

**Course Outline**  
**ECOLOGY AND MANAGEMENT OF GRAZING**  
*(An Online Course in Grazing Animal Management)*  
**MODULE 3: FORAGE QUALITY AND ANIMAL NUTRITION**

**Presentation 1: Forage Quality from the Animal's Perspective**

- A) Animal Perspective
  - 1) Availability and preference
  - 2) Live-to-dead
  - 3) Herbaceous to woody
  - 4) Leaf to stem ratio
  - 5) Inhibitory factors
    - a) thorns
    - b) spines
    - c) toxins
  - 6) Forage Intake
    - a) highest quality possible
    - b) as fast as possible
  - 7) Leaving time to ruminate and rest
- B) Selection Factors
  - 1) Feedback
  - 2) Palatability
  - 3) Toxicity
  - 4) Preference
  - 5) Availability

**Presentation 2: Forage Quality from a Nutritional Perspective**

- A) Cell characteristics
  - 1) cell walls
    - a) digestibility
    - b) hemicelluloses
    - c) cellulose
    - d) lignin
  - 2) cell interiors
    - a) lipids
    - b) amino acids
    - c) proteins
  - 3) Energy
    - a) Fiber analyses
      - (1) detergent fiber analysis (NDF)
      - (2) in vitro digestion of dry matter" (IVDDM and IVDMD)
      - (3) near infrared spectroscopy (NIR)
  - 4) Protein
    - a) Plant parts
    - b) Analysis
      - (1) Kjeldahl
  - 5) Vitamins

- 6) Minerals
- 7) Factors that Influence forage quality
  - a) grass vs. forbs (broadleaves)
  - b) herbaceous vs. woody
  - c) cool vs. warm season plants
  - d) temperature
  - e) soil moisture
  - f) states of maturity

**Presentation 3: Herbivore Digestions**

- A) Fermentation
  - 1) Pre-gastric (ruminants)
  - 2) Post-gastric (cecal)
- B) Ruminant Digestion
  - 1) Anatomy and Physiology
    - a) Rumen
      - (1) Mouth and Esophagus
      - (2) Rumen material
      - (3) Rumen flow
    - b) Reticulum
    - c) Omasum
    - d) Abomasum
    - e) Young ruminants
    - f) Cud chewing
    - g) Gas production
    - h) Nutrient absorption
- C) Cecum Digestion
- D) Foraging Strategies

**Presentation 4: Animal Nutrient Requirements**

- A) Energy
- B) Protein
- C) Vitamins
- D) Minerals
- E) Nutrient Problems

**Presentation 5: Balancing Nutrient Requirements and Forage Quality**

- A) Seasonal forage quality
- B) Seasonal nutrient requirements
- C) Forage gaps
- D) Animal nutrient Intake
- E) Body Condition

**Assignments**

- A) Annual Rangeland Forage Quality (M3,P2)
- B) Using Stage of Maturity to Predict the Quality of Annual Range Forage (M3 P2)
- C) Balancing Beef Cow Nutrient Requirements and Seasonal Forage Quality on Annual Rangeland (M3, P5)
- D) Body Condition Scoring of Beef Cows (M3, P5)