use as catalysts | | | | | | | | | | | | | | | | | | | | | | |
| **Learning Outcomes and Competences** | | To recognize organometallic ligands and compounds. To learn organometallic reactions and organometallic catalysts | | | | | | | | | | | | | | | | | | | | | | |
| **Textbook and /or References** | | İnorganik Kimya G.L.Miessler D.A.Tarr.(çeviri) | | | | | | | | | | | | | | | | | | | | | | |
| **Assessment Criteria** | |  | | | | | | | | | | | | | | | | If any,mark  as (X) | | | | | Percent  (%) | |
| Midterm Exams | | | | | | | | | | | | | | | | X | | | | | 40 | |
| Other | | | | | | | | | | | | | | | |  | | | | |  | |
| Final Exam | | | | | | | | | | | | | | | | X | | | | | 60 | |
| **Prepared by** | | Prof. Dr. Perihan Gürkan, Assoc. Prof. Dr. Ümmühan Özdemir Özmen | | | | | | | | | | | | | | | | | | | | | | |
| **Week** | | Subject | | | | | | | | | | | | | | | | | | | | | | |
| **1**  **2**  **3**  **4**  **5**  **6**  **7**  **8**  **9**  **10**  **11**  **12**  **13**  **14** | | History, organic ligands , nomenclature  The 18-electron rule ,counting electrons  Carbonyl complexes and ligands similar to carbonyl  Carbonyl complexes and ligands similar to carbonyl  Hydride and dihydrogen complexes  Ligands having π systems ,linear π systems  Midterm  Cyclic π systems  Fullerene complexes  Alkyl,carbene and carbyne complexes  Organometallic reactions  Spectral analysis and characterization of organometallic compounds  Organometallic catalysts  Homogeneous and heterogeneous catalysts | | | | | | | | | | | | | | | | | | | | | | |
|  | |  | |  | |  | |  | | |  | |  | |  | | |  |  | | |  |  | |
| Course Title-Course Code: Electronic Spectra of Inorganic Compounds CHEM 411 | | | | | | | | | | | Name of the Programme: Chemistry | | | | | | | | | | | | | |
| Semester | | Teaching Methods | | | | | | | | | | | | | | | | Credits | | | | | | |
| Lecture | | Recite | | Lab. | |  | |  | | | Other | | Total | | | Credit | | | **ECTS Credit** | | | |
| 7-8 | | 28 | |  | |  | |  | |  | | | 50 | | 78 | | | 2 | | | 3 | | | |
| Language | | Turkish | | | | | | | | | | | | | | | | | | | | | | |
| Compulsory / Elective | | Compulsory | | | | | | | | | | | | | | | | | | | | | | |
| Prerequisites | | - | | | | | | | | | | | | | | | | | | | | | | |
| Course Contents | | Ligand and Crystal Field Theory, Term symbols , Free Ions(d1-d9) in Weak and Strong Fields,Racah Parameters, Selection rules, Orgel and Tanabe Sugano diagrams , Electronic Spectra of Oh and Td Complex ions , Determination of Δo from electronic spectra Interelectronic interactions Spectrochemical and Nephelauxetic series, | | | | | | | | | | | | | | | | | | | | | | |
| **Course Objectives** | | To describe the theory of d-d transitions of metal in coordination complexes;interpretations of electronic spectra of dn complexes ,determination of Δ from spectra | | | | | | | | | | | | | | | | | | | | | | |
| **Learning Outcomes and Competences** | | To suggest the number and energies of d-d transitions in Oh and Td coordination complexes, correlation diagrams, interpretations of experimental electronic spectra | | | | | | | | | | | | | | | | | | | | | | |
| **Textbook and /or References** | | İnorganik Kimya –G.L.Miessler D.A.Tarr.(çeviri)  İnorganik Kimya-II Prof. Dr. Cemal Kaya  Anorganik Kimya- Prof. Dr. Saim Özkar  A.B.P.Lewer ,Inorganic Electronic Spectroscopy,2nd ed.Elsevier-1982 | | | | | | | | | | | | | | | | | | | | | | |
| **Assessment Criteria** | |  | | | | | | | | | | | | | | | If any,mark ***as (X)*** | | | | | **Percent**  **(%)** | | |
| **Midterm Exams (2)** | | | | | | | | | | | | | | | x | | | | | 40 | | |
| **Quizzes (2)** | | | | | | | | | | | | | | | x | | | | | 30 | | |
| **Laboratory Work** | | | | | | | | | | | | | | |  | | | | |  | | |
| **Other** | | | | | | | | | | | | | | |  | | | | |  | | |
| **Final Exam** | | | | | | | | | | | | | | | x | | | | | 30 | | |
| **Instructors** | | Prof. Dr. Perihan Gürkan | | | | | | | | | | | | | | | | | | | | | | |
| **Hafta** | | **Konular** | | | | | | | | | | | | | | | | | | | | | | |
| 1  2  3  4  5  6  7  8  9  10  11  12  13  14 | | Introduction, Crystal and Ligand Field Theory  Absorbtion of light, Atomic spectroscopy  Atomic Term symbols (1.quiz)  Atomic Term symbols,Term energies  Ground state term symbols  1. Midterm  Free Ions(d1-d9) in Oh and Td ligand field  Free Ions(d1-d9) in Oh and Td ligand field  Selection rules, Racah Parameters (2.quiz)  Orgel and Tanabe Sugano diagrams  Electronic Spectra of Oh and Td Complex ions  2. Midterm  Spectrochemical and Nephelauxetic series  Determination of Δo from electronic spectra | | | | | | | | | | | | | | | | | | | | | | |

**COURSE DESCRIPTION**

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| MAGNETİSM IN COORDINATION COMPOUNDS**. KİM-465** |
| |  |  |  |  | | --- | --- | --- | --- | | Course Title: | MAGNETISM IN COORDINATION COMPOUNDS | | | | Credits | 2 | Credits | 3 | | Semester | 7-8 | Semester | ELECTIVE | |
| **COURSE INFO** |
| **--LANGUAGE OF INSTRUCTION:** |
| Turkish |
| **NAME OF LECTURER(S)** |
| Assoc. Prof.Ayla BALABAN GÜNDÜZALP |
| **-- WEBSITE/SITES OF LECTURER(S)** |
| <http://websitem.gazi.edu.tr/site/balaban> |
| **-- Email of LECTURER(S)** |
| [balaban@gazi.edu.tr](mailto:balaban@gazi.edu.tr) |
| **-- LEARNING OUTCOMES OF THE COURSE UNIT** |
| Learning magneticproperties of thecoordinationcompoundsandmeasurementtechnique; learningmagneticmaterialsandapplicationfields; learningspectroscopicmethodsusedmagneticfield |
| **-- MODE OF DELIVERY** |
| The mode of delivery of this course is Face to face |
| **-- PREREQUISITES AND CO-REQUISITES** |
| There is no prerequisite or co-requisite for this course. |
| **-- RECOMMENDED OPTIONAL PROGRAMME COMPONENTS** |
| There is no recommended optional programme component for this course.. |
| |  |  | | --- | --- | | **-- COURSE CONTENT** | | | 1. Week | Magnetism and magnetic field | | 2. Week | Magnetism types | | 3. Week | Magnetic properties of compounds and application fields | | 4. Week | Inorganic materials as superconductors | | 5. Week | Magnetism in medical therapy and uses of coordination compounds | | 6. Week | Measurement of magnetic moment of coordination complexes | | 7. Week | Midterm exam | | 8. Week | Contrubiton of spin, orbital and others to magnetic moment | | 9. Week | Temperature effect to magnetic susceptibility, Curie and Neel temperatures | | 10. Week | Magnetism-geometry relation in Valence Bond Theory | | 11. Week | Magnetism in Crystal Field and Molecular Orbital Theories | | 12. Week | Importance of mass spectroscopy for coordination complexes | | 13. Week | Principle of nuclear magnetic resonance for metal complexes | | 14. Week | Determination of magnetism by electron spin resonance method | |
| **-- RECOMMENDED OR REQUIRED READING** |
| **1.** Day, P., Denning, R.G., Evans, S., Gregson, A.K., Hamnet,t A, Orchard, A.F., Sanders, N., Electronic Structure and Magnetism of Inorganic Complexes (Vol:2), The Chemical Society Burlington Houde, London-England, 1971.  **2.**Housecroft, C.E., Inorganic Chemistry, Pearson Education Limited, Harlow-England, 2005.  **3.**Iggo, J.A:, NMR Spectroscopy in Inorganic Chemistry, Oxford Science Publications, New York, USA, 1999.  **4.** Becker, J.S., Inorganic Mass Spectrophometry, Wiley Inc.  Publication, West Sussex, England, 2007. |
| **-- PLANNED LEARNING ACTIVITIES AND TEACHING METHODS** |
| Lecture, Question & Answer, Demonstration |
| **-- WORK PLACEMENT(S)** |
| non |
| |  | | --- | | **-- ASSESSMENT METHODS AND CRITERIA** | | |  |  |  | | --- | --- | --- | |  | **Quantity** | **Percentage** | | **Mid-terms** | 1 | 40 | | **Assignment** | 0 | 0 | | **Exercises** | 0 | 0 | | **Projects** | 0 | 0 | | **Practice** | 0 | 0 | | **Quiz** | 0 | 0 | | **Contribution of In-term Studies to Overall Grade** |  | 40 | | **Contribution of Final Examination to Overall Grade** |  | 60 | | |
| |  |  | | --- | --- | | **-- WORKLOAD** | | | |  |  |  |  | | --- | --- | --- | --- | | **Efficiency** | **Total Week Count** | **Weekly Duration (in hour)** | **Total Workload in Semester** | | **Theoretical Study Hours of Course Per Week** | 14 | 2 | 28 | | **Practising Hours of Course Per Week** |  |  | 0 | | **Reading** | 10 | 2 | 20 | | **Searching in Internet and Library** |  |  | 0 | | **Designing and Applying Materials** |  |  | 0 | | **Preparing Reports** |  |  | 0 | | **Preparing Presentation** |  |  | 0 | | **Presentation** |  |  | 0 | | **Mid-Term and Studying for Mid-Term** | 1 | 13 | 13 | | **Final and Studying for Final** | 1 | 13 | 13 | | **Other** |  |  | 0 | | **TOTAL WORKLOAD:** | | | **74** | | **TOTAL WORKLOAD / 25:** | | | **2.96** | | **ECTS:** | | | **3** | | | |  |  | |
| |  | | --- | | **-- PROGRAM LEARNING OUTCOMES RELATIONAL LEVEL** | | |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **NO** | **PROGRAM LEARNING OUTCOMES** | **1** | **2** | **3** | **4** | **5** | | 1 | To learn with which terms the Science of Chemistry produces knowledge |  |  |  |  | X | | 2 | To learn the benefits of the scientific perspective and method of evaluation. |  |  |  |  | X | | 3 | To have knowledge on the basic subjects of chemistry |  |  |  | X |  | | 4 | To be able to discuss the sociological perspectives critically and to find out the deficiencies in the knowledge and the practice. |  |  |  | X |  | | 5 | To be able to use the knowledge of the field in the daily and professional life with a sense of social responsibility by gaining life-long learning abilities. |  |  |  |  | X | | 6 | To be able to establish links with the other disciplines about social problems and concerns and to learn the differences and similarities of the knowledge between this discipline and related disciplines. |  |  |  | X |  | | 7 | To have a certain knowledge on the methods of reaching to written and visual data sources, and to be able to assess this data in terms of theoretical analysis and practice. |  |  |  |  | X | | 8 | To be able to share ideas and solutions on problems both verbally and in written by providing quantitative and qualitative data. |  |  |  | X |  | | 9 | To be able to follow the knowledge and information on Chemistry science and communicate with colleagues by using a foreign language. |  |  |  | X |  | | 10 | To be able to use the computer softwarealong with other informatics and communicative technologies on a required level by the field. |  |  |  | X |  | | 11 | To be able to maintain the knowledge and the experiences on Chemistry alive, to be able to develop one’s self by exchanging and sharing these experiences with others. |  |  |  |  | X | | |

**COURSE DESCRIPTION**

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| ADVANCED TOPICS IN COORDINATION CHEMISTRY**. KİM-463** |
| |  |  |  |  | | --- | --- | --- | --- | | Course Title: | ADVANCED TOPICS IN COORDINATION CHEMISTRY | | | | Credits | 2 | Credits | 3 | | Semester | 7-8 | Semester | ELECTIVE | |
| **COURSE INFO** |
| **--LANGUAGE OF INSTRUCTION:** |
| Turkish |
| **NAME OF LECTURER(S)** |
| Prof. Nurcan KARACAN, Prof. Perihan GÜRKAN, Assoc. Prof.Ayla BALABAN GÜNDÜZALP |
| **-- WEBSITE/SITES OF LECTURER(S)** |
| <http://websitem.gazi.edu.tr/site/nkaracan>, <http://websitem.gazi.edu.tr/site/pgurkan>, <http://websitem.gazi.edu.tr/site/balaban> |
| **-- Email of LECTURER(S)** |
| [nkaracan@gazi.edu.tr](mailto:nkaracan@gazi.edu.tr), [pgurkan@gazi.edu.tr](mailto:pgurkan@gazi.edu.tr), [balaban@gazi.edu.tr](mailto:balaban@gazi.edu.tr) |
| **-- LEARNING OUTCOMES OF THE COURSE UNIT** |
| Tolearnthesomeadvancedtopics in coordinationchemistry |
| **-- MODE OF DELIVERY** |
| The mode of delivery of this course is Face to face |
| **-- PREREQUISITES AND CO-REQUISITES** |
| There is no prerequisite or co-requisite for this course. |
| **-- RECOMMENDED OPTIONAL PROGRAMME COMPONENTS** |
| There is no recommended optional programme component for this course. |
| |  |  | | --- | --- | | **-- COURSE CONTENT** | | | 1. Week | Introductiontotransition metal complexes | | 2. Week | Bonding theory in transition metal complexes: LFT (Ligand Field Theory) Jahn-Teller Effect | | 3. Week | Bonding theory in transition metal complexes: AOM (Angular Overlap Model) | | 4. Week | Bonding theory in transition metal complexes: AOM and pi bonding | | 5. Week | Bonding theory in transition metal complexes: MOT, application on octahedral complexes | | 6. Week | Bonding theory in transition metal complexes: MOT, application on tetrahedral complexes | | 7. Week | Midterm exam | | 8. Week | Bonding theory in transition metal complexes: MOT, application on square plane complexes | | 9. Week | Electronic spectra of coordination complexes: Term sembols, Selection Rules | | 10. Week | Electronic spectra of coordination complexes: Orgel and Tanabe-Sugano Diagrams | | 11. Week | Electronic spectra of coordination complexes: Charge-Transfer Complexes | | 12. Week | Reaction mechanism of coordination complexes: Substitution Reactions | | 13. Week | Reactionmechanism of coordinationcomplexes: Trans Effects | | 14. Week | Reaction mechanism of coordination complexes: Oxidation Reduction Reactions | |
| **-- RECOMMENDED OR REQUIRED READING** |
| **1.** Karacan N, Gürkan P. (Editors), InorganicChemistry (Miessler G.L. andTarr D.A.), (2002), PalmePublishing, 2nd. ed.Ankara, Türkiye  **2.** Lawrance G.A.,IntroductiontoCoordinationChemistry (2010) John Wiley&Sons Ltd., United Kingdom  **3**. Bertini I.,Gray H.B., Stiefel E.I., Valentine J.S., BiologicalInorganicChemistry (2007) UniversityScienceBooks, USA |
| **-- PLANNED LEARNING ACTIVITIES AND TEACHING METHODS** |
| Lecture, Question & Answer, Demonstration |
| **-- WORK PLACEMENT(S)** |
| non |
| |  | | --- | | **-- ASSESSMENT METHODS AND CRITERIA** | | |  |  |  | | --- | --- | --- | |  | **Quantity** | **Percentage** | | **Mid-terms** | 1 | 40 | | **Assignment** | 0 | 0 | | **Exercises** | 0 | 0 | | **Projects** | 0 | 0 | | **Practice** | 0 | 0 | | **Quiz** | 0 | 0 | | **Contribution of In-term Studies to Overall Grade** |  | 40 | | **Contribution of Final Examination to Overall Grade** |  | 60 | | |
| |  |  | | --- | --- | | **-- WORKLOAD** | | | |  |  |  |  | | --- | --- | --- | --- | | **Efficiency** | **Total Week Count** | **Weekly Duration (in hour)** | **Total Workload in Semester** | | **Theoretical Study Hours of Course Per Week** | 14 | 2 | 28 | | **Practising Hours of Course Per Week** |  |  | 0 | | **Reading** | 10 | 2 | 20 | | **Searching in Internet and Library** |  |  | 0 | | **Designing and Applying Materials** |  |  | 0 | | **Preparing Reports** |  |  | 0 | | **Preparing Presentation** |  |  | 0 | | **Presentation** |  |  | 0 | | **Mid-Term and Studying for Mid-Term** | 1 | 13 | 13 | | **Final and Studying for Final** | 1 | 13 | 13 | | **Other** |  |  | 0 | | **TOTAL WORKLOAD:** | | | **74** | | **TOTAL WORKLOAD / 25:** | | | **2.96** | | **ECTS:** | | | **3** | | | |  |  | |
| |  | | --- | | **-- PROGRAM LEARNING OUTCOMES RELATIONAL LEVEL** | | |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **NO** | | **PROGRAM LEARNING OUTCOMES** | **1** | **2** | **3** | **4** | **5** | | 1 | To learn with which terms the Science of Chemistry produces knowledge | |  |  |  |  | X | | 2 | To learn the benefits of the scientific perspective and method of evaluation. | |  |  |  | X |  | | 3 | To have knowledge on the basic subjects of chemistry | |  |  |  |  | X | | 4 | To be able to discuss the sociological perspectives critically and to find out the deficiencies in the knowledge and the practice. | |  |  |  | X |  | | 5 | To be able to use the knowledge of the field in the daily and professional life with a sense of social responsibility by gaining life-long learning abilities. | |  |  |  |  | X | | 6 | To be able to establish links with the other disciplines about social problems and concerns and to learn the differences and similarities of the knowledge between this discipline and related disciplines. | |  |  |  | X |  | | 7 | To have a certain knowledge on the methods of reaching to written and visual data sources, and to be able to assess this data in terms of theoretical analysis and practice. | |  |  |  |  | X | | 8 | To be able to share ideas and solutions on problems both verbally and in written by providing quantitative and qualitative data. | |  |  |  | X |  | | 9 | To be able to follow the knowledge and information on Chemistry science and communicate with colleagues by using a foreign language. | |  |  |  | X |  | | 10 | To be able to use the computer softwarealong with other informatics and communicative technologies on a required level by the field. | |  |  |  | X |  | | 11 | To be able to maintain the knowledge and the experiences on Chemistry alive, to be able to develop one’s self by exchanging and sharing these experiences with others. | |  |  |  |  | X | | |