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**FIRST SEMESTER 2016-2017**  
**Course Handout Part-II**

**Date:** 02/08/2016

In addition to part -I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

**Course No.** : **CE G534**  
**Course Title** : **PAVEMENT MATERIAL CHARACTERIZATION**  
**Instructor-in-charge** : **NIKHIL SABOO**

**OBJECTIVE:**

The main objective of this course is to understand the different material components typical in pavement and learn about the importance of the properties of these components for effective functioning of the pavement. In this course we would also look into the guidelines outlined for testing, specifications and characterization of various material used in pavements (both nationally and internationally). A brief about the ongoing worldwide research on various material aspects of pavements will also be covered as a part of different lectures.

**COURSE OUTLINE:**

The whole course has been divided into five different phases as follows:

1. Bituminous Materials: **Phase 1**
2. Aggregates: **Phase 2**
3. Bituminous Mix Design: **Phase 3**
4. Mechanical Properties of Bituminous Mixes: **Phase 4**
5. Soil: **Phase 5**

**TEXT BOOKS:**

- T1. Atkins, H. N., *Highway Materials, Soils and Concretes*, Fourth Ed., Prentice-Hall, 2002.
- T2. Yoder E. J. and Witczak, M.W., *Principles of Pavement Design*, 2nd Ed., John Wiley & Sons, 1975.

**REFERENCE BOOKS:**

- R1: Huang, Y.H., *Pavement Analysis and Design*, Pearson, 2004.





R2. Chakroborty, P. and Das, A., *Principles of Transportation Engineering*, PHI, New Delhi, 2003.

R3. Khanna, Justo, Veeraragavan, *Pavement Materials laboratory manual*, PHI, New Delhi.

R4. Read, J., Whiteoak, D., *Shell bitumen Handbook*, Fifth Edition

R5. Roberts, FL., Kandhal, PS., Brown, ER., Lee, DY., Kennedy, TW., *Hot Mix Asphalt Materials, Mixture, Design and Construction*. NCAT.

R6. Codes and Practices (separate list and copies will be provides)

### **COURSE PLAN:**

Phase number	Topics to be covered	References <sup>1</sup>	No. of Lectures <sup>2</sup>
1	Introduction to bituminous materials, History and manufacturing of bitumen	T1,R4	1
	Chemical and rheological properties of bitumen: A peep into Viscoelasticity	T1,R4,R6	3
	Specifications and quality of bitumen (Indian and International considerations)	T1,R5,R4,R6	3
	Introduction to polymer modified binders, cutbacks and emulsions: Types, specifications and properties	T1,R4,R6	3
	Mechanical testing and properties of bitumen; durability and adhesion of bitumen	T1,R4,R6	3
	Conclusions and important points of Phase 1	-	1
2	Aggregates: origin and types; production	T1,R5,R6	1
	Use of aggregates in highways; desirable properties and testing	T1,R3,R5,R6	2
3	Introduction to bituminous mixes	T1,T2,R2,R5	1
	Need and importance of aggregate gradation: different methods; types of aggregate gradation and its use	R2,R5,R6	3
	Marshall mix design of bituminous mixes	T1,R2,R3,R5,R6	3
	Introduction to Superpave mix design	R6	3
4	Fundamental tests on bituminous mixes	T1,R1,R4,R5,R6	1
	Simulative and empirical tests	R4,R6	2
	Stiffness of bituminous mix	T2,R1,R2,R4,R6	1
	Permanent deformation and Fatigue characteristics of bituminous mixes	T2,R1,R2,R5	2
5	Use of soils in pavements and its importance	T1,T2,R2,R5	1
	Desirable properties and tests on soils; Introduction to modification of soils	T1,T2,R1,R3,R5,R6	3





6	Requirements and design of mix for cement concrete pavements	T1,R6	2
	Material requirements for different joints: Types and use	R6	2
<b>Total</b>			<b>41</b>

<sup>1</sup>Appropriate chapter numbers will be discussed in the class

<sup>2</sup>Number of lectures are tentative

### **EVALUATION SCHEME:**

Component	Duration	Weight	Date & Time	Remarks
Mid Term Test	90 min	25%	<TEST_1>	OB/CB
Monthly Assignments/Case study presentation/Literature Survey		20%	Will be announced every month	OB/CB
Term Papers		20%		OB
Comprehensive Examination	180 min	35%	<TEST_C>	OB

- **Chamber Consultation Hour:** Thursday 5 pm - 7 pm
- **Reading assignments will be given as and when necessary.**
- **Notices:** Notices and communication will be sent through your BITS mail only.

Instructor-in-charge

