COURSE OUTLINE

(1) GENERAL

SCHOOL	Sciences			
ACADEMIC UNIT	International Graduate Program in Biological Inorganic Chemistry			
LEVEL OF STUDIES	Graduate			
COURSE CODE	**1**	**SEMESTER**	**1**	
COURSE TITLE	Bioinorganic chemistry			
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*			**WEEKLY TEACHING HOURS**	**CREDITS**
Face to face				5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).				
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Scientific field Special background Specialised general knowledge			
PREREQUISITE COURSES:	No			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek / English			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)	http://bic.chem.uoi.gr/BIC-En/bioinorganic-en.html			

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

- The aim of the course is the teaching and understanding of the basic principles of Biological Inorganic Chemistry - Bioinorganic Chemistry that are considered necessary for the completion of postgraduate students' education. Also, the aim of this course is to present and describe bioinorganic systems through the correlation of the function, structure and activity of inorganic elements within the organisms. In particular, this course will include: a) a systematic study of trace element biosystems; b) the effect of the concentration of trace elements on health and the environment; and c) the pharmaceutical chemistry of the inorganic compounds.

- Upon completion of this course the students will be able to:

1. recognize the contribution of chemistry of metal molecules to the development of chemistry and other related fields.
2. evaluate the role of metal ions in biological systems.
3. know the function of metalloporphyrins of hemoglobin in oxygen binding by metal ions.
4. know the structure and function of metalloenzymes and metalloproteins.

5. know the iron biochemistry.
6. understand the role of metal ions in photosynthesis, cobalamine B12 and in basic functions of living organisms.
7. know how trace elements are involved in basic functions of the body.
8. recognize the applications of metal biomolecules in growth.
9. evaluate the applications of metal biomolecules as metallotherapeutic agents.
10. know metal biomolecules' applications as photoactive drugs.
11. evaluate applications of metal biomolecules as diagnostic agents.
12. know the applications of metal molecules in toxicology.

Knowledge
Knowledge and understanding of basic concepts, principles and theories related to Biological Inorganic Chemistry-Biochemistry, the role of metal ions in biological systems, the structure and function of metalloproteins and metalloenzymes, the role of metal ions in nucleic acids and metalloporphyrins.

Skills
Skills in predicting and assessing the role of metal ions in biological systems both as an external and as an internal factor.

Abilities
Ability to apply the knowledge provided to deal with problems related to Biological Inorganic Chemistry and Bioinorganic Chemistry.
Ability to evaluate the bond type of metal ions with biomolecules.
Ability to correctly evaluate-chooses the data provided to solve complex problems.
Ability to work independently and to interact with other students on the subject.

General Competences
Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

The general competences that students should have acquired are:
Search for, analysis and synthesis of data and information and decision making
Translating the theory into practice
Production of free, creative and inductive thinking
Working independently and team work
Acquire the appropriate theoretical base to allow further education at a doctoral level (theoretical and laboratory).

(3) SYLLABUS

Course Theory: electron transfer-metalloproteins. Blue copper proteins (hemocyanin, etc.). Photosynthetic systems. Competitive metal action. Metalloporphyrins. Iron proteins (e.g., ribonucleotide reductase, ferredoxin, etc.). Enzyme-Coenzymes (e.g., cyanocobalamin B_{12}, thiamine, etc.). Metal interactions with DNA, RNA and their derivatives. Metal based drugs such as Pt antitumor agents and other metals such as Pd, Sn, Ti, V, Ru etc as antiarthritic, antibacterial, antiviral agents etc.. Radiopharmaceuticals in diagnosis and treatment. Interactions of metal ions with peptides and proteins as models of biological systems. Heavy metal poisoning. Environmental Inorganic Biological Chemistry. Biocatalysts and biomimetic materials.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	E-mail, PowerPoint
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	

Activity	***Semester workload***
Lectures	39
Essay writing	43
Individual study, preparation	43
Course total	***125***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Student evaluation is done by the final written examination (100%). The final examination includes: Multiple Choice, short-answer, open-ended, and Problem Solving Questions

(5) ATTACHED BIBLIOGRAPHY

1. Βιοανόργανη χημεία, Δημήτριος Κεσίσογλου, Γεώργιος Ψωμάς, Εκδόσεις Ζήτη, 2011, 296 σελ. ISBN 978-960-456-264-0.
2. Bioinorganic Chemistry, Ivano Bertini, Harry B. GRAY, Stephen J. Lippard, Joan Selverstone Valentine, University Science Books, Mill Valley, California (1994) ISBN 0-935702-57-1
3. «Biological Inorganic Chemistry. An Introduction», Robert R. Crichton, 2008, Elsevier
4. «The Biological Chemistry of the Elements. The Inorganic Chemistry of Life», 2nd Ed., J. J. R. F. da Silva, R. J. P. Williams, 2001, Oxford University Press
5. «Bioinorganic Medicinal Chemistry», E. Alessio Ed., 2011, Wiley VCH.

Additionally suggested bibliography
Metal Ions in Biological Systems, 43 Vol. Set, CRC Press.

- Related academic journals:
Metallomics, Journal of Biological Inorganic Chemistry, Journal of Inorganic Biochemistry, Bioinorganic Chemistry & Applications, Inorganic Chemistry, Dalton Transactions, Inorganica Chimica Acta

COURSE OUTLINE

(1) GENERAL

SCHOOL	Sciences			
ACADEMIC UNIT	International Graduate Program in Biological Inorganic Chemistry			
LEVEL OF STUDIES	Graduate			
COURSE CODE	**2**	**SEMESTER**	**1**	
COURSE TITLE	Physicochemical, Spectroscopic and Biochemical Methods in Bioinorganic Chemistry			
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*			**WEEKLY TEACHING HOURS**	**CREDITS**
				5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).				
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Scientific field Special background Specialised general knowledge			
PREREQUISITE COURSES:	No			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek / English			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)	http://bic.chem.uoi.gr/BIC-En/physical-en.html			

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The aim of the course is to familiarize students with the physicochemical, spectroscopic and biochemical methods used in Bioinorganic Chemistry. In addition, students are taught the basic principles of instruments operation used in chemical analysis, their applications, their characteristics and uses and to evaluate their results.

After completion of the course, students should be able to:

- know basic analytical / physicochemical methods and to choose the most appropriate method based on the properties of compounds.
- interpret spectra, identify characteristic peaks of infrared spectra and make structure and spectrum correlation.
- Organize the analysis by selecting the correct method, taking into account the relevant parameters (interferences) and making the necessary calculations.
- analyze by selecting the correct method, taking into account the relevant parameters (interferences) and making the necessary calculations.
- understand the basic meanings of spectrophotometry, laws and apply them to chemical

analysis.

- Understand the principle of samples preparation, protocol used, sampling patterns and samples' maintenance.
- be familiar with the basic methods of molecular structure determination and study of biomolecular properties in solution and solid state.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

The general competences that the student should have acquired and to which the subject is aimed are:
Search for, analysis and synthesis of data and information and decision making
Translating the theory into practice
Production of free, creative and inductive thinking
Working independently and team work
Acquire the appropriate theoretical base to allow further education at a doctoral level (theoretical and laboratory).

(3) SYLLABUS

Ultraviolet and Visible Spectroscopy, electronic transitions, radiative processes, energy diagram, internal conversion, conical intersection, structure determination and solvent effect

Fluorescence spectroscopy, Stokes Shift, fluorescence, experiments
, quenching, lifetime and quantum yield, fluorescence anisotropy
Infrared Spectroscopy,
Raman Spectroscopy
Mass spectroscopy. Ionization methods.
Electron spin resonance spectroscopy.
Spectroscopic methods for structure analysis such as mass spectrometry, nuclear magnetic resonance spectroscopy, infrared spectroscopy, and ultraviolet spectroscopy. Fundamentals of the NMR phenomenon, relationship between NMR spectra and molecular structure. Recording of routine spectra (1H and 13C), esssentials of data processing (e.g., weighting functions). 1D NMR techniques: Decoupling, DEPT, relaxation measurement, magnetisation transfer, NOE difference spectra. 2D NMRtechniques: Homo- and heteronuclear correlation (COSY, TOCSY, HSQC, HMBC), measurement of the nuclear Overhauser effect (NOESY, ROESY).
Cyclic voltamentry
Mass spectroscopy ESI, FAB, FD, MALDI-TOF ionization procedures.
X-ray,, Bragg's Law, • What's in a crystal?, space group symmetry, non-crystallographic symmetry, impossible symmetry , Practical Details, growing crystals, sample preparation, X-ray sources, data collection, Solving Structures from Diffraction Images

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	E-mail, PowerPoint
TEACHING METHODS *The manner and methods of teaching are described in detail.*	

Activity	***Semester workload***
Lectures	39

Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc. *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	Essay writing	43
	Individual study, preparation	43
	Course total	***125***
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, concerningother* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Student evaluation is by the final written examination (100%). The final examination includes: Multiple Choice, short-answer, open-ended, and Problem Solving Questions.	

(5) ATTACHED BIBLIOGRAPHY

Suggested Bibliography

1) Infrared and Raman Spectra of Inorganic and Coordination Compounds: Part A: Theory and Applications in Inorganic Chemistry, Sixth Edition, Kazuo Nakamoto, Print ISBN:9780471743392, Online ISBN:9780470405840, DOI:10.1002/9780470405840, Wiley on line

2) Physical Methods for Chemists, Russel S. Drago, second edition, Surfside scientific publishers, 1992, USA.

3) Molecular Magnetism, Olivier Kahn

4) Crystal Structure Analysis. Principles and Practice Clegg, W., Blake, A.J., Gould, R.O. and Main, P.

5) Instrumental methods in Electrochemistry, Southampton Electrochemistry Group, Elis Horwood Ltd, 1990

6) Lectures Notes

Related academic journals:

Inorganic Chemistry, Dalton Transactions, Polyhedron, Inorganica Chimica Acta

COURSE OUTLINE

(1) GENERAL

SCHOOL	Sciences		
ACADEMIC UNIT	International Graduate Program in Biological Inorganic Chemistry		
LEVEL OF STUDIES	Graduate		
COURSE CODE	**1**	**SEMESTER**	**2**
COURSE TITLE	Laboratory of Spectroscopic and Physicochemical Techniques		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
		10
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Scientific field Special background Specialised general knowledge
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek / English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	http://bic.chem.uoi.gr/BIC-En/spectroscopyLab-en.html

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The aim of the course is to familiarize students with the physicochemical, spectroscopic and biochemical methods used in Bioinorganic Chemistry. In addition, students are taught the basic principles of instruments operation used in chemical analysis, their applications, their characteristics and uses and to evaluate their results. Students will participate in simple experimental exercises to familiarize themselves with the instruments and devices of an analytical laboratory and to consolidate their respective theoretical knowledge.

After completion of the course, students should be able to:

- know basic analytical / physicochemical methods and to choose the most appropriate method based on the properties of compounds.
- interpret spectra, identify characteristic peaks of infrared spectra and make structure and spectrum correlation.
- organize the analysis by selecting the correct method, taking into account the relevant parameters (interferences) and making the necessary calculations.
- understand the basic meanings of spectrophotometry, laws and apply them to chemical

analysis.

- understand the principle of samples preparation, protocol used, sampling patterns and samples' maintenance.
- know thermal analysis and its applications, different solutions separation methods, familiarize themselves with the corresponding chromatograms and recognize the different peaks.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

The general competences that the student should have acquired and to which the subject is aimed are:
Search for, analysis and synthesis of data and information and decision making
Translating the theory into practice
Production of free, creative and inductive thinking
Working independently and team work
Acquire the appropriate theoretical base to allow further education at a doctoral level (theoretical and laboratory).

(3) SYLLABUS

Introduction to optical methods of analysis. Spectroscopic and non-spectroscopic techniques. Measurement quantification techniques
Samples analysis with:

- Visible - ultraviolet spectrophotometry (Vis-UV), organology and applications
- Infrared spectroscopy (FT-IR), structure identification and identification of chemical compounds, organology.
- Nuclear magnetic resonance (NMR)
- Fluorimetry, organology and applications.
- Atomic Spectroscopy: Atomic Absorption Spectroscopy.
- Polosimetry, refractometry.
- Mass Spectroscopy (MS).
- Magnetic nuclear resonance (NMR) spectroscopy: organology and applications.

Laboratory Part of Course

- **Visible spectrophotometry**
- **Ultraviolet spectrophotometry**
- **Infrared spectroscopy**
- **Fluorimetry**
- **Atomic spectroscopy**

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	E-mail, PowerPoint
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art*	

Activity	*Semester workload*
Lectures	39
Essay writing	106
Individual study,	105

workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc. *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	preparation	
	Course total	***250***
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, concerningother* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Student evaluation is done either by presenting to a committee of teachers and a public audience a semester work (100%).	

(5) ATTACHED BIBLIOGRAPHY

Suggested Bibliography

Infrared and Raman Spectra of Inorganic and Coordination Compounds: Part A: Theory and Applications in Inorganic Chemistry, Sixth Edition, Kazuo Nakamoto, Print ISBN:9780471743392, Online ISBN:9780470405840, DOI:10.1002/9780470405840, Wiley on line

Related academic journals:

Inorganic Chemistry, Dalton Transactions, Polyhedron, Inorganica Chimica Acta

COURSE OUTLINE

(1) GENERAL

SCHOOL	Sciences		
ACADEMIC UNIT	International Graduate Program in Biological Inorganic Chemistry		
LEVEL OF STUDIES	Graduate		
COURSE CODE	**3**	**SEMESTER**	**1**
COURSE TITLE	Special Topics in Biochemistry-Molecular Biology		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
		5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Scientific field Special background Specialised general knowledge
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek / English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	http://bic.chem.uoi.gr/BIC-En/biochemistry-en.html

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The course provides deepening into selected chapters of Biochemistry and Molecular Biology. The ultimate goal is to configure a general base of knowledge and perceptions, necessary for the understanding of biochemistry, physiology, pharmacology, clinical chemistry, for learning by examples, for application of chemical knowledge in the interpretation of biomedical phenomena and to familiarize students with the principles of Biochemistry, Molecular Biology and with the principles of laboratory studies. Also, students will be able to describe essential cytological mechanisms.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Team work
Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and sensitivity to gender issues
Criticism and self-criticism

Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

The general competences that students should have acquired are:
Search for, analysis and synthesis of data and information and decision making
Translating the theory into practice
Production of free, creative and inductive thinking
Working independently and team work
Acquire the appropriate theoretical base to allow further education at a doctoral level (theoretical and laboratory).

(3) SYLLABUS

(α) Biochemistry: Nucleic acids, peptide hormones, biological membranes, biological types, enzymology issues, enzyme kinetics, enzyme structure etc.
(b) Peptide chemistry: Introduction, α-amino acids, peptides and proteins. Peptide synthesis. Three-dimensional structure of peptides and proteins. Side reactions of peptide synthesis. Separation and isolation of peptides and proteins. Biological extensions of peptide chemistry.
(c) Forensic Chemistry-Forensic Toxicology
(d) Cell Biology. Microbial Toxins.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	E-mail, PowerPoint

TEACHING METHODS

The manner and methods of teaching are described in detail.
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.

The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS

Activity	***Semester workload***
Lectures	39
Essay writing	43
Individual study, preparation	43
Course total	***125***

STUDENT PERFORMANCE EVALUATION

Description of the evaluation procedure

Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.

Student evaluation is done either by presenting to a committee of teachers and a public audience (40%) and by the final written examination (60%). The final examination includes:
Multiple Choice, short-answer, open-ended, and Problem Solving Questions

(5) ATTACHED BIBLIOGRAPHY

1. Ειδικά Θέματα Βιολογίας Κυττάρου. Ρυθμιστικοί μηχανισμοί κυτταρικής λειτουργίας. Θωμόπουλος, Γ. Ν. (2006). Εκδόσεις University Studio Press. Θεσσαλονίκη.
2. Το Κύτταρο: Μια Μοριακή Προσέγγιση ΕΠΙΤΟΜΗ ΕΚΔΟΣΗ, Geoffrey M. Cooper & Robert E. Hausman, Έκδοση: 1η/2013, ΑΚΑΔΗΜΑΪΚΕΣ ΕΚΔΟΣΕΙΣ Ι. ΜΠΑΣΔΡΑ & ΣΙΑ Ο.Ε., 2013

3. Βασικές αρχές κυτταρικής Βιολογίας Alberts (Ιατρ. Εκδ. Πασχαλίδης 2006), Alberts B., Bray D., Hopkin K., Johnson A., Lewis J., Raff M., Roberts K., Walter P., 2η έκδ./2006, BROKEN HILL PUBLISHERS LTD, 2006

- Related academic journals:
Journal of Medicinal Chemistry, Molecular Oncology, Biological Chemistry, Journal of Biological Chemistry

COURSE OUTLINE

(1) GENERAL

SCHOOL	Sciences		
ACADEMIC UNIT	International Graduate Program in Biological Inorganic Chemistry		
LEVEL OF STUDIES	Graduate		
COURSE CODE	**3**	**SEMESTER**	**1**
COURSE TITLE	Biophysics of pharmaceutical action		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
		5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Scientific field Special background Specialised general knowledge
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek / English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	http://bic.chem.uoi.gr/BIC-En/biophysics-en.html

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

After successfully completing the course, descriptive marker 6 of the European Qualifications Framework, students should be able to:

- know basic principles of biophysics of biomolecules and drugs
- know the effect of functional groups and stereochemistry on the biological activity of compounds
- know basic websites in order to find structural biology information
- know types of software and the principles of molecular simulation
- know basic meanings of multiparametric statistical analysis
- be aware of the basic principles governing the Quantitative Relationships Action - Structure (QSAR)

Knowledge

Protein-ligand interactions (molecular binding and molecular dynamics)
Thermodynamics of interactions (electron, steric, topological and hydrophobic parameters)
QSAR methodology

Skills
Molecular modeling
Biophysicochemical properties analysis through multi-parameter methods

Abilities
Team work and working independently
Learning opportunities for relevant computational packages

General Competences
Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

The general competences that students should have acquired are:
Search for, analysis and synthesis of data and information, with the use of the necessary technology
Working independently
Team work
Learning opportunities for relevant computational packages
Acquiring bibliographic research publicity skills
Acquire the appropriate theoretical base to allow further education at a doctoral level (theoretical and laboratory).

(3) SYLLABUS

1. Drug design. Introduction: Correlation of parameters (geometry, stereochemistry, bioavailability, toxicity, side effects, interactions).

2. The biophysics of the 3D structure. Structure of proteins and macromolecules. Flexibility, Wrap - Energy Paths.

3. Structural Biology. Experimental techniques (X-ray, NMR)

4. Databases. Protein Data Bank (PDB)

5. Introduction to molecular modeling. Modeling techniques and algorithms.

6. Joint compounds. Theoretical study of joint anticancer compounds and their anti-tumor mechanisms.

7. Equilibrium ratio model. Drug planning

8. Molecular dynamics of biomolecules. Protein-ligand interactions (molecular binding and molecular dynamics). Thermodynamics of interactions (electron, steric, topological and hydrophobic parameters). Force fields.

9. Meanings of multiparametric statistical analysis

10. QSAR - Drug Design. Introduction: Correlation of parameters (geometry, stereochemistry, bioavailability, toxicity, side effects, interactions).

11. Available software (demonstration and / or hands-on training)

12. Project - Presentation

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	E-mail, PowerPoint

TEACHING METHODS

The manner and methods of teaching are described in detail.
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.

The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS

Activity	*Semester workload*
Lectures	39
Essay writing	43
Individual study, preparation	43
Course total	***125***

STUDENT PERFORMANCE EVALUATION

Description of the evaluation procedure

Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.

Student evaluation is done either by presenting to a committee of teachers and a public audience (50%) and by the final written examination (50%). The final examination includes:
Multiple Choice, short-answer, open-ended, and Problem Solving Questions

(5) ATTACHED BIBLIOGRAPHY

- Molecular Biophysics for the Life Sciences Norma M. Allewell; Linda O. Narhi; Ivan Rayment Springer, 9781461485476
- Computational Biochemistry and Biophysics Oren M. Becker; Alexander D. Mackerell Jr; Benoit Roux; Masakatsu Watanabe Marcel Dekker Ltd, 082470455X
- A Primer on QSAR/QSPR Modeling: Fundamental Concepts (Springer briefs in Molecular Science) Kunal Roy; Supratik Kar; Rudra Narayan Das Springer, 9783319172804
- Statistical Modelling of Molecular Descriptors in QSAR/QSPR Matthias Dehmer; Kurt Varmuza; Danail Bonchev; Frank Emmert-Streib
Wiley-Blackwell, 9783527324347

- Related academic journals:
- Journal of Chemical Information and Modeling
- Journal of Medicinal Chemistry
- RSC Advances
- Journal of Biological Physics
- Biophysical Journal
- Biophysical Chemistry

COURSE OUTLINE

(1) GENERAL

SCHOOL	Sciences		
ACADEMIC UNIT	International Graduate Program in Biological Inorganic Chemistry		
LEVEL OF STUDIES	Graduate		
COURSE CODE		**SEMESTER**	**2**
COURSE TITLE	Collection of bibliographic data and presentations concerning the research field of the Postgraduate Diploma Thesis		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	5	5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Scientific field Special background Specialised general knowledge
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek / English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	http://bic.chem.uoi.gr/BIC-En/mathimata-en.html

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Course description

The student will develop and submit a detailed project for his/her Thesis, including research methodology, experimental plan (including timetable and detailed milestones). The project should be approved by the supervisor before the student starts the research activity. The student will be in contact with the supervisor throughout the program with regular feedback.

Expected Learning Outcomes

After completion of the course, students should be able to:

- demonstrate initiative and confidence in their ability to make decisions and follow the consequences created.
- apply a detailed approach to solve problems.
- effectively apply the appropriate communication skills as experts.
- produce a critical review using and reporting appropriate information sources.
- make reasonable conclusions and make suggestions based on the work of the project they

have undertaken

- •produce a structured written report using appropriate format with appropriate reports.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

The general competences that students should have acquired are:
Search for, analysis and synthesis of data and information and decision making
Translating the theory into practice
Production of free, creative and inductive thinking
Working independently and team work
Acquire the appropriate theoretical base to allow further education at a doctoral level (theoretical and laboratory).
Project planning and management
Production of new research ideas
Working in an interdisciplinary environment
Adapting to new situations

(3) SYLLABUS

The student will develop and submit a detailed project for his/her Thesis, including research methodology, experimental plan (including timetable and detailed milestones). The project should be approved by the supervisor before the student starts the research activity. The student will be in contact with the supervisor throughout the program with regular feedback.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face, Work in a laboratory environment
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Natural presence
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	

Activity	***Semester workload***
Essay writing	60
Individual study, preparation	65
Course total	***125***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical*	The evaluation of the students is done through oral examination - public presentation of data (100%).

examination of patient, art interpretation, concerningother *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	

(5) ATTACHED BIBLIOGRAPHY

Suggested Bibliography
Supervisors will indicate the appropriate literature and appropriate references concerning the subject of diploma thesis.

COURSE OUTLINE

(1) GENERAL

SCHOOL	Sciences		
ACADEMIC UNIT	International Graduate Program in Biological Inorganic Chemistry		
LEVEL OF STUDIES	Graduate		
COURSE CODE	**1**	**SEMESTER**	**2**
COURSE TITLE	Introduction to the Research Laboratory		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	10	10
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Scientific field Special background Specialised general knowledge
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek / English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	http://bic.chem.uoi.gr/BIC-En/mathimata-en.html

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Course description

The aim of this laboratory is the "introduction to research of Biological Inorganic Chemistry", as well as the spectroscopic techniques. The laboratory aims at teaching the research methodology and familiarizing postgraduate students with various subjects of Biological Inorganic Chemistry. Students will be given a research theme, whether known or original. Students should initially search the literature and then reproduce in the laboratory published research from relevant publications in well-known journals, or start a new research topic and come to acceptable results. The examination is accomplished by a public presentation, to an audience of postgraduate students and faculty members. Supervisors of this laboratory may be all faculty members dealing with Biological Inorganic Chemistry. The faculty members are responsible for the distribution of the postgraduate students in their laboratories and provide them with the necessary facilities.

Expected Learning Outcomes

After completion of the course, students should be able to:

- demonstrate initiative and confidence in their ability to make decisions and follow the consequences created.

- apply a detailed approach to solve problems.
- effectively apply the appropriate communication skills as experts.
- produce a critical review using and reporting appropriate information sources.
- make reasonable conclusions and make suggestions based on the work of the project they have undertaken
- •produce a structured written report using appropriate format with appropriate reports.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

The general competences that students should have acquired are:
Search for, analysis and synthesis of data and information and decision making
Translating the theory into practice
Production of free, creative and inductive thinking
Working independently and team work
Acquire the appropriate theoretical base to allow further education at a doctoral level (theoretical and laboratory).
Project planning and management
Production of new research ideas
Working in an interdisciplinary environment
Adapting to new situations

(3) SYLLABUS

The aim of this laboratory is the "introduction to research of Biological Inorganic Chemistry", as well as the spectroscopic techniques. The laboratory aims at teaching the research methodology and familiarizing postgraduate students with various subjects of Biological Inorganic Chemistry. Students will be given a research theme, whether known or original. Students should initially search the literature and then reproduce in the laboratory published research from relevant publications in well-known journals, or start a new research topic and come to acceptable results. The examination is accomplished by a public presentation, to an audience of postgraduate students and faculty members. Supervisors of this laboratory may be all faculty members dealing with Biological Inorganic Chemistry. The faculty members are responsible for the distribution of the postgraduate students in their laboratories and provide them with the necessary facilities.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face, Work in a laboratory environment
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Natural presence
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of*	

Activity	*Semester workload*
Essay writing	125
Individual study, preparation	125

the ECTS		
	Course total	***250***
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, concerningother* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	The evaluation of the students is done through oral examination - public presentation of data regarding the research field of thesis (100%)	

(5) ATTACHED BIBLIOGRAPHY

Suggested Bibliography

Supervisors will indicate the appropriate literature and appropriate references concerning the subject of postgraduate diploma thesis.

COURSE OUTLINE

(1) GENERAL

SCHOOL	Sciences		
ACADEMIC UNIT	International Graduate Program in Biological Inorganic Chemistry		
LEVEL OF STUDIES	Graduate		
COURSE CODE	**3**	**SEMESTER**	**2**
COURSE TITLE	Thesis A		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
		15
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Scientific field Special background Specialised general knowledge
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek / English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	http://bic.chem.uoi.gr/BIC-En/StartDiploma-en.html

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The postgraduate thesis is an individual in-depth research / exploration of a specific topic. Thesis should be chosen according to particular interests of the student or the academic supervisor and should be in harmony with the Department's research strategy. The overall goal is to provide students with the opportunity to develop and implement research methodologies. This process will lead to the development of a wide range of skills. It is important to gain self-management skills to achieve the specific objectives set within a specific time period. The ability to identify problems and find appropriate solutions, as well as the ability to evaluate the results and to propose alternative strategies, should also be demonstrated.

Course description

The student will develop and submit a detailed project proposal, including logical basis, research methodology, experimental plan (including timetable and detailed highlights) and cost. The program proposal must be approved by the supervising professor before the student starts practical work. The student will be in close contact with the supervisor throughout the program with regular feedback.

Expected Learning Outcomes

After completion of the course, students should be able to:

- demonstrate initiative and confidence in their ability to make decisions and follow the consequences they create.
- apply a detailed approach to solve problems.
- effectively apply appropriate communication skills as experts.
- produce a comprehensive self-management plan to achieve set goals.
- produce a critical review using and reporting sources of information.
- produce and justify a sustainable project proposal and experimental plan that is appropriate in terms of methodologies, available resources, time and cost.
- undertake a work plan that generates primary data, followed by analysis and interpretation of data using appropriate tools.
- draw logical conclusions and make suggestions based on the work of the project that has been undertaken.
- Produce a structured written report using the appropriate format with the appropriate references.
- Demonstrate an in-depth understanding of the project through self-defense with oral presentation (support for postgraduate diploma thesis).

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and sensitivity to gender issues
Criticism and self-criticism
Production of free, creative and inductive thinking
……
Others…
…….

The general competences that students should have acquired are:
Search for, analysis and synthesis of data and information and decision making
Translating the theory into practice
Production of free, creative and inductive thinking
Working independently and team work
Acquire the appropriate theoretical base to allow further education at a doctoral level (theoretical and laboratory).
Project planning and management
Production of new research ideas
Working in an interdisciplinary environment
Adapting to new situations

(3) SYLLABUS

Supervisors will indicate the appropriate literature and appropriate references concerning the subject of postgraduate diploma thesis.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face, Work in a laboratory environment
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Natural presence
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.*	

Activity	*Semester workload*
Essay writing	188
Individual study, preparation	187

The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS		
	Course total	***375***
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, concerningother* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	The evaluation of the students is done by Oral Examination - Public Presentation of the Postgraduate Diploma Thesis (100%).	

(5) ATTACHED BIBLIOGRAPHY

Suggested Bibliography

Supervisors will indicate the appropriate literature and appropriate references concerning the subject of postgraduate diploma thesis.

COURSE OUTLINE

(1) GENERAL

SCHOOL	Sciences		
ACADEMIC UNIT	International Graduate Program in Biological Inorganic Chemistry		
LEVEL OF STUDIES	Graduate		
COURSE CODE	**1**	**SEMESTER**	**3**
COURSE TITLE	Thesis B		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
		30
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Scientific field Special background Specialised general knowledge
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek / English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	http://bic.chem.uoi.gr/BIC-En/StartDiploma-en.html

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The postgraduate thesis is an individual in-depth research / exploration of a specific topic. Thesis should be chosen according to particular interests of the student or the academic supervisor and should be in harmony with the Department's research strategy. The overall goal is to provide students with the opportunity to develop and implement research methodologies. This process will lead to the development of a wide range of skills. It is important to gain self-management skills to achieve the specific objectives set within a specific time period. The ability to identify problems and find appropriate solutions, as well as the ability to evaluate the results and to propose alternative strategies, should also be demonstrated.

Course description

The student will develop and submit a detailed project proposal, including logical basis, research methodology, experimental plan (including timetable and detailed highlights) and cost. The program proposal must be approved by the supervising professor before the student starts practical work. The student will be in close contact with the supervisor throughout the program with regular feedback.

Expected Learning Outcomes

After completion of the course, students should be able to:

- demonstrate initiative and confidence in their ability to make decisions and follow the consequences they create.
- apply a detailed approach to solve problems.
- effectively apply appropriate communication skills as experts.
- produce a comprehensive self-management plan to achieve set goals.
- produce a critical review using and reporting sources of information.
- produce and justify a sustainable project proposal and experimental plan that is appropriate in terms of methodologies, available resources, time and cost.
- undertake a work plan that generates primary data, followed by analysis and interpretation of data using appropriate tools.
- draw logical conclusions and make suggestions based on the work of the project that has been undertaken.
- Produce a structured written report using the appropriate format with the appropriate references.
- Demonstrate an in-depth understanding of the project through self-defense with oral presentation (support for postgraduate diploma thesis).

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and sensitivity to gender issues
Criticism and self-criticism
Production of free, creative and inductive thinking
……
Others…
…….

The general competences that students should have acquired are:
Search for, analysis and synthesis of data and information and decision making
Translating the theory into practice
Production of free, creative and inductive thinking
Working independently and team work
Acquire the appropriate theoretical base to allow further education at a doctoral level (theoretical and laboratory).
Project planning and management
Production of new research ideas
Working in an interdisciplinary environment
Adapting to new situations

(3) SYLLABUS

Supervisors will indicate the appropriate literature and appropriate references concerning the subject of postgraduate diploma thesis.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face, Work in a laboratory environment
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Natural presence
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.*	

Activity	*Semester workload*
Essay writing	375
Individual study, preparation	375

The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS		
	Course total	***750***
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, concerningother* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	The evaluation of the students is done by Oral Examination - Public Presentation of the Postgraduate Diploma Thesis (100%).	

(5) ATTACHED BIBLIOGRAPHY

Suggested Bibliography

Supervisors will indicate the appropriate literature and appropriate references concerning the subject of postgraduate diploma thesis.