Principles of Asphalt Pavement Materials and Construction for Industry
Course Outline

COURSE DESCRIPTION:
Describes the constituents used in the construction of asphalt pavements. Asphalt concrete mixture properties are explained including design processes, manufacturing, asphalt pavement construction methods and forensics. Included are the manufacture of asphalt cement, emulsions and cutbacks, material properties and behavior.

COURSE OBJECTIVES/GOALS:
Upon completion of the course students shall:

- Relate the complex processes involved in the manufacture of asphalt binders used for paving construction
- Optimize performance of asphalt paving mixtures
- Optimize economy of asphalt paving mixtures
- Analyze the construction processes for asphalt pavements
- Analyze the maintenance processes for asphalt pavements
- Describe the failure mechanisms of asphalt pavements

PROVIDED TEXT:

- Roberts, F.L. Kandhal, P. S., Brown, E. R., Lee, Dah-Yinn, and Kennedy, T. W., "Hot Mix Asphalt Materials, Mixture Design and Construction"
- Kevin M. Jones "Asphalt Pavement Materials and Construction for Industry" (Three Ring Binder)

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Weekly Schedule

Week One Lecture: Origin and History of Bituminous Materials and Uses

- Asphalt vs Tar
- Roofing, Waterproofing, Paving

- **Week One: Refining methods and behavior of asphalts**
- Atmospheric Distillation
- Vacuum and Other Processes

- **Week One:** Handling asphalt materials safely.
- Heating procedures,
- Environmental controls and issues.

- **Week One: Characterization, specifications, types of asphalts**
- Penetration, Viscosity and Temperature Susceptibility
- Dynamic Shear Rheology

- **Week One:** Specifications used for pavement construction.
- Test procedures
- Purpose of Specifications for Purchasing

Week Two: Behavior of asphalts, Time-temperature superposition, Rheology

- **Week Two: Purchasing, test procedures, grading**
- State DOT Specifications
- Purpose of Tests, description of materials, behavior

- **Week Two: Physical/Chemical Properties of Asphalts**
- Bending Beam Rheometer
- Stiffness and Time-Temperature Relationships

- **Week Two: Types of Aggregates used in Asphalt Paving**
- Origins of Aggregates
- Physical Properties

- **Week Two:** Aggregates in the laboratory.
- Weight volume relationships.
- Specific gravity.

Week Three: Properties of aggregates, Test procedures, Specifications

- **Week Three:** Physical properties introduction.
- Fracture, flat and elongated pieces, abrasion, soundness.

- **Week Three: Grading of aggregates, Blending and optimization**

- **Week Three:** Sieve analysis.
- Blending of stockpiles.

- **Week Three: Asphalt mixtures, Specifications, Behaviors**

- **Week Three:** Mixing asphalt and aggregates.
- Batching aggregates to gradation
- Ovens, heating, and mixer operation

Week Four: Volumetric properties, Fundamentals of design, Voids, VMA, Voids Filled and Traffic

- **Week Four:** Compaction of asphalt mixtures in the laboratory.
- Gyratory compactor fundamentals
- Ovens and molds and Heavy and Hot Objects

- **Week Four:** History of asphalt concrete mixture design
- Formulas, Hubbard-Field, and Marshall
- Hveem and Superpave

- **Week Four:** Weight-volume relationships of compacted asphalt samples.
- Specific Gravity
- Maximum Theoretical Specific Gravity

- **Week Four:** Marshall design procedure
- Rational Design and Field Control of Mixtures

- **Week Four:** Physical properties of compacted asphalt samples.
- Marshall Stability and Flow and Hveem Stability
- Superpave Compactibility and Voids

Week Five: Superpave design system

- SHRP develops Superpave
- Traffic vs Laboratory Compaction

- **Week Five:** Mixture design processes.
- Superpave compactor and traffic levels
- Lottman (AASHTO T283) moisture conditioning

- **Week Five: Asphalt mixture manufacture, plants and processses**
- Asphalt plants, batch and continuous
- Stockpiling practice, production

Week Six: Asphalt paving construction operations

- Laydown operations, equipment and methods
- Compaction methods and production

- **Week Six: Pavement Preservation**
- Preventive maintenance vs rehabilitation

- Crack seals, chip seals, slurry seals, recycling

- **Week Six: Review / Evaluations/ Hand out Certificates**