# Lesson Plan

Name of Faculty : SATENDER VASHISHTHA
Discipline : CERAMIC ENGINEERING
Semester : 3rd
Subject : Ceramic Raw Material
Lesson Plan Duration : 16 WEEKS
Work Load (Lecture /Practical) per week in hours: Lecture : 04 Practical: 0

| Theory | | |
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| **Week** | **Lecture Day** | **Topic ( Including Lectures, Assignment & Sessional Test )** |
| 1 | 1 | **UNIT -1 Introduction of Clays**<br>Geology of clays |
| 1 | 2 | mineralogy of clays |
| 1 | 3 | **Clay:** Definition, classification of clays with examples |
| 1 | 4 | Primary clays or residual clay |
| 2 | 5 | Secondary clays or transported clays. |
| 2 | 6 | **Plastic Raw Materials (Clay)**<br>Kaolin clay, Ball Clays & fire clay. Properties & uses in ceramic industries |
| 2 | 7 | Alumina clays & Bentonite clay. Properties & uses in ceramic industries |
| 2 | 8 | Impurities in clay like silica, alumina, calcium, magnesium, titanium alkalis, and carbonaceous material. |
| 3 | 9 | Benefication and Purification of clay – mechanical and chemical methods – sorting, sifting, air separation, washing methods of clays. |
| 3 | 10 | Winning and mining of clays. Magnetic separation. |
| 3 | 11 | **Properties:** Specific gravity, Moisture content, Plasticity. |
| 3 | 12 | Plasticity – theories of plasticity and measurement of plasticity. |
| 4 | 13 | Bulk Density (green and dry) Shrinkage and its effects on final product. |
| 4 | 14 | Effect of heat on clays. |
| 4 | 15 | ***Revision, discussion, doubt clearing & Assignment for Unit-1*** |
| 4 | 16 | **UNIT- II**<br>**Plastic Raw Materials (Non-Clay)** |

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| | | Talc, steatite, pyrophyllite and sericite pyrophyllite. Properties and uses. |
| 5 | 17 | **Non-Plastic Raw Materials**<br>Silica – Various forms of silica raw materials like quartz, sand, sand stone, quartzite, Flint. - Properties and Uses. |
| 5 | 18 | Role of silica in Ceramic bodies Effect of heat on silica. |
| 5 | 19 | **Phosphate Containing Raw Materials**<br>Bone ash, Apatite - Properties & uses. |
| 5 | 20 | ***Revision, discussion, doubt clearing & Assignment for Unit-2*** |
| 6 | 21 | **UNIT III**<br>**Alumina**<br>Sources of various alumina: Gibbsite, Diaspore, bauxite, corundum - Properties and uses. |
| 6 | 22 | Sources of various alumina: fused alumina and sintered alumina -<br>Properties and uses. |
| 6 | 23 | Preparation of fused alumina and sintered alumina. |
| 6 | 24 | **Other Alumina & Silica Containing R w Materials**<br>Silimanite &Kyanite - Properties & uses. |
| 7 | 25 | Andalusite & mullite - Properties & uses. |
| 7 | 26 | ***Revision, discussion, doubt clearing & Assignment for Unit-3*** |
| 7 | 27 | Revision of Unit-1 & 2 for 1st Sessional Test |
| 7 | 28 | 1st Sessional Test |
| 8 | 29 | **UNIT -IV**<br>**Fluxes**<br>Definition and Types of feldspars (Potash Feldspar, Soda feldspar) |
| 8 | 30 | Definition and Types of other fluxing materials (Cornish stone,<br>nepheline syenite) |
| 8 | 31 | Properties and uses of feldspars (Potash Feldspar) |
| 8 | 32 | Properties and uses of feldspars (Soda feldspar) |
| 9 | 33 | Properties and uses of other fluxing materials (Cornish stone) |

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| 9 | 34 | Properties and uses of other fluxing materials (nepheline syenite) |
| 9 | 35 | Role of feldspar in triaxial body |
| 9 | 36 | **Frit**<br>Definition and use of frit in glaze preparation. |
| 10 | 37 | Purpose of fritting |
| 10 | 38 | Manufacturing of Frit: Smelting, Quenching. |
| 10 | 39 | Manufacturing of Frit: Drying & milling. |
| 10 | 40 | ***Revision, discussion, doubt clearing & Assignment for Unit-4*** |
| 11 | 41 | Revision of Unit-3 & 4 for 2nd Sessional Test |
| 11 | 42 | 2nd Sessional Test |
| 11 | 43 | **UNIT - V**<br>**Synthetic Materials**<br>Carbides: Definition and of Types silicon carbide (SiC), boron carbide (B4C) - Properties and uses. |
| 11 | 44 | Tungsten carbide (WC) and calcium carbide(Ca2C) - Properties and uses. |
| 12 | 45 | Nitrides: Definition and Types (Silicon Nitride (Si3N4), Boron nitride (BN)) - Properties and uses. |
| 12 | 46 | Silicides: Definition and Types, General Properties and uses. |
| 12 | 47 | **Processing Additives**<br>De-flocculants: Role and types |
| 12 | 48 | Binders : Role of binder |
| 13 | 49 | Types of Binders (Clay Binders, Molecular Binders.) |
| 13 | 50 | Types of Binders (Vinyl Binders, Cellulose Binders.) |
| 13 | 51 | Types of Binders (Polyethylene Glycol Binders, Waxes.) |
| 13 | 52 | Lubricants, Types and role. |
| 14 | 53 | Colouring Oxides |
| 14 | 54 | **Industrial Wastes as Raw Materials:**<br>Sources & utilization of industrial wastes like Cullets, Grog, |

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| 14 | 55 | Sources & utilization of industrial wastes like Fly Ash, Blast Furnace Slag |
| 14 | 56 | ***Revision, discussion, doubt clearing & Assignment of Unit-V*** |
| 15 | 57 | Revision for 3rd Sessional Test |
| 15 | 58 | 3rd Sessional Test |
| 15 | 59 | **Revision and doubt clearing class for Unit-1** |
| 15 | 60 | **Revision and doubt clearing class for Unit-2** |
| 16 | 61 | **Revision and doubt clearing class for Unit-3** |
| 16 | 62 | **Revision and doubt clearing class for Unit-4** |
| 16 | 63 | **Revision and doubt clearing class for Unit-5** |
| 16 | 64 | **Preparatory test for HSBT Exam** |

**List of books for preparing notes of Ceramic Raw Material**


1. Sudhir Sen, "White Wares", Oxford & IBH Publishing Co., New Delhi
2. S K Jain, "Mineral Processing", CBS Publishers & Distributors, New Delhi
3. Singer and Singer, "Industrial Ceramics", Oxford & IBH Publishing Co., New Delhi
4. S.K. Mirmira, "Indian Pottery", Gramodaya Sangh, Bhadrawati.
5. W.E. Worrel, "Ceramics Raw Materials", Pergamon Press
6. W D Kingery, "Introduction to Ceramics", Elsevier Scientific Publishing Company,New York
7. W.Ryan, "Properties of Ceramics Raw Materials", Pergamon Press.