

GUJARAT TECHNOLOGICAL UNIVERSITY
B. E. SEMESTER: VII
METALLURGY ENGINEERING

Subject Name: **Alloy Design**

Subject Code: **172104**

| Teaching Scheme | | | | Evaluation Scheme | | | |
|-----------------|----------|-----------|-------|---------------------|-----------|---------------------------|----------------------|
| Theory | Tutorial | Practical | Total | University Exam (E) | | Mid Sem Exam (Theory) (M) | Practical (Internal) |
| | | | | Theory | Practical | | |
| 3 | 1 | 0 | 4 | 70 | 30 | 30 | 20 |

| Sr. No | Course Content | Total Hrs. |
|--------|--|------------|
| 1. | Concept of alloy design, Steps in alloy design, Significance of alloy design. | 6 |
| 2. | Single phase, dual phase and multiphase materials, Effect of matrix on properties of materials, Effect of size, shape and distribution of second phase on mechanical properties of alloys. | 10 |
| 3. | Precipitation and particle coarsening, recrystallization and grain growth. Solid/Liquid phase transformation in pure metals, single phase alloys, constitutional supercooling and eutectic alloys. | 10 |
| 4. | Alloy design for better tensile strength, ductility, toughness, fatigue strength, creep strength, wear resistance and elevated temperature strength. | 12 |
| 5. | High strength low alloy steels, Maraging steels, High speed steels, Hadfield steel and Super alloys. Alloy design of lightweight and high strength powder metallurgical Al based alloys, | 10 |
| 6. | Application of computer-based methods for alloy designing. | 6 |

Text Books:

1. ASM Handbook, Vol.1 & 2, Properties and Selection: Metals Park, Ohio.
2. Boyer, H.E.(ed.), Selection of Materials for component Design: Source Book, American Society for Metals, Metals Park, Ohio.
3. Ashby, M.F. Materials Selection in Mechanical Design, New York: Pergamon, 1992.
4. Ranganathan S., Arunachalam V.S. and Cahn R.W. (Eds.), Alloy Design, Indian Academy of Science, Bangalore, 1981.
5. Tien John K. and Ansell George S. (Eds.), Alloy and Microstructural Design, Academic Press.