



**UNIVERSITY OF CRETE**



**Department of Primary  
Education**

## **Courses offered to Erasmus students**

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## **A06 Σ07 Teaching in Multilingual and Multicultural Classes**

In this seminar we delve into issues raised in the context of compulsory courses in Intercultural Education and Bilingualism and Teaching Greek as a Second Language, such as: The formation of a hybrid/bicultural identity among immigrant students, the teacher's contribution to the integration of immigrant students and in their successful educational course, and dealing with the cultural and linguistic diversity as a source of enrichment for all and not as an obstacle and disadvantage.

The basic sections are as follows:

- Basic concepts and axioms of Intercultural Education
- Negotiation of identities in multicultural environments
- Accelerating the development of 'academic language' in mainstream classrooms
- Models for the development of multilingual and intercultural competence.

## **A06 Σ12 Intercultural Pedagogy: Theory and Practice**

- Basic principles and goals of Intercultural Pedagogy
- Multicultural management models
- The role of the teacher in the multicultural school
- Intercultural readiness of teachers
- Planning activities in multicultural classrooms
- Reflection on the basic concepts of Intercultural Pedagogy.

## **A06 Π13 Interculturalism and Education**

The course includes the following topics:

- The content of Intercultural Education
- Basic concepts, principles and history of Intercultural Education
- Models of Intercultural Education
- Immigration to and from Greece. Immigration - Socialization in migratory environment
- Institutional framework of Intercultural Education in Greece
- Education and multiculturalism: Examples from the Greek Diaspora
- Racism, prejudices, stereotypes
- Identities in multicultural environments
- Universality - Relativity of values: Human Rights
- Multicultural classroom management: intercultural teacher preparedness.

## **A06 Π14 Conversing with the (ethnic) Cultural Diversity in Cultural Settings Relating to Experience and Learning**

The course includes the following topics:

- Theoretical approaches, criteria of distinction and content of the concepts 'identity diversity'
- Education as an institutional mechanism for the formation and reproduction of identities
- The discourse on identities in the context of border pedagogy
- Identity and diversity in diverse educational and cultural environments relative to learning
- Directing / Representative Pedagogy as a negotiation methodology of students identities with different sociocultural background
- The museum as a cultural place for the promotion of different identities, communication and exchange of cultural experiences.

## **A07 Σ06 Immigration, Family, Social Systems and Education in Cultural Learning Environments**

The course includes the following topics:

- Approach of social systems based on the systemic view within the multicultural and socially diverse modern societies
- Social identities and integration practices of individuals and groups from different socio-cultural environments
- Mediating role of education in multicultural and socially diverse environments
- Contribution of non-formal forms of education, such as museum education, the creation of 'intermediate' spaces of social interaction, exchange of cultural and learning experiences

(Re) documentary pedagogy with application of the art methodology in creating attractive and interactive environments.

## **A08 Π01 Bilingualism and Teaching of Greek as a Second Language**

The course includes the following topics:

- Introduction to the phenomenon of bilingualism (bilingualism as a global, social and Individual phenomenon)
- Dimensions of bilingualism
- Linguistic use and development of bilingualism in bilingual communities
- The acquisition of a L2 (learning theories, characteristics)

- Approaches to a second language teaching
- The teaching of Greek as a L2 and as a Foreign language (types of students, educational material, methodology)
- Theories about the relationship between bilingualism and learning
- Teaching bilingual students in mainstream classrooms (models for support of students with low knowledge of Greek and successful school and social inclusion).

### **A11 Π04 Teacher Training with the Use of New Technologies (e-Learning)**

- Introduction to teacher training as an integral part of adult education.
- Fundamental approaches to the pedagogical use of ICT and especially Social Media in teacher training.
- The basic features of online teacher training environments (e-learning).
- Introduction to the concept of creativity in the Knowledge of Society and linking it with teacher training using ICT.
- Good teacher training practices using ICT in Greece and internationally
- Methodology for designing teacher training environments with the use of ICT in Greece and internationally.

### **A15 Σ03 Advanced Learning Technologies and Distance Education in Schools: Theory and Practice**

- Basic features of Digital Games
- Basic features of Digital Games in education
- Appropriate practices in Greece and internationally
- Pedagogical Utilization of Digital Games in education with emphasis on encouraging the creativity of students and teachers.

### **A15 Σ06 Virtual and Augmented Reality in Education**

- Key features of virtual reality applications in education
- Key features of augmented reality applications in education
- Appropriate practices in Greece and internationally .Methodology of planning and practical application in the classroom of virtual and augmented reality technologies in various didactics items with emphasis on the interdisciplinary approach and creativity encouragement.

### **B03 Π03 Organization and Dynamics of the Classroom**

- School class, Academic effectiveness - psychosocial development.
- Strategies for creating a positive psychological-social classroom environment.
- The importance of the teacher's relationship with the students /the importance of relationship of the student with himself/herself.
- Management of behavioral problems in the classroom.
- Direct teaching: Implementation strategies.
- Personalized teaching: Implementation strategies.
- Differentiated teaching: Implementation strategies.
- Laboratory lesson for the design of differentiated curriculum.
- Co-teaching: Strategies for implementing co-teaching models
- The importance of school interactions in in the student's identity building.
- Relationships between teachers and parents and their role in the academic and social progress of students.
- Interdisciplinary collaboration: Effective learning through interdisciplinary cooperation.
- Evaluation of the course, reflection and solving questions for Examination.

### **B05 Σ04 Speech Disorders at School**

The course presents and analyzes current research data on issues of diagnosis and demarcation of developmental language disorders, extensive reference is made to intervention programs implemented internationally to improve children's language skills as well as issues of educational practice.

- Course presentation (thematic units and bibliography). Clarification of key terms (language, speech, communication) and components of the language system
- Cordial language development of children: Characteristics.
- Contemporary interpretations and classification of developmental language difficulties and disorders.
- Methods of assessment of oral speech in childhood

Children's language assessment: application and ethics issues

- The role of the school psychologist, special educator and speech therapist in the assessment and intervention of oral speech disorders
- Informal and weighted tests to assess the development of phonological awareness
- Vocabulary evaluation with the Crighton Vocabulary Scales (Greek version). The Speech and Oral Test.
- Developmental language disorder: Linguistic and cognitive characteristics, detection, differential diagnosis, intervention

- Language development in the autism spectrum and in children with genetic syndromes
- Language development in children with deafness or hearing impairments
- Stuttering and selective mutism in elementary school students
- Psychosocial adjustment of children with language disorders
- Conclusions - Summary.

## **B05 Π07 Integration and Accession of Children with Special Difficulties / Disorders**

- Introduction to Disability

Introduction to basic definitions of disability. Discussion about the role and the difficulties the disabled people face in modern society.

- Introduction to Inclusive education

Basic terminology, philosophy, basic principles of inclusive education.

- Inclusive education

Discussion on the different ways of understanding and applying inclusion education.

- The rights of the disabled children - Social exclusion educational and social policy in Greece and internationally
- Educational policy and integration education Greek and international educational policy for the students with disabilities and / or special educational needs
- Approach models to disability

Medical and social model relating to understanding and disability management

- Forms and levels of integration and accession. Conditions for integration in the school environment. The role of the Integration Departments. The role of parallel support. Academic, social and spatial integration. Advantages and disadvantages.
- Collaborative teaching

Defining and understanding a new form of teaching in one school for all students

- Differentiated teaching

Access to learning through differentiated teaching.

- Practical application of differentiated teaching.
- Laboratory lesson

Presentation of assignments for differentiated teaching

- Interdisciplinary collaboration and integration

Roles and responsibilities of special and general education teachers through interdisciplinary cooperation.

Research methods and educational practice.

## Γ01 Π01 Curriculum. Theory and Practice

- Course presentation (thematic units and bibliography). Conceptual approach of curriculum. Overview of curriculum definitions. Problems of conceiving and conceptualizing it. Sectors and regions of curriculum. Curriculum theories.
- Ideology and hierarchy of school knowledge. Selection, ranking and "Legalization" of school / educational knowledge. Relationships between knowledge and power. The "Hidden" or implicit curriculum.
- Theories and philosophies of curriculum and the superposing school / educational functions (relation of the curriculum to the theories of the mind, learning, reaching, the use of teaching aids, assessment, etc.).
- Expertise of design and development of curriculum. Structure and development of cognitive content by regions (eg language, history). Forms design and types of curriculum. Adaptation and personalization of curriculum in the characteristics of students.
- Curricula and textbooks. Roles, characteristics, ideology, structure, functions. Procedures for preparation and / or selection of teaching material. Electronic forms of the textbooks, multiple sources, e-curriculum, e-learning & e-media.
- Curriculum in Greece and its peculiarities. The nature of cognition objects and the timetable in Greece over time. Critical interpretation, text analysis, deconstruction.
- The nature of speech in curriculum. From nationalist ideology to supranational formations. Studies around curriculum and textbooks in Greece.
- Problems and weaknesses of the Greek curriculum. Legal texts, educational purposes, the purpose of curriculum, cognitive objects, etc. The asymptotic relationship between the various levels of the educational function. Effects on superposing educational functions and ways of dealing with the phenomenon.
- Modern trends and research of the cognitive objects of curriculum in different countries.
- Involvement of the teacher in the decision making for the implementation and adjustment of curriculum and textbooks. The "mutation" of the teacher from simple "executor / implementer" of the program to "pedagogical authority".. The integration of educational innovations in the curriculum and the implementation of the flexible zone. Possibilities, problems, limitations and difficulties.
- The curriculum and Europe. Search for multiple perspectives of curriculum and of educational functions. The curriculum and the ideology of Europeanism. Prospects for one common curriculum in the united Europe. Purposes, contents and searches on the constant changing educational landscape. New trends and models of the curriculum
- Evaluation of the curriculum and the overlapping functions of Forms of SP evaluation. Concepts, types, approaches, methodology, problems and deadlocks of evaluation of SP.
- Conclusions - Summary.



## **Γ01 Π04 The Teacher as the Shaper of the Curriculum**

- Course presentation (thematic units and bibliography). The history of curriculum relating to school textbooks of the Greek primary school.
- Modern concerns regarding curriculum and textbooks. The role of the teacher.
- Critical decisions regarding their practicality and compatibility of curricula and textbooks with the educational abilities and experiences of the students.
- Expertise of design and development of curricula and textbooks. Structure and development of cognitive content by areas. Forms and types design. Adaptation and personalization regarding the characteristics of students of primary school in our country.
- The curriculum and school textbooks in Greece and their peculiarities. The nature of the subjects and the timetable in Greece over time. Critical interpretation, text analysis, deconstruction.
- Problems and weaknesses of the Greek curricula and textbooks of primary school. Impact on overlapping educational functions and ways dealing with the phenomenon.
- Comparative evaluation of regulatory and structural frameworks regarding the margins of teachers' autonomy at different time periods in our country.
- Involvement of the teacher in decision making for the implementation and adjustment of the curriculum and textbooks. The "mutation" of the teacher from simple "executor / implementer" of the program to "pedagogical authority".
- Relationship between learning, teaching and educational material at its micro level classroom: procedures for adapting and reorganizing school textbooks by teachers according to the "profile" of abilities of the students in his / her class.

Current trends and research of the cognitive objects that are taught in the Greek primary school.

## **Γ02 Π03 Alternative Approaches of Teaching / Learning and their Theory Foundation**

- Acquaintance, discussion about students' expectations, finding needs, information on the topics and objectives of the course introductory conceptual decisions.
- Characteristics of alternative teaching / learning examples.
- Classical influences. Influence of ancient Greek philosophers on modern approaches to teaching and learning. The amorous dimension of teaching.
- John Dewey: The New Education Movement.
- Celestin Frene: The school of the people.
- Paolo Freire: Education as Liberation.
- Alexander Sutherland Neill: The School as a Democratic community.
- Socio-historical-cultural approaches to teaching and learning.
- The current Greek school. The New Unified Curriculum regarding its operation. Alternative schools. The school of nature and colors.
- Teaching and learning for sustainable development. Examples from Greece and the rest of the world.
- The project method.
- Collaborative teaching.
- The Internet at the service of learning. Concept maps as learning tools.
- Summary. Creating teaching plans.

## **Δ03 A08 Introduction to Music**

- Introduction to Active Listening, Sound Sources, Sound Physics, Acoustics, characteristics, distinctions etc. and activities. Choir / screening opera / visit to an artistic space etc.
- Theory of Music I- sounds, rhythmic values, language of music and creative consolidation and understanding activities. Choir / opera screening/ visit to an artistic space etc.
- Theory of Music II- scales and tonality, harmony in music and its deconstruction, and activities of consolidation and understanding .Choir / opera screening/ visit to an art space etc.
- History of Greek Music I- Ancient Greece- Byzantine - Traditional Music and activities of active listening, acoustics and kinesthetic perception, etc. Choir / opera screening / visit to an artistic space etc.
- History of Western Music I- Monophony, Polyphony, Baroque- and activities of active listening, auditory perception, composition, etc. Choir / opera screening / visit to an art space etc.

- Musical instruments - physics of musical instruments, families, characteristics, types of orchestras - musical examples of integration in education, such as Petros and Prokofiev the Wolf, Britten's youth conductor etc. Choir / opera screening / visit to an artistic space etc.
- History of Western Music II- Classical period, Romanticism, Opera- and activities. Choir / opera screening / visit to an artistic space etc.
- History of Western Music III - the 20th century and modern classical creation-activities of auditory perception and performance creation. Choir / opera screening / visit to an art space etc.
- Ethnomusicological approaches - The Balkans, the East, Europe- and activities of recognition, listening, movement-dance etc. Choir / screening opera / visit to an artistic space etc.
- Ethnomusicological approaches - Africa, Oceania, America and activities of recognition, listening, movement-dance, creation of musical instruments etc. Choir / opera screening / visit to an artistic space etc.
- History of Greek Music II: Art Greek Music- Ionian School, National School, 20th and 21st century and activities. Choir / opera screening / visit to an art space etc.
- Popular genres and Folk Music and activities Choir / opera screening / visit to an art space etc.
- Reflection, conclusions, summary.

### **Δ03 A09 Music with Emphasis on Music Pedagogy**

- Introduction to music education: Ancient Greece, Middle Ages, Rousseau, Galin-Paris-Cheve, Curwen. Activities for the strengthening of the team, pulse and tuning. Choir / opera screening / visit to an art gallery space etc.
- The Rhythmic- music pedagogical method of Dalcroze - Activities that connect the body, mind and ear, based on the above method. Choir / opera screening / visit to an artistic space etc.
- The Music-Motor Education of C. Orff. Introductory activities improvisation, body percussion etc. and creating sound / rhythm / music history. Choir / opera screening / visit to an artistic space etc.
- The Kodaly music education system. The traditional song as a way of approaching musical knowledge, rhythmic activities etc. Choir / opera screening / visit to an art space etc.
- Modern music pedagogical trends: its new approach music pedagogy- Small, Swanwick, MMCP. Activities that unite music with other Arts. Choir / opera screening / visit to artistic space etc.
- Paynter's music pedagogical approach. Activities Acoustic perception and composition based on Sound. Choir / opera screening / visit to an art space etc.
- The Practical Philosophy of D.J. Elliott. Choir / opera screening / visit to an art space etc.

- Approaches to multicultural and intercultural music education- Campbell, Nketia, Elliott etc. and multimodal musical activities on multiculturalism and interculturalism. Choir / opera screening / visit to an art space etc.
- Improvisation in the creative process and activities. Choir / opera screening / visit to an art space etc.
- Learning Disabilities and Arts: theoretical directions, ways approach and practical applications. Choir / opera screening / visit to artistic space etc.
- Comparison and correlation of musical approaches and activities on it. Choir / opera screening / visit to an artistic space etc.
- Comparison, correlation and creation of idiopathic approaches. Choir / opera screening / visit to an art space etc.
- Reflection, conclusions, summary.

### **Δ03 A26 Physical Movement in Interdisciplinary Teaching: a Multimodal Approach**

- Music-Motor Education I Creative Dance I (and creative- interdisciplinary consolidation and comprehension activities).
- Intelligence, Environment and Creativity.
- Music-Motor Education Creative Dance II (and creative- interdisciplinary consolidation and comprehension activities).
- From interdisciplinarity to unification: theory and practice projection opera / dance theater / dance / ballet / visit to an artistic space etc.
- Perception of Movement in space (and creative interdisciplinary consolidation and understanding activities) screening of opera / dance theater / dance / ballet / visit to an artistic space etc.
- Body Percussion educational musical instruments and their use.
- Movement in relation to time and space-time (and creative- interdisciplinary consolidation and comprehension activities) opera show / dance theater / dance / ballet / visit to an artistic space etc.
- Improvisation in the classroom and in practice (and creative- interdisciplinary consolidation and comprehension activities) opera show / dance theater / dance / ballet / visit to an artistic space etc.
- Beyond motor and music-motor skills: expressive movement and sound screening of opera / dance theater / dance / ballet / visit to artistic space etc.
- Hue, Dynamics, Intensity, and Structure: approaching unification.
- From Movement to Post-Movement: The Arts as a Destination.
- Reflection, conclusions, summary.

## **Δ05 Π04 Modern History: Greek and European**

The course "Modern History: Greek and European" examines mainly the period from the Greek Revolution and the establishment of the modern Greek state, with the London Protocol in 1830, until the outbreak of World War II. The context of the course emphasizes the Modern Greek History in relation to the European History at the same time, as the Contemporary Greek history can not and should not be considered cut off from the corresponding European history, while the new technologies and historical sources are utilized. At the same time, History is examined in the context of interdisciplinarity.

- Introduction - Course presentation (thematic units and bibliography) Historical Geography
- The Ottoman Past, the Greeks in the Ottoman Empire, the European and the Modern Greek Enlightenment
- The establishment of the Filiki Eteria and the Greek Revolution of 1821. Other revolutions in Europe - the Struggle for Italian unification (Risorgimento). Kapodistrias governor of Greece, his work, his assassination, the period until the arrival of King Otto.
- The reign of King Otto, the Revolution of September 3 1843, the Constitution of 1844. The Great Idea. The reign of King George: the territorial expansion of Greece, the Declared Principle, Bipartisanship (Trikoupi - Deligiannis), the economic course of Greece, the bankruptcy of 1893, the first modern Olympic Games.
- The Industrial Revolution (first and second phase) and its consequences in Europe and Greece.
- The national issues: Cypriot, Macedonian, Cretan, Pontian.
- The Movement of the Neo-Turks (1908), the Movement in Goudi (1909), El. Venizelos Prime Minister of Greece, the Balkan Wars (1912-1913), the October
- Revolution (1917) and its international impact, the First World War (1914-1918), the National Division.
- Political, social and economic developments in Greece Interwar: the Treaty of Sevres (1920), the Asia Minor Campaign, the Asia Minor Catastrophe (1922), The Refugee Issue.
- Political, social and economic developments in Greece Interwar period: The Treaty of Lausanne (1923), the last government of El. Venizelou, political changes, the dictatorship of Metaxas.
- From the interwar period and the creation of Nazi Germany and fascist Italy at the beginning of World War II and the fascist onslaught of 1940 against Greece.
- The intellectual life in Greece and in Europe (ideological currents, social claims, Literature, Art, Science).
- Review - Conclusions - Summary.

The course includes educational trips to historical sites and museums.

## **Δ05 Π10 Interdisciplinary Dimensions and Approaches of History**

This course examines the concept of Interdisciplinarity and its relationship to History. "As the historian G. Dertilis characteristically states," History is one science, [...] an imperialist art: it is spreading to more and more people diverse research sites [...] '. Indeed, the "nature" of its history indicates collaboration with other disciplines or cooperation in order to give prominence to the past and to cogitate spherical aspects of its history. Knowledge, after all, will must be treated as a whole. [...] This is best achieved with

Interdisciplinarity that is in line with the specificity of the science of History, more, perhaps than any other scientific discipline. The course focuses on the study of History (mainly Modern and Contemporary), as it offers more, compared to other periods, interdisciplinary research opportunities and through Geography, Religion / Theology, Literature, Youth Technologies, Oral History, Cinema (animation),

Photography, Science and other research and teaching means and disciplines. Interdisciplinarity in History can be particularly useful both in its field research and in the field of teaching practice. Many sciences or disciplines are associated with History and especially with the Modern and contemporary period. The last ones can be used creatively in the study and teaching of History, with objectives the holistic approach of research problems, the expression of prolific concerns related to the teaching of the course, the creation of didactics proposals that aim, inter alia, to make the course attractive, the cultivation of critical thinking, the deepening of learning and the spherical , as much as possible, knowledge approach.

Note: In the course, lectures are given by experts in matters of interdisciplinary approach to History.

## **E01 Π07 Methodology of Teaching Mathematics in Primary School**

- Elements of Teaching Theory: Constructivism in relation to learning and teaching of Mathematics, the conceptual space and space problems of teaching mathematics, the conceptual image (concept image) of the student for the subject taught , difficulties and obstacles encountered by students and the role in learning mathematics, students' mistakes and their importance, the semiotic fields of expression and processing of mathematical concepts and the importance of their alternation in learning these concepts.
- Discussion on the construction of the concept of number. Didactic approaches and teaching methodology regarding: the introduction of the concept of number in prosthetic structures: introduction of addition and subtraction, addition and subtraction with small numbers, addition and subtraction with larger numbers and its addition and subtraction algorithms, the part of the problem relating to addition and subtraction and their categorization and classification.
- Teaching approaches and teaching methodology regarding multiplicative structures: introduction of multiplication and division, learning the multiplication table , the algorithms of multiplication and division, the part of problems solved by multiplication or division and the categorization and classification, proportional amounts inversely proportional amounts.

- The evolution of students' geometric thinking, characteristics of teaching geometry and their importance in the development of students' geometric thinking. Didactic approaches regarding some basic sections of the Curriculum Program of Geometry in Primary School (the concept of angle, vertical and parallel lines, triangles, rectangles, circles, areas). Educational software for Geometry and their didactic utilization. The epistemological difference between empirical and Euclidean Geometry and its significance, the difficulties and obstacles that students face in approaching them in Euclidean Geometry.
- The utilization of the History of Mathematics in the teaching of Mathematics.

Alternative forms of teaching Mathematics: Collaborative teaching, differentiated teaching, exploratory teaching and learning, self-correction, self-learning and self-corrective teaching activities.

## **E01 Π08 Modules from the Mathematics Program of the Primary School**

- Presentation of the purpose and structure of the course. Discussion and exercises on: Euclid division, certain divisibility properties and their proofs (if  $\alpha$  divides  $\beta$  and  $\beta$  divides  $\gamma$  then  $\alpha$  divides  $\gamma$ , if  $\alpha$  divides  $\beta$ ,  $\gamma$  then divides and  $b + c$ ), prime and complex numbers, analysis of a natural product of primes factors.
- Discussion and exercises for: the square root criterion for verifying prime numbers, the Eratosthenes' sieve, proof that prime numbers are infinite, the EQF (definition and its applications, finding the EQF using its first factor product analysis), the MKD (definition and applications, finding MKD using product analysis first factors), practical problems where MKD is used and the EQF, first factor product analysis software and search for great firsts and their educational versions as well their applications.
- Discussion and exercises for: the property  $K\Gamma(\alpha, \beta) = \lambda \cdot EK\Gamma(\alpha, \beta)$ , the property  $MK\Delta(\alpha, \beta) = \lambda \cdot K\Delta(\alpha, \beta)$ , the Euclid's algorithm for finding MKD for two or more numbers, the comparison of MKD algorithms.
- Discussion and exercises for: properties  $EK\Gamma(\lambda \cdot \alpha, \lambda \cdot \beta) = \lambda \cdot EK\Gamma(\alpha, \beta)$ ,  $MK\Delta(\lambda \cdot \alpha, \lambda \cdot \beta) = \lambda \cdot MK\Delta(\alpha, \beta)$  and their extension for more than two numbers, the properties of  $EKP(a, b, c) = EK\Gamma(EK\Gamma(\alpha, \beta), \gamma)$ ,  $MK\Delta(\alpha, \beta, \gamma) = MK\Delta(MK\Delta(\alpha, \beta), \gamma)$  and their extension for more than two numbers, the property of  $EKP(\alpha, \beta) = \alpha \cdot \beta / MK\Delta(\alpha, \beta)$  and its applications (in particular the EQF finding algorithm based on this property and the Euclidean algorithm), the comparison of algorithms finding the EQF.
- Discussion and exercises for: software that implements the algorithms discussed in previous courses (spreadsheets, educational software) and their didactic utilization, the properties of equilibrium numbers, the divisibility criteria, the "cross criterion" for its control multiplication and its extension for division.
- Discussion and exercises for: basic aspects of the concept of fraction, the introduction of its concept fraction on the board, the concept of equivalent fractions and the algorithm conversion of two heteronymous fractions into homonyms, its meaning addition and subtraction fractions, addition algorithms and fraction removal, addition and subtraction problems.
- Discussion and exercises for: the concept of multiplication and division of fractions, their multiplication and division algorithms, the problems that are solved by a multiplication or a division of fractions.

- Discussion and exercises for: complex problems of multiplication and division of fractions, the meaning of decimal numbers, algorithms of their operations decimal numbers, the criteria for controlling decimal operations number.
- Discussion and exercises for: the concept of percentages, percentage problems, decimal comparison and fractional writing. Summary of the discussion on fractions and the decimals. Brief discussion on real numbers and their classification.
- Discussion and exercises for: the meaning of the corresponding amounts, the properties of the corresponding amounts, the problems of the corresponding amounts and the ways their solutions, how we distinguish the corresponding amounts from quantity relations where the amounts are not analogous.
- Discussion and exercises for: the meaning of inversely proportional amounts, the properties of inversely proportional corresponding amounts, the problems of inversely proportional amounts and the ways of their solutions. The proportions and inversely proportional amounts as functions, the algebraic expressions of these functions, the graphs representations of these functions.
- Discussion and exercises for: The multiple corresponding amounts and the ways for their solutions.

Discussion and exercises for: the types and the relationship of the analogs and the inverse analogs amounts, the types of multiple analog amounts and their endorsement as functions of many variables.

## **E01 Π12 The Mathematical Game in the Modern Teaching of Mathematics**

- Introductory discussion about the math game and the possibilities it offers in terms of developing mathematical skills, acquiring knowledge and cultivating a positive attitude towards Mathematics.
- Discussion of some characteristic logic games (NIM, master mind, minesweeper,...) analysis of their mathematical content, didactic analysis in terms of their educational utilization. Assigned relevant work to students.
- Discussion of geometric puzzles, analysis of their mathematics content, relevant historical references, didactic analysis regarding their educational utilization. Assignment of relevant tasks to students.
- Discussion of the possibilities offered by the computer and internet regarding the Mathematical game.
- Discussion of arithmetic puzzles, analysis of their mathematics content, relevant historical references, didactic analysis regarding their educational utilization. Assignment of relevant tasks to students.
- Discussion of puzzles and combinatorial games and probabilities. Analysis of their mathematical content, relevant historical references, didactic analysis in terms of their educational utilization. Assigned relevant work to students.
- Discussion of educational activities with math games they designed and suggest students, and which can be utilized in the classroom or in others environments (all day, family environment, students' free time).
- Discussion of sample activities with math games designed by students and performed with elementary school students.



## **E02 Π02 Basic Concepts of Physics**

- Natural units of measurement, vector & monometer sizes, graphic representations of natural sizes
- Engineering: Types of movements (Linear smooth / smoothly changing / changing motion, smooth / variable circular motion), Composition & Analysis of Forces, Laws of Newton, Project-Energy, Principle of Energy Conservation, Rotary motion, Torque Conservation Principle, Torque
- Electromagnetism: Structure of the Atom, Ways of Electrification, Conductors-Insulators, Beginning Electric Load Conservation, Electric Quantum Quantity, Electric Coulomb Power, Electric Field, Electric Potential and Electric Dynamics lines, Electric Dynamic Energy, DC Circuits, Electrical Resistors & Ohm's Law, Resistor Connection, Electricity & Power Thermodynamics: Heat-Temperature, Good & Bad Heat Conductors, Thermal Expansion into Solids / Liquids / Gases, Ways of Heat Propagation, Changes Phases.
- Fluid Mechanics: Pressure Definition, Hydrostatic & Atmospheric Pressure, Buoyancy, Cruising, Transmission of Pressures in Fluids, Bernoulli Principle.
- Wave: Characteristic Sizes of Oscillation, Wave Types, Wave Properties, Sound Waves, Subjective & Objective Characteristics of Sound

Optics: Nature of Light, Reflection / Refraction / Diffraction / Fun of Light, Colors & Light Absorption & Emission Mechanisms.

## **E02 Π06 Science Education**

- Delimitation of the scientific field of the Teaching of Natural Sciences
- Scientific Literacy - Aims & objectives of teaching NS- Detailed NS programs
- Learning Theories in the field of NS (Cognitive and sociocultural approaches)
- Conceptual change.
- Ideas of students in NS
- Teaching model of NS
- Phases of teaching a constructivist model of learning NS
- Teaching & Learning through exploration
- Didactic reconstruction of scientific content

Didactic Planning of NS courses - Teaching scenarios – Worksheets.

## **E03 Σ09 Educational Robotics**

- Introduction, Groups Theoretical framework. Technological progress and society. Technological and Scientific Literacy of the primary school teachers.
- Introduction to Hardware and Software. Introduction to Robotics, Starting Programming, More Programming, Building Complex programs, Data collection and display. Guided activities and structured research for students who are related to the

concepts of Robotics, (movement forward, movement forward back, turn, move to the square, my commands 1), (repeat action, audio detection, audio control, distance detection, distance control, price on-screen sensor), (black line detection, follow the line, contact detection, rotation sensor, rotation sensor reset). (speed control, impact counter, area control, random duration, the commands 2, remote response), data (audio recording) real-time, speed recording, file saving, crawling objects).

- 1st and 2nd Independent Project. Two long-term projects relating to collaborative activity. Perspective and ways of introducing Educational Robotics in Primary School. Use of EP in teaching and learning Science, Applied Mathematics, Informatics and Engineering. Design, construction and programming of robots for a challenge (Sumo, RoboPong, PrintLEGO).
- Evaluation - Presentation Final audit, Presentation of Projects (competitions, internships).

### **E03 Π11 Digital Literacy and Internet**

- Informatics as a scientific field
- Introduction. Science and Technology in societal environments. The problems of introducing ICT in education.
- Digital Literacy

Information and data, Digital world, digital duo.

- Internet

Introduction. Technological historical data. The World Wide Web. Navigation Programs. Cookies.

- Introduction to Free Software / Open Source Software

What it is and why we use it in education. Creative Commons Licenses.

Presentation of Educational Software

- Search the Web

Search engines, retrieval and management of information, search strategies, information reliability check.

- Legal issues on the Internet

Personal Data Protection Regulation (GDPR).

- Introduction to web 2.0 environments

Working on the Internet (Text editing, presentations and online Spreadsheets. Collaborative environments (such as Google Docs).

- Modern and asynchronous communication

Email, Skype, viber, Zoom, Webex, MS Teams etc.

- Digital security

Malware Protection. Spam protection

- Security of personal data

Personal Data Protection Regulation (GDPR). Theft protection identity. The right to oblivion.

- Social Media.

Social media, their role in education

- Protection of children and adolescents. The role of the family and the education system. World Day Secure Internet.
- Safe educational environments

Website presentation.

## **E04 Σ01 Natural Sciences, Technology, Engineering and Mathematics (STEM) in Education**

- Knowledge of Natural Sciences content (Physics, Chemistry, Biology, Geology):
- Basic Concepts, Conservation Principles, Experimental Investigation Techniques
- Knowledge of Mathematics: Study & Analysis of Graphs , Solving & problem Modeling
- Knowledge of Technology content: Programming, Computational Thinking,

Operation of Innovative Technological Tools, Limits & Possibilities of Technological Means

- Knowledge of Engineering content: Engineering Design Cycle

Performance Optimization, Error Checking & Evaluation

- Examples of interdisciplinary teaching modules Design, Artifact Development
- Application and Control of Artifacts
- Artifact Redesign & Optimization
- STEM Teaching Practice

## **E04 Σ02 Science - Society - Technology (STS) in Education**

- The value of the STS approach to teaching
- Targeting the STS approach
- Nature of science and technology
- Political, social, cultural and economic composition of science and technology
- Analysis of contemporary social - interdisciplinary issues and challenges
- The concept of activism, social responsibility and active citizenship
- The public understanding of science

- Teaching strategies and practices for the application of the STS approach to teaching
- Students' reasoning on interdisciplinary - social issues
- Course planning based on the STS approach.