| Semester | SIX |
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| Paper Number | **HSTCR6132T & HSTCR6132P** |
| Paper Title | **Design of Experiments** |
| No. of Credits | **6** |
| Theory/Composite | **Composite** |
| No. of periods assigned | Th: 4 <br> Pr: 3 |
| Module | single |
| Course description/objective | *At the end of the course, a student should be able to* <br> o Understand Randomization and Replication as essential principles and Local Control as a desirable principle in statistical designing of experiments. <br> o Construct standard designs – CRD, RBD and LSD and apply ANOVA techniques to analyse these designs. <br> o Compare relative efficiency of one design with respect to the other. <br> o Analyse the standard designs if one observation is missing in the layout. <br> o Understand Incomplete Block Designs. <br> o Construct and analyse un-confounded and confounded Factorial Designs. <br> o Construct Fractional Factorials by creating aliases. |
| Syllabus | **UNIT 1:** <br> ***Experimental designs:*** Role, historical perspective. Terminologies: Experimental error, Basic principles, Uniformity trials, Fertility contour maps, Choice of size and shape of plots and blocks. [5L] <br> ***Basic designs:*** Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD) – Layout, Model and Analysis, Relative Efficiencies, Analysis with one missing observation. [10L] <br><br> **UNIT 2:** <br> ***Incomplete Block Designs:*** Balanced Incomplete Block Design (BIBD) – parameters, relationships among its parameters, incidence matrix and its properties. [8L] <br><br> **UNIT 3:** <br> ***Factorial experiments:*** Advantages, Notations and Concepts of $2^n$ factorial experiments- their design and analysis. Total and Partial confounding for $2^n$ ($n \leq 5$), factorial experiments. [19L] <br><br> **UNIT 4:** <br> ***Fractional factorial experiments:*** Construction of one-half and one-quarter fractions of $2^n$ (n≤5) factorial experiments, Alias structure, Resolution of a design. [10L] |
| List of Practical | 1. Analysis of CRD |

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| | 2. Analysis of an RBD<br>3. Analysis of an LSD<br>4. Analysis of an RBD with one missing observation<br>5. Analysis of an LSD with one missing observation<br>6. Analysis of $2^2$ and $2^3$ factorial in CRD and RBD<br>7. Analysis of $2^2$ and $2^3$ factorial in LSD<br>8. Analysis of a completely confounded two level factorial design in 2 blocks<br>9. Analysis of a completely confounded two level factorial design in 4 blocks<br>10. Analysis of a partially confounded two level factorial design<br>11. Analysis of a single replicate of a $2^n$ design<br>12. Analysis of a fraction of $2^n$ factorial design |
| Reading/Reference Lists | 1. Goon, A.M., Gupta, M.K. and Dasgupta, B. (2005): Fundamentals of Statistics. Vol. II, 8thEdn. World Press, Kolkata.<br>2. Mukhopadhyay, P. : Applied Statistics.<br>3. Cochran, W.G. and Cox, G.M. (1959): Experimental Design. Asia Publishing House.<br>4. Dey, A. (1986) : Theory of Block Designs, Wiley Eastern Limited.<br>5. Montgomery, D. C. (2008): Design and Analysis of Experiments, John Wiley.<br>6. Das, M.N. and Giri, N.C. (1986): Design and Analysis of Experiments. Wiley Eastern Ltd.<br>7. Kempthorne, O. (1965): The Design and Analysis of Experiments. John Wiley. |

| Evaluation | Theory | Practical |
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| | CIA: 10<br>End-Sem: 50<br>Total: 60 | Continuous assessment: 40 |

| Paper Structure for End Sem Theory | Short questions (5 marks each) | Long questions (15 marks each) |
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| | 4 out of 6 | 2 out of 3 |