**Course title: BiologyI** Full marks: 100 (80T + 20P)

Course No. : Sc. Ed. 418 Pass marks: 28T + 8P

Nature of course: Theory (T) + Practical(P) Periods per week: 6(T)x6(P)-3pds/day/week/gr

Level: B. Ed Four Year Total periods: 150

Year: First Time per period : 55 minutes

1. **Course Description**

This course is an introductory course designed for the students specializing Science Education.This course aims to provide knowledge on the biodiversity of plants and animals. It intends to prepare the students with a sound background on classification of lower and higher groups of plants and animals along with their body structures and life cycles of some important species.

**This course consists of two parts: Plant Science Part I and Animal Science Part II.**

The theoretical part of Plant Science Part I deals with classification, structure and reproduction of Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms, Angiosperms and distribution and description of some important economic plants of Nepal, whereas practical part of Plant Science Part I deals with the identification, classification, structure and reproduction of lower and higher plants, preparation of temporary slides of vegetative and reproductive parts of different plants included in the course content. It also includes field visit for collection and preservation of plant specimens.

Similarly the theoretical part of Animal Science Part II deals with the classification, structure and life cycle of some important lower and higher animals. Practical Part of Animal Science Part II deals with identification, classification, structure and reproduction of lower and higher animals included in the content course. It includes field visit for collection and preservation of animals.

Plant Science Part I carries 40 marks in theory and 10 marks in practical.

Animal Science Part II carries 40 marks in theory and 10 marks in practical.

Students are required to secure pass marks independently both in Theory and Practical in Part I as well as in Part II.

1. General Objectives

The general objectives of this course are as follows:

* To acquaint the students with different groups of plants and animals according to their characteristic features.
* To familiarize the students with structures, life-cycles and economic importance of selected plant and animal species.

1. **Specific Objectives and Contents**

**Plant Science Part I: Theory**

|  |  |
| --- | --- |
| **Specific objectives** | **Contents** |
| * Differentiate the algae into appropriate order according to their characteristics. * Differentiate the moulds into the appropriate order according to their characteristics. * Differentiate the bryophytes into appropriate order according to their characteristics. * Differentiate the Pteridophytes into order according to their characteristics. * Differentiate the Gymnosperms into order according to their characteristics. | **Unit I: The Non-flowering Plant (14)**   * 1. Algae      1. Oedogoniales      2. Charales      3. Fucales      4. Nemalionales   2. Fungi      1. Aspergillales      2. Perenosporales      3. Uredinales      4. Ustilaginales      5. Moniliales   3. Bryophytes      1. Marchantiales      2. Anthocerotales      3. Polytrichales   4. Pteridophytes      1. Psilotales      2. Lycopodiales      3. Equisitales      4. Filicales   5. Gymnosperms      1. Cycadales      2. Coniferales      3. Gnetales |
| * Describe the morphology of the floral parts of monocot and dicot plants. * Describe the salient features and merits and demerits of different systems of classification such as Bentham and Hooker, Engler and Prantl, and Takhtajan. * Describe vegetative, floral structures, systematic positions, economic importance and affinities of the families: Rannunculaceae, Rosaceae, Labiateae, Rutaceae, Cucurbitaceae, Cyperaceae, , Cannaceae.      * Explain the distribution, scientific names and medicinal values of some medicinal plants and oil yielding plants. | **Unit II: The Flowering Plants (29)**   * 1. Taxonomy basics      1. Monocot and dicot flower parts      2. Salient features and merits and demerits of different systems of classification of flowering plants      + Bentham and Hooker      + Engler and Prantl      + Takhtajan   2. Vegetative, floral structure, systematic positions, economic importance and affinity of the families of flowering plants      1. Rannunculaceae      2. Rosaceae      3. Caryophyllaceae      4. Labiateae(Lamiaceae)      5. Rutaceae      6. Cucurbitaceae      7. Cyperaceae      8. Cannaceae   3. Medicinal plants and oil yielding plants      1. Distribution, scientific names and medicinal value of medicinal plants * *Terminalia chebula* ( Harro) * *Centella asciatica*(Ghod tapre) * *Emblica officinalis (*Amala) * *Nardostachys jatamansi*(Jatamanshi) * *Artimesia vulgaris*( Titepati) * *Taxus baccata* (Thingre)   + 1. Distribution, scientific names and oil value of oil yielding plants: * *Olea europaea* ( Jaitan) * *Helianthus annus* (Sun flower) * *Glycine max* (Soya bean) * *Cocos nucifera* (Coconut) * *Brassica campestris* (Mustard) |
| * Describe the habitat, habit, structure and life cycle of Algae, Fungi, Bryophytes, Pteridophyte and Gymnosperm species listed in the contents. | **Unit III: Diversity of Plants (34)**   * 1. Structure, life cycle, habitat & habits of the plants      1. Algae:      + *Oedogonium, Chara*      + *Batrachospermum*      1. Fungi :      + *Albugo*      + Rust      1. Bryophytes :      + *Anthoceros*      + *Polytrichum*      1. Pteridophytes:      + Sterlization of sporogenous tissue      + *Equisetum and Lycopodium*      1. Gymnosperm      + *Ephedra*      + *Ginkgo biloba* |

*Note: The figures in the parenthesis indicate approximate periods for respective units.*

**Plant Science Part I: Practical**

|  |  |
| --- | --- |
| **Specific Objectives** | **Activities** |
| * Prepare different types of stains required for temporary slide preparation( safranin, light green and cotton blue). * To study vegetative and reproductive parts of some lower plants (algae, fungi, bryophytes and pteridophytes). * Prepare temporary slides of important parts of some commonly found algae, fungi, bryophytes and pteridiphytes. * Identify different types of lower and higher plants. * Describe, identify and classify the plants belonging to different families included in the course content. * To visit field and collect and preserve plants. | * Preparation of safranin, light green and cotton blue in aqueous and alkaline media. * Preparation of temporary slides and study on the structure and reproduction of the following Algae: *Spirogyra, Oedogonium, Nostoc, Oscillatoria.* * Habit, structure and reproductive parts of *Volvox, Chara, Fucus, Batrachospermum* from permanent slides. * Study of the somatic and reproductive structures of the following Fungi: *Albugo, Alternaria*, *Puccinia* (Black Rust) and *Ustilago* (smut fungi) from permanent slides. * Study of vegetative and reproductive parts of *Marchantia, Anthocerous and Polytricchum* * Study of habit, habitat and vegetative / reproductive parts of some pteridophytes(*Dryopteris, Lycopodium, Equisetum, Adiantum* ) from preserved specimens and permanent slides. * Study of external structures of *Cycas, Pinus and Ephedra* cones. * Preparation and study of temporary slides of Gymnosperms :   I. V.S. of leaf: Cycas and Pinus leaves/needles.   * II. T.S. of stem *Gingkgo* and *Ephedra*. * Description of the characteristic features of the following families in the semi-technical terms with floral formula, floral diagrams and systematic position :   1. Rannunculaceae 2. Rosaceae 3. Caryophyllaceae 4. Labiatae 5. Rutaceae 6. Cucurbitaceae 7. Cannaceae 8. Cyperaceae.   * **Field trip:** * Collection, preservation and herbarium preparation. * Submission of field trip report (individual). |

**Animal Science Part II : Theory**

**3. Specific Objectives and Contents**

|  |  |  |
| --- | --- | --- |
| Specific Objectives | Contents | |
| * Classify lower animals in order. * Identify lower animals with their salient features. | **Unit I: Classification of Invertebrates (15)**   * + 1. Protozoa   1. Lobosa   2. Euglenoida   3. Holotricha   4. Gregarinida   1.5. Haemosporida   * 1. 1.2. Porifera      1. 1.2.1. Homocoela      2. 1.2.2. Heterocoela   2. 1.3. Coelenterata      1. 1.3.1. Hydroida      2. 1.3.2. Siphonophora      3. 1.3.3. Gorgornacea   3. 1.4. Platyhelmenthes/Aschelmenthes      1. 1.4.1. Digenea      2. 1.4.2. Taenoidea      3. 1.4.3. Ascaroidea   4. 1.5. Annelida      1. 1.5.1. Errantia      2. 1.5.2. Sedentaria   5. 1.6. Arthropoda      1. 1.6.1. Cladocera      2. 1.6.2. Chilopoda      3. 1.6.3. Decapoda      4. 1.6.4. Orthoptera      5. 1.6.5. Anoplura      6. 1.6.6. Hemiptera      7. 1.6.7. Diptera      8. 1.6.8. Lepidoptera   6. 1.7. Mollusca      1. 1.7.1. Pulmonata      2. 1.7.2. Decapoda      3. 1.7.3. Octopoda   7. 1.8. Echinodermata      1. 1.8.1. Articulata      2. 1.8.2. Asteroidea      3. 1.8.3. Forcipulata |
| * Classify higher animals in order. * Identify higher animals with their salient features. | **Unit II : Classification of Vertebrates (15)**   * 1. Pisces      1. Mastacembaliformes      2. Symbranchiformes,      3. Ophiocephaliformes      4. Clupiformes   2. Amphibia      1. Urodela      2. Proteda      3. Mutabilia      4. Anura      5. Gymnophiona   3. Reptilia      1. Chelonia      2. Rhynchocephalia      3. Squamata      4. Lacertilia      5. Ophidia      6. Crocodilia   4. Aves      1. Anseriformes      2. Falconiformes      3. Galliformes      4. Columbiformes      5. Psittaciformes      6. Piciformes      7. Passeriformes   5. Mammalia      1. Insectivora      2. Dermoptera      3. Chiroptera      4. Primates      5. Logomorphs      6. Rodentia      7. Carnivora      8. Sirenia |
| * Describe the structure and life cycle of lower animals. * Describe the habit, habitat, structure and physiological systems of Cockroach. | **Unit III: Life Cycle of Lower Animals (25)**   * 1. Structure, life cycle and economic importance of      1. Hydra      2. Taenia      3. Mosquito      4. Wuchereria      5. Ascaris      6. Leech      7. Snail      8. Starfish   2. Habit, habitat, structure and physiological systems of Cockroach      1. Digestive      2. Respiratory      3. Circulatory      4. Excretory      5. Nervous      6. Reproductive |
| * Describe structure and life cycle of higher animals. * Describe the habit, habitat, structure and physiological systems of Rabbit. | **Unit IV: Life Cycle of Higher Animals (25)**   * 1. Structure, life cycle and economic importance of      1. 4.1.1. Carp Fish      2. 4.1.2. Toad      3. 4.1.3. Grass Snake      4. 4.1.4. Chicken      5. 4.1.5. Rat   2. Habit, habitat, structure and physiological systems of Rabbit      1. Digestive      2. Respiratory      3. Circulatory      4. Excretory      5. Nervous      6. Reproductive |

**Animal Science Part II. Practical**

|  |  |
| --- | --- |
| **Specific Objectives** | **Activities** |
| * Identify different types of lower and higher animals. * Prepare temporary slides of different parts of animals. * Collect and preserve plants and animals. | * Study of specimens and Histological Structures of important lower and higher animals from each order. * Preparation of Alcohol Series. * Preparation of Safranin. * Preparation of Permanent Slides and Labelled Diagrams of Paramecium, Hydra and Developmental Stages of Mosquito. * Dissection, Exposition and Study of Digestive, Circulatory, Nervous and Reproductive organs of Cockroach and Rabbit and Draw the diagrams and Label each parts. * Study field visits and submission of field Report in a proper format. |

1. **Instructional Techniques**

The instructional techniques for this course are divided into two groups. First group consists of general instructional techniques applicable to most of the units. The second group consists of specific instructional techniques applicable to specific units.

* 1. **General Instructional Techniques**
* Lecture
* Discussion
* Demonstration
* Displaying of specimen, photographs, newspaper cutting etc. of structure of animals
* Preparation of charts of life cycles and systems of animals
  1. **Specific Instructional Techniques**
* Project Work
* Field visit, Museum, Specimen and Herbarium

1. **Evaluation**

**Theory part**

Annual examination will be held by the Office of the Controller of Examinations at the end of the academic session for which 80 percent of total marks will be allocated. Both in Plant Science Part I and Animal Science Part II Evaluation scheme in Annual Examinations of Theoretical parts is as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **Types of questions** | **Total questions**  **to be asked** | **Number of questions**  **to be answered and marks allocated** | **Total marks** |
| Group A: Multiple choice items | 14 questions | 14x 1 mark | 14 ( 7+7) |
| Group B: Short answer questions | 6 with 2 or questions | 6 x 7 | 42 (21+21) |
| Group C: Long answer question | 2 with or questions | 2 x 12 marks | 24 (12+12) |
|  |  | Total | 80 Marks |

**Practical**

Evaluation in Annual Examinations of Practical parts both in Plant Science Part I as well as in Animal Science Part II

|  |  |  |  |
| --- | --- | --- | --- |
| Examination | Area of examination | Marks | Total |
| **Internal** | **Regularity** | **0.5** | **2** |
| **Regular practical performance** | **0.5** |
| **Record book** | **1** |
| **External** | **Experiment** | **6** | **8** |
| **Viva** | **2** |

**Recommended** **Books & References**

**Recommended Books : Plant Science Part I**

**( Theory)**

Dutta, A. C. (2000). *Textbook of Botany for Degree students.* Oxford University Press. **(For unit I &III)**

Misra, S. P. & Priti, S. (2000). *An Introduction to Taxonomy of Angiosperm vol.3.* Delhi: Ratan Prakasan Mandhir. **(For unit II)**

Rashid, A.(2007). *An Introduction to Pteridophytes.*Vikash Pub. House Ltd. **(For unit I & III )**

Sharma, O. P. ( 2006 ). *Textbook of Algae*. Tata Mc. Graw Hill Publishing Company Ltd., New Delhi(For **Unit I & III** ).

Sharma, O. P. (2008). *Textbook of Fungi.* Tata Mc. Graw Hill Publishing Company Ltd.,New Delhi (For Unit I**&III**).

Sharma, O. P. ( 2002). *Gymnosperms*.PragatiPrakashan, Meerut (**For Unit** **I & III** ).

Vasistha, B. R. (1999). *Botany for Degree students- Bryophytes*. New Delhi: S. Chand & Company. Ltd. **(For unit I & III)**

Vasistha, B. R. & Sinha, A. K. (2007). *Botany for Degree student -Fungi*. New Delhi: S. Chand & Comp. Ltd. **(For unit I)**

Vasistha, B. R. (1999). *Gymnosperms,* New Delhi: Vikas Publication, House Ltd. **(For unit I)**

**(Practical)**

Pandey, B. P. (2009). *Modern Practical Botany Vol. I & II.* New Delhi: S. Chand & Company Ltd.

**References**

Pandey,B. P. **(**2001). *College botany, Vol.-2,* New Delhi: S. Chand & Company Limited.

Saxena, A. K.& Sarabhai, R. P. (1998). *Textbook of Botany Vol,-3* Agra: Ratan Prakasan Mandhir.

**Recommended Books : Animal Science Part II**

**(Theory)**

Kotpal, R. L. *Modern Textbook of Zoology.* Meerut: Rastogi Publication. **(For units I to III)**

**(Practical)**

Majpuria, T. C. (1994). *Introduction to Chordate and Invertebrate Zoology.* India: S. Nagin & Pradeep Publications.

Manadhar, K. D. & Shakya, R. K. *A Hand book of Practical Zoology.* Kathmandu: Ratna Pustak Bhandar.

**References**

Maharjan, S. D. (1996*). Biology part II*. Kathmandu: CD.C. , T. U.

Majpuria, T. C. (1994). *Introduction to Chordate and Invertebrate Zoology.* India: S. Nagin & Pradeep Publications.