**Nepal Algebra Project(NAP)**
**Central Department of Mathematics**
**Tribhuvan University,Kirtipur, Kathmandu,Nepal**
**Fields and Galois Theory- Short Note of Module 2 - Lecture 1**
**Course Instructor: Roger and Sylvia Wiegand**

# NAP: Module -2, Lecture -1, 16:30 – 18:45, Tuesday, May 16, 2017

- We began by reviewing several of the most important basic things from Module 1, for example:
  - Minimum polynomial of an element of an extension field.
  - Degree of a field extension, multiplicativity of degrees along a tower of fields.
  - Construction of a field extension containing a root of a given polynomial of positive degree.
  - $[F(\alpha) : F] = \deg f$, where $f$ is the min poly for $\alpha$ over $F$.
  - If $\alpha$ and $\beta$ have same min poly over $F$, $\exists!$ $F$-iso $F(\alpha) \to F(\beta)$ taking $\alpha$ to $\beta$. Picture to illustrate.
- We defined what it means to say that a polynomial *splits in $K$*.
- We did some examples to motivate the notion of a splitting field:
  - Find min poly of $\sqrt{2+\sqrt{2}}$ over Q. (Splitting field has degree 4.)
  - Splitting field of $X^3 - 2$ over Q has degree 6. Picture to illustrate
- We defined *splitting field $K$ of $f(X)$ over $F$* and proved that $[K : F] \leq (\deg f)!$ . The question arose as to whether the degree is always a *divisor* of $d!$ . On the spot, we said that we did not know whether or not it is true in general, but that we would see later that that is true in characteristic 0 (using Galois Theory).