Session 8 - ERGONOMICS

**ERGON --> WORK**

**NOMOS --> LAW**

The Laws to be Observed at Work

**Human Factor Engineering**

Human Factors:  
- Physical and mental work capacity
- Fatigue
- Body forces, strength and posture
- Body sizes
- Thermal comfort/heat stress/cold stress
- Vision
- Hearing
- Perception
- Information processing
- Decision making
- Performance and efficiency
- Adaptation and rehabilitation

Engineering:  
- Industrial design
- Work place design
- Product design
- Machine design
- Furniture design
- Ventilation
- Lighting
- Acoustics
- Engineering control
- (Chemical & Physical)
- Building orientation
- Maintenance

**Ergonomics**

- Ergonomics means literally the study or measurement of Work
- In addition to work as labour for monetary gain, work also includes
  - Sports
  - Leisure activities
  - Domestic work
  - Education and training
  - Health and social services

**Ergonomics considers human operators variability**

- An automobile design has to consider
  - Range of physical size and strengths of users
  - Seats are comfortable
  - Controls readily identifiable and within easy reach
  - Clear visibility front and rear
  - Easily read internal instruments
  - Ease of entry and egress

**AIMS OF ERGONOMICS**
• Ensures that human needs for safe and efficient working are met in the design of work system
• To design
  o Appliances
  o Technical Systems
  o Tasks
  o In such a way to improve
    ➢ Human Safety
    ➢ Health
    ➢ Comfort and
    ➢ Performance

Basic aims of ergonomics

• Efficiency in purposeful activity
• To achieve desired result without
  ä Waste
  ä Error
  ä Damage to persons
• Working situation in harmony with the activities of the worker

Difficulties in achieving the aims of ergonomics

è Human operator is flexible and adaptable
è Large individual differences
  è Obvious differences: --> Physical size, strength
  è Not obvious differences  --> Culture, style, level of skill

Thus a systematic approach and theory are necessary. There should be measurable objectives to be checked and remedial action taken. A detailed study of the science of ergonomics provides these approaches and theories

DEFINITIONS OF ERGONOMICS

ä Ergonomics is a means of improving working conditions and reducing illness at work
ä Ergonomics attempts to ‘Fit the Job to the Man’ rather than ‘Fit the Man to the Job’
ä Ergonomics is concerned with the design of systems in which people carry out work
ä Ergonomics optimizes Efficiency, Health, Safety and Comfort of people through better designs of products and work places

Who is a human operator?

è Skilled professional using a complex machine in an artificial environment
è Customer who has purchased a new equipment
è Child sitting in a classroom
è Disabled person in a wheel chair
WHAT IS ERGONOMICS?

Ergonomics is:

1. “Higher productivity and a better place to work”
2. “The science that saves both lives and dollars”
3. “Human engineering where the goal is to optimize worker well being and productivity”
4. “A way of thinking about and planning work so that it suits the capabilities and needs of the people”

Ergonomics is a solution finding method for questions like these:

- How can human body dimensions be applied to car seat design?
- What is the proper height for kitchen counters?
- How can traffic lights be programmed for optimal urban traffic flow throughout the day?
- How can stereo receiver displays and controls be coded to effectively define their respective functions?
- How can the material and design of swim suits for competition be improved for minimal water resistance?
- How should computer software and screens work and look best to fit human cognitive capabilities?

Ergonomic needs in a workplace

- Physical work environment
  - Thermal comfort
  - Noise and vibration control
  - Adequate and proper lighting
- Chemical environment
  - Control of pollution
  - General and exhaust ventilation
- Work physiology
  - Control excessive physical load
  - Avoid physical and muscular fatigue
  - Adequate rest pauses
  - Arrangement of static and dynamic work
- Anthropometry (Body sizes)
  - Designs to fit body sizes of users
  - Appropriate working levels
  - Adequate work space
  - Avoid overcrowding of machines and workers
- Occupational Biomechanics
  - Appropriate work postures (sitting, standing)
  - Safe load lifting and carrying techniques
  - Adopt proper techniques in manual materials handling
- Psychological aspects
Avoid perceptual and mental loads and fatigue
Appropriate design of displays and control
Appropriate conditions for Vigilance tasks
Avoid human error and stress
Job motivation and satisfaction

Social psychology
Practice good relationship among employees and between employer and employee

Macro ergonomics
Suitable working hours, intervals, holidays, leave
Appropriate shift schedules
Welfare facilities
Job rotation and incentives schemes
Fair salary structure, Good administrative structure
Good work organization schemes
Fringe benefits (housing, transport, sports)
Labour union facilities
Training and education
Promotional prospects

Safety and Ergonomics
Good housekeeping
Performance feedback

Systems ergonomics
Systems groups in problem solving and development work
Participative ergonomics
User centered designs

Benefits of ergonomics
- Productivity
- Product quality
- Safety
- Health
- Reliability
- Job satisfaction
- Personal development

Ergonomic contributions to development in industrially developing countries
- Research on basic data needs
- Promote special abilities
- Refine simple methods
- More appropriate “experts”
- Action learning (Learning by doing, not imitating)
- Better supported education and research
- Re-conceptualize standard setting