**MSc Degree: Environmental Science and Engineering**

**Biodiversity Management and Conservation**

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| **First Semester** | | | | | | **Second Semester** | | | | | |
| **Course Row** | **Course Title** | **Course code** | **Credit Number** | **Theoretical** | **Practical** | **Course Row** | **Course Title** | **Course code** | **Credit Number** | **Theoretical** | **Practical** |
| 1 | Research Methods | 60-24-075 | 2 | 2 | - | 4 | Advanced remote sensing | 60-24-189 | 2 | 1 | 1 |
| 2 | Advanced statistical methods | 60-24-188 | 2 | 2 | - | 9 | Conservation Genetics | 60-24-149 | 2 | 2 | - |
| 3 | Geographic information system | 60-24-145 | 2 | 1 | 1 | 8 | Habitat management and evaluation | 60-24-148 | 2 | 2 | - |
| 45 | Complementary wildlife ecology | 60-24-180 | 2 | 2 | - | 12 | Participatory conservation | 60-24-151 | 2 | 2 | - |
| 36 | Migratory species management | 60-24-171 | 2 | 2 | - | 35 | Invasive species management | 60-24-170 | 2 | 2 | - |
| 13 | Wildlife population monitoring | 60-24-152 | 2 | 2 | - | 40 | Tourism in protected area | 60-24-175 | 2 | 2 | - |
| 5 | Climate change impact assessment | 60-24-164 | 2 | 2 | - |  | - | - | - | - | - |
|  | **Total Score in semester** | | 14 | 13 | 1 |  | **Total Score in semester** | | 12 | 11 | 1 |

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| **Third Semester** | | | | | | **Forth Semester** | | | | | |
| **Course Row** | **Course Title** | **Course code** | **Credit Number** | **Theoretical** | **Practical** | **Course Row** | **Course Title** | **Course code** | **Credit Number** | **Theoretical** | **Practical** |
| 6 | Thesis | 60-24-023 | 6 | - | 6 | 6 | Thesis | 60-24-023 | 6 | - | 6 |
|  | **Total Score in semester** | | 6 | - | 6 |  | **Total Score in semester** | | 6 | - | 6 |

**MSc Courses: Biodiversity Management and Conservation**

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| Topic/Headlines | Total Units | Semester | Title |
| Research definition and various types of it, literature review for research, introducing search engines and information databases for scientific research, presenting an applicable software for research documentation, skills of preparing scientific proposal and its details (including explanation of the problem and its importance, defining the research objectives, hypothesis and material and methods required to conduct the research work), planning and implementation of stages of a research work (literature review, material and methods, data collection, implantation of the experiments), statistical principles (including variables, sampling, statistical population, statistical analysis of data) parameters of deviation, distribution, signification, regression, correlation, non-parametric statistics, proposal and manuscript preparation, grammatical principals and concerns. | 2 | 1 | Research Methodology |
| • Course Introduction  • Fundamental concepts of statistics  • Parametric and non-parametric statistics  • Data preparing 1: Scatter plot, Q-Q plot, Box plot  • Data preparing 2: Normality test, Variances Homogeneity test, Independence assumption  • Concepts of Hypothesis testing  • One sample tests about a population mean  • Comparing two populations/sample means: independent and paired populations/samples  • Principles of analysis of variances (ANOVA)  • Experimental designs: CRD  • Experimental design: RCBD, Relative efficiency  • Experimental design: LS  • Experimental design: Factorial  • Simple Correlation and partial correlation  • Linear and nonlinear regression  • Validation of regression models: Holdout cross validation, Leave one out cross validation, K-fold cross validation  • Introduction to PCA | 2 | 1 | Advanced Statistical Methods |
| GIS definitions, History, Applications in natural resources and the environment, Baes of GIS, Data importing in GIS environment, Spatial and descriptive data, Presentation model of geographical data, Advantage and disadvantage of raster data, Advantage and disadvantage of vector data, Data quality and their assessment, Rater analysis in GIS environment.  Familiarity with the environment of a GIS software, Introducing the importing data, Data management in GIS software, Importing data into software, Editing, Saving, Presenting of information layers, Create the digital elevation model, Slope, Aspect, Digitizing the Arial photo, Rater analysis | 2 | 1 | Geographical Information |
| Satellite image types, Correction types (Atmospheric, geometric, Radiometric), Preprocessing and image processing, Survey of environmental indexes using satellite image, Sampling in remote sensing, Classification types, Classification using advance methods, Accuracy assessment, Spectral classification, Classification analysis, Thermal remote sensing, Application of thermal remote sensing in environmental sciences, Environmental pollutions survey using remote sensing, Application of active remote sensing in environmental sciences, Application of statistics in remote sensing, Application of remote sensing in aquatics and terrestrial ecosystems, Application of remote sensing in biodiversity and habitats, Integrated of remote sensing and GIS,  Familiarity with the satellite data types, Preprocessing, corrections and classifications of satellite images and familiarity with a remote sensing software | 2 | 2 | Advanced Remote Sensing |
| Review of the greenhouse gases effects on recent climatic changes and paleoclimatology, review of the climatic changes effects on environmental, Basic concepts of global climate: Radiation, Solar Energy, Atmospheric Circulation, Oceanic Circulation, Physical Process of Climate and Atmospheric Physics, Introducing climatic models and classification of climatic models, Relationships between land cover, snow, ice, vegetation cover with atmospheric-oceanic oscillations, mathematic and statistical modelling of climatic changes, downscaling and prediction of changes, trend analysis of climatic variables and detection of climatic changes, introducing data banks and how to prepare data, applications of downscaled atmospheric information, modelling extreme events such as drought, Flood, Strom, Modelling rising sea water levels, Climatic Scenarios of IPCC, GCMs, Introducing LarsWG, SDSM, HadCM3, RCM, ECHO-G, ClimGen, Applications of Satellite Maps in monitoring climatic changes, Relationships between Climatic changes and Dust storm, Evaluating of climatic changes effects on land ecosystems, Coastal and Marine ecosystems, mammals, Birds, Aquatic, Invertebrates, Evaluating climatic changes effects on health and human health | 2 | 1 | Climate Change Impact Assessment |
| Carrying out a research project in the relevant field which has been approved in accordance with the rules of the department of education and the university and the results are compiled in the dissertation to be defended in the presence of the jury. | 6 | 3&4 | Thesis |
| Habitat evaluation principals, habitat evaluation history in Iran and in the world, theories and basic concepts in habitat evaluation, generalization, realism and accuracy in ecological models, habitat use, habitat selection and habitat preference, niche, habitat variable mapping, species and habitat interaction, sampling and field observation, spatial and temporal scales, habitat evaluation management implementation, habitat evaluation challenges, climate change mapping, species migration process, Metapopulation habitat modeling, habitat modeling introduction and classification, habitat modeling implementation in conservation planning.  Habitat modeling using R software  Habitat modelling using other professional software. | 2 | 2 | Habitat Management and Evaluation |
| Population genetics principles, Concepts of population genetics in conservation biology, Molecular markers, DNA extraction, PCR an electrophoresis methods, Neutral theory in population genetics, Measuring gene flow among populations, Genetic diversity estimation of populations, Hardy-Weinberg equilibrium, Linkage disequilibrium, Genetic distance among individuals and populations, Statistical models in population genetics, Bottle neck event and its measurement, calculating allelic frequencies in populations, Natural selection mechanisms, DNA barcoding, Conservation units, Relatedness of genetic diversity and fitness, Inbreeding & outbreeding and theirs consequences on the populations, Allelic purification, Management plans based on genetic populations (Genetic rescue, introduction individuals), Gene banks. | 2 | 2 | Conservation Genetics |
| Introduction, concepts, participatory conservation history, local people's perceptions of biodiversity, biodiversity threats caused by human activity and human impacts on biodiversity, globalization and consumerism, community-based conservation, different levels of public interest in participation, stakeholder identification and analysis techniques, barriers to community participation in conservation, role of women and youth in conservation, links between biodiversity conservation, local livelihoods and exploitation of wildlife resources, wildlife trade, local beliefs and local knowledge, value of indigenous and local beliefs and knowledge in conservation, alternative livelihood strategies, wildlife compensation schemes, ecotourism contributions to conservation, wildlife conservancies, capacity-building and conservation education, human-wildlife conflict, roles of NGOs in the conservation, local communities and management of protected areas, participatory zoning. | 2 | 2 | Participatory Conservation |
| Goals and importance of wildlife population monitoring programs, monitoring conservation objectives, implementation of a monitoring program, appropriate monitoring method selection, data management systems developing, accuracy and bias, detection rate and its related errors, sampling designs, index species, census and abundance indices, determining the estimated abundance validation, balance between cost and accuracy, direct count, marking (tagging) methods, capture recapture, other methods involve capturing, using camera traps, distance sampling: stripe transect, spot transect, transect count, aerial survey, plotless sampling methods, population abundance indices, mammals, birds, reptiles, amphibians, fish, vertebrates and plants monitoring techniques, environmental variables measurement for the purposes of monitoring, literature review and case studies, seminar representing by students. | 2 | 1 | Wildlife Population Monitoring |
| Invasive species and exotic species, invasive species treats towards endemic biodiversity, invasive species ecology and adaptation, examples of the invasive species in different parts of the world and their management, introducing the invasive species in terrestrial and aquatic ecosystem of Iran, invasive species physical, chemical and biological control techniques, invasive species management techniques, invasive species invasion trend simulation, climate change and spreading the invasive species, Invasive species risk assessment, sensitive habitats in related to the invasive species, invasive species economical evaluation, literature review and case studies, seminar presentation by students. | 2 | 2 | Invasive Species Management |
| Introduction and concepts of migratory species, types of migratory species and migration, observing, banding and marking migratory animals (birds, mammals, aquatic species), applying isotopic methods, radio telemetry, radar monitoring and other suitable techniques to tracking migratory animal movements, reasons animals migrate, climate change and migration, animal navigation and orientation, migratory adaptations, protection of migratory animals, study of wildlife migratory routes and corridors, migration modeling and mapping, migratory behavior, migratory routs, location and timing (when to move), Convention on the Conservation of Migratory Species of Wild Animals (CMS), literature review and case studies, seminar representing by students. | 2 | 1 | Migratory Species Management |
| Introduction and concepts of tourism, types of tourism, nature tourism, concepts of protected area network, international classification system for protected areas, classification and characteristics of protected areas in Iran, the role of tourism in conservation, ecotourism and protected areas, tourism activities in protected areas, mountain regions, forest areas, desert tourism, adventure tourism, wildlife tourism, ecotourism, cultural, heritage and historical tourism, ecolodge types and definitions, empowering local communities and sustainable tourism development in protected areas, tourism facilities and services of protected areas, benefits and challenges of tourism in protected areas, tourism and visitor management in protected areas, protected areas and tourism planning, protected area zoning for conservation and use, guidelines for zoning in protected areas, concept of carrying capacity in tourism and estimation of tourism carrying capacity, monitoring and managing visitors in protected areas, visiting one of the protected areas in Iran. | 2 | 2 | Tourism in Protected Areas |
| Scientific method and theories examination in ecological studies, types of the ecological studies, reviewing some statistical concepts, ecological data collection principles, experiment designing in ecological studies (sampling, sampling methods and sample collection and adequate sample size determination), wildlife population abundance estimation (transect count, transect optimal size determination and distance methods), dispersal patterns and determination of organism dispersal patterns, species richness and diversity measurement, niche breadth measurement and niche overlap, applicable statistical tests in ecological studies.  Field data collection and data analysis.  Doing statistical and ecological exercises | 2 | 1 | Complementary Wildlife Ecology |