**DEBRE MARKOS UNIVERSITY**

**COLLEGE OF POST GRADUATES**

**COURSE SYLLABI FOR SECOND SEMESTER COURSES\_ SEM.II/2012EC**

**COLLEGE/SCHOOL/INSTITUTE: NATURAL AND COMPUTATIONAL SCIENCES**

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| Department | Program Name | Course details | Remark |
|  MathsMaths | Course Title and code | Course code  | CrHr | Course description |  |
| Algebra  | Introduction to Algebraic Geometry | Math 626 | 3 | This gives an introductory concept in Algebraic Geometry. It discusses the concepts of Affine varieties, Groebner bases, Polynomial and rational functions on a variety. It also aims to establishe fundamental relationship between geometry and algebra by using Hilbert’s Nullstellensatz. |  |
| Differential | Distribution Theory and Function Spaces | Math 686 | 3 | The course covers topics such as: Introduction to Function Spaces, Sobolev spaces *Wkp*; The space *Hsp* ; Nikolskii- Besov Spaces *B1p,*,$θ$, The Concept of Distributions; Test Functions and Distributions; Differentiation of Distributions; Direct Product and Convolution of Distributions;Tempered Distributions and Fourier Transform; Applications in Mathematical Physics including description of Ellipticity, Hypoellipticity and partially Hypoellipticity of Differential Operators; Analysis of Boundary Domain Integral Equations. |  |
| Year I | Algebra II | Math 522 | 3 | The course covers the theory of modules, fields and their extension, ruler and compass constructions of Galois Theory, the fundamental theorem of Galois Theory and applications of Galois Theory. |  |
| Real Analysis II | Math 562 | 3 | The Main topics to be covered in this course include: measurable sets, measurable functions, Integration, product measures, signed measures; Lp- spaces, positive linear functional. |  |
| Ordinary Differential Equations | Math 682 | 3 | The course covers topics such as: initial Value Problems, Contraction mapping principle, Fixed Point theorems, Fundamental existence and uniqueness theorems, Stability and asymptotic behavior of solutions, Explicit/Implicit Linear Systems of First & higher Order, Phase plane and Phase portrait, Nonlinear systems, Lyapunov functions, Grobman- Harthman linearization theorem, Eignvalue Problems and Boundary values, Linear/Nonlinear boundary value problems, fundamental matrix and Green’s function, maximum Principle, Upper and lower solutions, Uniqueness and estimation theorems, Sturm-Liouville and Generalized Fourier Series, Comparison theorems, Oscillation phenomena, generalized Fourier series, Rotation symmetric elliptic problems, Approximate solutions and Euler polygons, Error analysis, Convergence and consistency, Zero- stability and initial value problem, |  |
| Functional Analysis | Math 564 | 3 | This course covers topics such as: Linear Operator, Normed linear space; Banach spaces, Hilbert spaces and topological vector spaces. |  |

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**COURSE SYLLABI FOR SECOND SEMESTER COURSES\_ SEM.II/2012EC**

**COLLEGE/SCHOOL/INSTITUTE: \_\_NCS\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| --- | --- | --- | --- |
| Department | Program Name | Course details | Remark |
| physics  | Course Title and code | Course code  | CrHr | Course description |  |
|  | Quantum Mechanics I | phys642 | 3 | **Linear Vector and Representation Theory:** Linear vector space, Dirac notations of Bra - Ket notation, Matrix representation of Observables and states, Determination of eigenvalues and eigenstate for observables using matrix representations, Change of representation and unitary transformations, Coordinate and momentum representations, Equations of motion in Schrödinger and Heisenberg pictures**Theory of Angular Momentum**: Symmetry, invariance and conservation laws, relation between rotation and angular momentum, commutation rules, Matrix representations, addition of angular momenta and Clebsch-Gordon coefficients, Pauli spin matrices**Green’s Functions:** Green’s function method of solving inhomogeneous differential equations, Boundary Conditions, Application to One-dimensional problems **Scattering Theory:** Differential and total Scattering cross-sections laws, partial wave analysis and application to simple cases; Integral form of scattering equation, Born approximation validity and simple applications **Approximation Methods:** Time-independent Perturbation theory (non-degenerate and degenerate) and applications to fine structure splitting, Zeeman effect (Normal and anomalous), Stark effect, and other simple cases, Variational method and applications to helium atom and simple cases; WKB approximation and applications to simple cases. Time-dependent Perturbation theory, Fermi’s Golden rule, Semi-classical theory of interaction of atoms with radiation  | Since they are 1st year students they do not have specialization |
| Classical Electrodynamics I | PHYS672 | 3 | **Electrostatics:** Electrostatic field and potential – field lines and Gauss’s law – Laplace’s and Poisson’s equation – electric dipole – work and energy – conductors – polarization – Gauss’s law in dielectrics – electric displacement – linear dielectrics **Magnetostatics:** Magnetic induction – electric current and Ohm’s law – steady current and Biot-Savart law – Ampere’s law and applications – magnetic flux – magnetization – magnetic intensity – energy density – linear and nonlinear media  **Maxwell’s Equations:** Faraday’s law – generalization of Ampere’s law – Maxwell’s equations – boundary conditions – scalar and vector potentials – Coulomb and Lorentz gauge – Poynting’s theorem **Electromagnetic Waves:** Electromagnetic wave equation – solution and propagation of monochromatic waves in non-conducting media – polarization and energy density – reflection and transmission at oblique incidence – waves in conducting media – wave guides – TE, TM and TEM waves in rectangular wave guide  **Radiating System:** Radiation from oscillating electric dipole – radiation from a half-wave dipole – application to antenna – types of antennas **Covariance and Relativistic Mechanics**: Minkowski’s space-time diagram, light cone, Four vectors, Lorentz transformation of Four vectors, Some tensor relations useful in special relativity, Minkowski’s force **Covariant Formulation of Electrodynamics**: Four vector potential, Electromagnetic field tensor, Lorentz force on a charged particle | Since they are 1st year students they do not have specialization |
| Computational Physics | PHYS602 | 3 | **Fortran:** Flow charts, Algorithms, Integer and floating point arithmetic, Precision, Variable types, Arithmetic statements, Input and output statements, Control statements, Executable and non-executable statements, Arrays, Repetitive and logical structures, Subroutines and functions, Operation with files, Operating systems, Creation of executable programs. **Numerical Methods of Analysis:** Solution of algebraic and transcendental equations: Iterative, bisection and Newton-Raphson methods, **Solution of Simultaneous Linear Equations**: Matrix inversion method, Interpolation: Newton and Lagrange formulas, Numerical differentiation, Numerical Integration, Trapezoidal, Simpson and Gaussian quadrature methods, Least-square curve fitting, Straight line and polynomial fits,**Numerical Solution of Ordinary Differential Equations**: Euler and Runge-Kutta methods **Simulation:** Generation of uniformly distributed random integers, Statistical tests of randomness, Monte-Carlo evaluation of integrals and error analysis, Non-uniform probability distributions, Importance sampling, Rejection method, Metropolis algorithm, Molecular diffusion and Brownian motion as random walk problems and their Monte-Carlo simulation  | Since they are 1st year students they do not have specialization |
| Atmospheric physics  | Radiative Transfer in the Atmosphere  | Phys 734  | 3 | Radiometric quantities, Molecular transitions, Absorption by gases, the radiative transfer equation, transmission in individual spectral lines and in bands of lines, light scattering theory for spheres, optical properties of earth-atmosphere system |  |
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| Solid state physics | Selected Topics | Phys795 | 3 | The study of a particular topic of the current interest is covered based on his/her specialization. Topics are to be selected with the consent of the Departmental Postgraduate Committee. Addition and deletion in the list of topics may be made from time to time by the consent of Departmental Postgraduate Committee.  |  |
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**DEBRE MARKOS UNIVERSITY**

**COLLEGE OF POST GRADUATES**

**COURSE SYLLABI FOR SECOND SEMESTER COURSES\_ SEM.II/2012EC**

**COLLEGE/SCHOOL/INSTITUTE: College of Natural and Computational Science**

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| --- | --- | --- | --- |
| Department | Program Name | Course details | Remark |
|  Chemistry  | Course Title and code | Course code  | CrHr | Course description |  |
| Analytical | Introduction to Research Methods | Chem. 652 | 2 | Information searching, scientific writing and presentation skills, preparation of research proposals, laboratory techniques and safety in the laboratory, data analysis, and the use of computers in a chemical research will be covered. |  |
| Advanced Practical Analytical Techniques | Chem. 622 | 2 | Lab experiments include Cyclic Voltammetry and amperometry, Gas chromatography (GC), High Performance Liquid Chromatography (HPLC), Infrared Spectroscopy (IR), Nuclear Magnetic resonance Spectroscopy (NMR), Ultraviolet spectroscopy (UV), Atomic absorption spectroscopy (AAS), etc. Experiments in Advanced Sample preparation and analysis methods will be designed. The students will be required to select optimized analysis method(s), including instrumentation(s), based on the sensitivity, selectivity, and cost and time efficiency |  |
| Electroanalytical Chemistry | Chem. 624 | 2 | Potentials, thermodynamics and electrode kinetics aspect of the electrode solution interface. Mass transfer by migration and diffusion. Fick's first and second laws of diffusion. Potential step methods (chronoamperometry) at planar and spherical electrodes; current-potential characteristics for reversible, irreversible and quasi-reversible electrode processes; potential sweep methods: linear sweep and cyclic voltammetry for reversible, irreversible and quasi-reversible systems; polarography and pulse voltammetry: normal, differential, pulse and square wave voltammetry, current-potential characteristics for reversible, irreversible and quasi-reversible electrode processes; controlled current techniques: chronopotentiometry; hydrodynamic methods: theoretical treatment of convection systems, current-potential curves at a rotating disk electrode, rotating disc and rotating ring-disc electrodes; techniques based on concepts of impedance: ac polarography/voltammetry, Bulk electrolysis methods, Electrogravimetry; Coulometry ; stripping analysis; modified electrodes. |  |
| Separation Science | Chem. 626 | 2 | An advanced study of the theory, instrumentation, and analytical applications of chemical separation methods. Mass transport processes, Thermodynamic and molecular basis of equilibrium separations, Chromatography and theory of retention, Kinetic processes in chromatography, Chromatography of planar surfaces, HPLC instrumentation: Adsorption, partition, ion-exchange, size-exclusion, affinity and chiral chromatography; Gas chromatography, supercritical fluid chromatography and “hyphenated methods |  |
|  | Chemometrics, Statistics and Quality Assurance in analytical Chemistry | Chem. 628 | 3 | Analytical measurements and chemometrics, Errors and error propagation, Statistics of Repeated Measurements; Selected Significance tests in Chemical Analysis; Quality Control: Sampling Applied to Quality Control; Method Validation; Making Analytical Measurements; Regression Analysis: The Correlation Coefficients, Limits of Detection, Regression Lines 156 and Curve Fitting. Non-parametric and Robust Methods, Experimental Design, Optimization and Pattern Recognition, Collaborative Trials and Control Chart |  |
| Seminar I  | Chem. 692 | 1 | The purpose of this course is to help students develop the necessary skills to communicate their knowledge to their colleagues and the public at large. It would entail organizing the content, oral delivery and proper write-up of a particular finding or research results. The skills required to do this will be discussed and practiced by writing a seminar paper and by defending in a seminar. The topics will likely be tilted toward Analytical Chemistry and its application to understanding synthetic phenomena. |  |
| Thesis | Chem. 798 | 6 | Research project will be selected by students in topics which are of particular interest to them in consultation with their supervisors approved by the program. Students carry out experiments under the supervision of research teaching staff according to an original research theme. Students spend one year on experiments for research and obtain new knowledge and skills as they plan and carry out investigations and experiments. Projects can also be executed in collaboration with other concerned institutions. Their experiments will be summed up in a thesis and defended. Therefore, the course includes activities such as problem identification, literature survey, proposal writing and defense, laboratory work, thesis writing and final defense. |  |
| Organic Chemistry | Advanced Organic Chemistry II | Chem. 642 | 3 | There are millions of organic compounds with thousands more being synthesized or isolated from natural sources every year. Each compound undergoes several reactions. If one tried to study all compounds and their reactions it would be an almost impossible task. Fortunately, the type of reactions of organic compounds can be classified into a few types; similarly most compounds can be classified into a number of structural types. Basic carbon-carbon bond forming reactions are reviewed and more advanced synthetic methodology involving main group and transition metal organometallic compounds are introduced. Students will encounterradical-, anion-, cation- and organometallic-mediated processes, gaining insights into the factors governing the mechanistic, stereochemical and regiochemical course of such processes. |  |
| Practical Organic Chemistry | Chem. 644 | 2 | Laboratory experiments that include multi-step syntheses of organic compounds, their isolation, purification, and characterization using modern spectroscopic and chromatographic techniques will be dealt. Lab experiments include Chromatographic techniques, cyclic voltammetry (CV), Flow Injection Analysis (FIA), Gas chromatography (GC), High Performance Liquid Chromatography (HPLC), Infrared Spectroscopy (IR), Nuclear Magnetic resonance Spectroscopy (NMR), Ultraviolet spectroscopy (UV), Atomic absorption spectroscopy (AAS), etc. |  |
| Organo-metallic Chemistry | Chem. 648 | 2 | The course gives a thorough introduction to organometallic chemistry with focus on the transition metals. The course starts with fundamental molecular properties and gradually develops this into practical applied catalysis. Structure and bonding issues in organometallic compounds are discussed in view of the 18-electron rule. Relevant and modern methods for characterization of organometallic compounds are described. Different reactive ligand types are discussed, including σ-bonded ligands such as alkyl, aryl, and hydride, as well as π-bonded ligands such as carbonyl, alkene, diene, alkyne, cyclopentadienyl, and arene. The properties of important anxcillary ligands such as phosphine and N-heterocyclic carbenes are given special attention. Organometallic reaction mechanisms are thoroughly discussed with emphasis on ligand substitution, oxidative addition, reductive elimination, insertion and elimination reactions, nucleophilic and electrophilic addition and abstraction at ligands, and the involvement of carbenes in metathesis and polymerization. The accumulated know-how at this point serves as the foundation for discussions about how organometallic complexes are utilized in homogeneous catalysis and in the activation of small molecules. The application of organometallics in catalysis is highlighted with selected important industrial processes. |  |
|  |  |  | Classification of Natural products: Biosynthesis of natural products. Survey of important classes of natural products: alkaloids, terpenes, steroids, prostaglandins, etc. It Studies isolation, structure, stereochemistry, synthesis, biogenesis and biological properties of classes of natural products from plant, animal, and microbial sources and biopolymers. |  |
|  | Introduction to Research methods | Chem. 652 | 2 | Information searching, scientific writing and presentation skills, preparation of research proposals, laboratory techniques and safety in the laboratory, data analysis, and the use of computers in a chemical research will be covered. |  |
| Seminar-I | Chem.692 | 1 | The purpose of this course is to help students develop the necessary skills to communicate their knowledge to their colleagues and the public at large. It would entail organizing the content, oral delivery and proper write-up of a particular finding or research results. The skills required to do this will be discussed and practiced by writing a seminar paper and by defending in a seminar. The topics will likely be tilted toward organic Chemistry and its application to understanding synthetic phenomena. |  |
| Thesis | Chem. 798 | 6 | Research project will be selected by students in topics which are of particular interest to them in consultation with their supervisors approved by the program. Students carry out experiments under the supervision of research teaching staff according to an original research theme. Students spend one year on experiments for research and obtain new knowledge and skills as they plan and carry out investigations and experiments. Projects can also be executed in collaboration with other concerned institutions. Their experiments will be summed up in a thesis and defended. Therefore, the course includes activities such as problem identification, literature survey, proposal writing and defense, laboratory work, thesis writing and final defense. |  |
| Physical chemistry | Advanced Electrochemistry | Chem. 632 | 3 | The electrical double layer, Electrode kinetics, electrocatalysis, electron transfer theory, Corrosion, Electrochemical energy conversion, electrode kinetic aspects, batteries, fuel cells, photoelectrochemical solar energy conversion, Industrial electrochemistry, inorganic electrolytic processes, organic electro synthesis, other industrial electrochemical processes (electroplating, electroforming, electro-winning, electrochemical machining) |  |
| Computational Chemistry | Chem. 634 | 2 | Molecular mechanics/Force Field Models, a simple molecular mechanics force field, features of molecular mechanics force fields, bond stretching, angle bending, Torsional terms, improper torsions and out-of-plane bending motions, non-bonded interactions, electrostatic interactions, quantum mechanical models: molecular orbital calculations, the Hartree-Fock equations, basis sets, electron correlation, semi-empirical methods, Hückel theory, extended Hückel theory, Density Functional theory, molecular simulation: molecular dynamics (Molecular dynamics using simple models, molecular dynamics with continuous potentials), Monte Carlo (Some theoretical background to the Metropolis method, combined quantum mechanical and molecular mechanical method) |  |
| Special topics in physical chemistry | Chem. 636 | 2 | The course focuses on current research topics in physical chemistry. Topics may be selected from the following: Surface Chemistry, photochemistry, Conducting Polymers, Material Science, and Molecular Spectroscopy etc. |  |
| Introduction to Research methods | Chem. 652 | 2 | Information searching, scientific writing and presentation skills, preparation of research proposals, laboratory techniques and safety in the laboratory, data analysis, and the use of computers in a chemical research will be covered. |  |
| Seminar-I | Chem.692 | 1 | The purpose of this course is to help students develop the necessary skills to communicate their knowledge to their colleagues and the public at large. It would entail organizing the content, oral delivery and proper write-up of a particular finding or research results. The skills required to do this will be discussed and practiced by writing a seminar paper and by defending in a seminar. The topics will likely be tilted toward physicalChemistry and its application to understanding synthetic phenomena. |  |
| Thesis | Chem. 798 | 6 | Research project will be selected by students in topics which are of particular interest to them in consultation with their supervisors approved by the program. Students carry out experiments under the supervision of research teaching staff according to an original research theme. Students spend one year on experiments for research and obtain new knowledge and skills as they plan and carry out investigations and experiments. Projects can also be executed in collaboration with other concerned institutions. Their experiments will be summed up in a thesis and defended. Therefore, the course includes activities such as problem identification, literature survey, proposal writing and defense, laboratory work, thesis writing and final defense. |  |
|  | Inorganic Chemistry | Transition Metal Organometallics and Catalysis | Chem.612 | 3 | This course is an advanced treatment of the synthesis, structures, reactions and spectroscopic identification of organometallic compounds, notably those of the transition elements. Bonding theory, synthesis, and reaction mechanisms of organotransition metal species will be examined. Modern applications of transition metal complexes in organic synthesis and the concept of catalysis, such as oxidations, reductions, carbon-carbon and carbon-heteroatom bond forming processes, will be surveyed. An overview on the synthesis and manufacture of high value materials (polymers, fine chemicals etc) will be described. |  |
| Bioinorganic Chemistry | Chem.614 | 3 | Inorganic elements are also essential in life processes. Metals are frequently present in living organisms. The major roles of metal ions in biological systems such as metalloproteins and metalloenzymes will be study. The roles of many of these systems as electron carriers, centers for binding and activating substrates or as agents for transferring atoms and groups will be discussed. Special emphasis will be made on how metals coordinate in bioinorganic materials and how they operate in nature. The course will also study how the introduction of metals into biological systems can be used to fabricate important artifacts such as probes and drugs. |  |
| Introduction to Research Methods | Chem.652  | 2 | Information searching, scientific writing and presentation skills, preparation of research proposals, laboratory techniques and safety in the laboratory, data analysis, and the use of computers in a chemical research will be covered. |  |
| Solid State Chemistry and Its Application | Chem.616 | 2 | Solid state chemistry is concerned mainly with crystalline inorganic materials, their synthesis, structures, properties and applications. A good place to begin is with crystal structures and crystal chemistry. All necessary crystal structure information is contained in data on unit cells, their dimensions and the positions or atomic coordinates of atoms inside the unit cell. Crystal chemistry combines this basic structural information with information about the elements, their principal oxidation states, ionic radii, coordination requirements and preferences for ionic/covalent/metallic bonding. A working knowledge of the Periodic Table and the properties of elements is, of course, invaluable to be able appreciate crystal chemistry, but conversely, knowledge of crystal structures and especially crystal chemistry provides a very useful way to gain increased understanding of the elements and their compounds. Many of the properties and applications of crystalline inorganic materials revolve around a surprisingly small number of structure types. This course mainly focuses on Crystal Structures, Unit Cells and Crystal Systems, Symmetry, Lattice Planes and Miller Indices, Crystal Densities and Unit Cell Contents, Close Packing in Crystal Structures, Crystal Defects, X-Ray Diffraction, Electrical and Magnetic Properties of solids. |  |
| Seminar I | Chem. 692 | 1 | The purpose of this course is to help students develop the necessary skills to communicate their knowledge to their colleagues and the public at large. It would entail organizing the content, oral delivery and proper write-up of a particular finding or research results. The skills required to do this will be discussed and practiced by writing a seminar paper and by defending in a seminar. The topics will likely be tilted toward inorganic Chemistry and its application to understanding synthetic phenomena. |  |
| Thesis | Chem. 798 | 6 | Research project will be selected by students in topics which are of particular interest to them in consultation with their supervisors approved by the program. Students carry out experiments under the supervision of research teaching staff according to an original research theme. Students spend one year on experiments for research and obtain new knowledge and skills as they plan and carry out investigations and experiments. Projects can also be executed in collaboration with other concerned institutions. Their experiments will be summed up in a thesis and defended. Therefore, the course includes activities such as problem identification, literature survey, proposal writing and defense, laboratory work, thesis writing and final defense. |  |

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**COURSE SYLLABI FOR SECOND SEMESTER COURSES\_ SEM.II/2012EC**

**COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCE**

**DEPARTMENT OF SPORTS SCIENCE**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Department**  | **Program**  | **No.** | **Course Title** | **Course Code** | **Credit Hour** | **Course Description**  | **Remark** |
| **Sports Science** | **MSc. In Health and Fitness**  | 1. | Biostatistics | Stat502 | 3  | Biostatistics is essential to ensuring that findings and practices in public health specifically health and fitness are supported by reliable evidence. This course covers the basic tools for the collection, analysis, and presentation of data in all areas of sports science. Central to these skills is assessing the impact of chance and variability on the interpretation of research findings and subsequent recommendations for public health. The contents included as follows: introduction to biostatistics, hypothesis testing: one-sample inference, estimation, analysis of variance, regression and correlation methods, |  |
| 2. | Physiological Basis of Sport and Fitness Conditioning | SpSc528 | 3 (2+1) | This course is aimed at developing an understanding of the physiological adaptations to fitness or long-term physical training with emphasis on metabolic, strength and conditioning principles. Through the awareness of the body's responses to chronic and acute exercise. The student will be able to organize and design a physical training or fitness program for young adults, athletes and special populations. This course includes the following contents: concepts of physiological basis of fitness & sport conditioning, physiological responses and adaptations of exercise, physiology of sports training, periodization of sports training, sport and exercise biomechanics, and fitness program design and personal training.  |  |
| 3. | Exercise testing, prescription, and supervision | SpSc522 | 4 (3+1) | This course mainly focuses on exercise testing, prescription and supervision both in theoretical and practical aspect for peoples with different disorder and fitness development. The contents include in this course: benefits and risks associated with physical activity, pre-participation health screening, pre-exercise evaluation, health-related physical fitness testing and interpretation, clinical exercise testing, interpretation of clinical exercise test results, general principles of exercise prescription, exercise prescription for healthy populations with special considerations and environmental considerations, exercise prescription for patients with cardiovascular and cerebro-vascular disease, exercise prescription for populations with other chronic diseases and health conditions, behavioral theories and strategies for promoting exercise. |  |
|  | 4. | Advanced Measurement and Evaluation in Health and Fitness | SpSc524 | 3 (1+2) | The purpose of this course is to expose the student to human performance measurement and evaluation techniques in sports and exercise applicable to research and/or clinical settings. This course includes the purposes of assessment, measurement, evaluation and test, methods of assessing body composition, health related physical fitness measurement, skill related physical fitness measurements, performance measurement in different sports, and physical fitness test batteries for different age group |  |

**DEBRE MARKOS UNIVERSITY**

**COLLEGE OF POST GRADUATES**

**COURSE SYLLABI FOR SECOND SEMESTER COURSES SEM.II/2012EC**

**COLLEGE/SCHOOL/INSTITUTE: NCSc.**

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| --- | --- | --- | --- |
| Department | Program Name | Course details | Remark |
| **Biology**  | Course Title and code | Course code  | CrHr | Course description |  |
| **Ecological and Systematic Zoology**   | Comparative Animal Anatomy and Physiology | Biol-626 | 3 | Comparison of sensory, motor, endocrine, osmoregulatory, digestive, respiratory and other physiological processes and integrative mechanisms in animals; representative animals will be selected to understand physiological functions; regulation of body function (neuronal, hormonal), digestion, respiration, excretion of metabolic end products, temperature regulation; reproduction.  |  |
| Biodiversity Conservation and Ethiopian Ecosystem | Biol-632 | 3 | Biodiversity levels of integration (i.e., genetic, species, ecosystem); centers of biological diversity; threats to biological diversity; loss of biodiversity, vulnerability to extinction, habitat destruction, fragmentation, degradation, exotic species introduction; population genetics and conservation; the basic rule of conservation genetics and its Methods; *in situ/ex situ* conservation: principles and measures of conservation; on-farm conservation; establishing, designing and managing protected areas; conservation and human societies; local conservation legislations; international agreements, Ethiopian ecosystems, biodiversity and their status. |  |
| Advanced Animal Ecology  | Biol-634 | 3 | Distribution of animal communities; ecological successions; environmental factors; the ecological methods, population ecology, community ecology, ecosystem ecology, etc. |  |
| Wildlife Management and Eco-tourism | Biol-636 | 3 | Objectives of wildlife management; selection and establishment of wildlife management areas; participatory approach to wildlife management; major elements of a wildlife area management; habitat evaluation, census methods, economic status, life history, application of ecological principles to management of wild animal, populations, natural tourism resources, game hunting, wildlife trophy, value of wildlife in Ethiopian economy. |  |
|  **Biomedical Science**  | Techniques in Molecular Biology  | Biol. 632 | 2 | This course introduces students to know the theory and laboratory techniques in molecular biology with an emphasis on DNA replication, transcription, gene expression and regulation, recombinant DNA and RNA techniques such as gene cloning, transformation, RT-PCR, DNA sequencing and DNA bioinformatics tools |  |
| Medical and Veterinary Entomology | Biol. 625 | 3(2+1) | This course provides an introduction to the roles of insects and other arthropods as direct agents of disease in humans and domestic animals, and as vectors (transmission) of disease causing agents of parasites (pathogens) both in humans and domestic animals. Information will be provided on the biology and behavior of disease vectors and external parasites, and on the annoying and venomous pests of humans and animals. The laboratory sessions will be devoted to the recognition and identification of medical and veterinary vectors/pests.Course outline Classification, biology and medical significance of certain insects and related arthropods. Anatomy and physiology of a representative blood-sucking insect, the mosquito. Classification, recognition, differentiation, biology, medical importance of culicine and aanopheline mosquitoes, sandflies, culicoides (biting midges), black flies, tabanids, tsetse-flies, houseflies and allied genera, bed-bugs, triatomid bugs, lice and fleas. Myasis. Other arthropods, particularly the Acarines (ticks and mites). Insecticides, mode of action, resistance and hazards to man and other animal and alternative methods. |  |
| Advanced Immunology | Biol.644 | 2 | Impact and controversies associated with breakthroughs in immunology and infectious diseases. General properties of immune responses; cells and tissues of immune system; lymphocyte activation and specificity; effector mechanisms; immunity to microbes; immunodeficiency and AIDS; autoimmune diseases; transplantation. Concepts and current knowledge of the diversity of immune response, experimental systems used in studying immunology, antigen-antibody reaction methods, monoclonal antibodies, antibody engineering, hypersensitivity reactions, autoimmunity, adhesion molecules and homing of cells of the immune system |  |
| Parasitic Helminths | Biol.642  | 2(1+1) | The course attempts to provide the student with a comprehensive knowledge of the biology of parasitic helminths with emphasis on parasites of greater medical and veterinary importance. |  |
| Epidemiology | Biol. 646 | 2  | This course introduces students to the basic principles, methods and applications of epidemiology. Students will learn to use the tools of descriptive and analytical epidemiology. They will also learn how to design epidemiologic information systems and epidemiologic research investigations. Students will acquire skills in the critical assessment of epidemiologic data using sampling and sample size determination, epidemic surveillance, public health screening and research studies. |  |
| Bioactivity of natural products | Biol. 648 | 2 | This course introduces the students to the use of plants for medicinal purpose; poisonous plants; chemistry and biological significance of natural products; natural products from higher plants in modern medicine. |  |