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|  | **National Institute of Technology Meghalaya**An Institute of National Importance | **CURRICULUM** |
| Programme | **Master of Technology**  | Year of Regulation | **2018-19** |
| Department | **Civil Engineering** | Semester | **II** |
| Course Code | Pavement Materials | Pre-requisite | Credit Structure | Marks Distribution |
| L | T | P | C | INT | MID | END | Total |
| **CE 518** | **Highway Materials**  | **NIL** | **3** | **0** | **0** | **3** | **50** | **50** | **100** | **200** |
| Course Objectives | 1. To learn about various materials used in pavement construction.
2. To understand fundamental properties and classification of pavement materials.
3. **To learn about various bituminous mixes and their design.**
4. **To learn about design bituminous mixes and their design**
 | Course Outcomes | CO1 | To understand about variety of highway material, their properties and characterization. |
| CO2 | To know about the variety of bituminous mixes and their design |
| CO3 |  To know about properties of pavement quality concrete and their deign |
| CO5 |  To know about evaluation criteria for quality of design mix  |
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| SYLLABUS |
| No. | Content | Hours | COs |
| I | **Unit** **I Aggregates:**Classification, physical properties of aggregates, Gradation of aggregates, skid resistance and polishing value of aggregates.  | **6** | CO1 |
| II | **Unit II Soil:**Soil classification, geotechnical properties of soil, strength and durability properties of soil, structural and constructional problems in soil subgrade, Sub-soil drainage, Soil stabilization using lime, flyash, geosynthetics etc. | **6** | CO1 |
| III | **UNIT III Bitumen:** Manufacturing of bitumen, chemical composition constituents, structure and Rheology,Mechanical and engineering properties of bitumen, Tests on bitumen, Emulsions, Tar –Properties, types, modifications, Durability of bitumen, Adhesion of bitumen, Modified bitumen. | **6** | CO1 |
| IV | **UNIT IV** **Bituminous Mixes:** Type of mixes- Hot mix asphalt, warm mix asphalt, cold mixes and emulsion. Design of bituminous mixes, Desirable properties of mixes, Tests on bituminous mixes, Fillers, Theory of fillers and specifications. Marshall mix design method, Superpave mix design method etc.…………… | **9** | CO2, CO4  |
| V | **UNIT V Cement Concrete:**Constituents and requirements, Physical, plastic and structural properties of concrete, Factors influencing mix design, Design of concrete mixes for dry lean concrete and pavement quality concrete with appropriate admixtures like flyash and high range water reducing admixtures etc. | **9** | CO3, CO4 |
| Total Hours | **36** |  |
| **Essential Readings** |
| 1. Kadiyali, L.R., *Traffic Engineering and Transport Planning*, Khanna Publishers, New Delhi, 2002.
 |
| 1. Vragwan, Khanna S.K., Justo C.E.G., *Highway Engineering*, Nem Chand & Bros., Roorkee, 2001
 |
| 1. IRC 37:2018 Guidelines for the design of flexible pavements
 |
| 1. IRC 44:2017 Guidelines for cement concrete mix design for pavements
 |
| **Supplementary Readings** |
| 1. Ministry of road transportation and highways manuals.
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| 1. IRC 58:2015 Guidelines for the design of plain jointed rigid pavements for highways
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