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|-----------|---|-------------------------|
| | | ion/ Reprint |
| 1. | Robert J.Schilling, Fundamentals of Robotics – Analysis & Control (Chapters 1 to 9 – UNIT I, II, III, V) Prentice Hall of India Pvt. Ltd. | 2002 |
| 2. | Saeed B.Niku, Introduction to Robotics – Analysis, Systems, Applications (Chapters 6 & 7 – UNIT IV) /Prentice Hall of India Pvt. Ltd. | 2003 |

1. Subject Code: **EP-412** Course Title: **Nuclear Materials for Engineering Applications**
2. Contact Hours : L : 3 T : 1 P : 0
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0
4. Relative Weight : CWS : 25 PRS : 0 MTE : 25 ETE : 50 PRE : 0
5. Credits : 4
6. Semester : Even
7. Subject Area : DEC-7
8. Pre-requisite: Fundamentals of Nuclear Physics
9. Objective: To impart the knowledge on Nuclear materials, Mechanical properties, Dislocations and radiation effects.

10.Details of Course :

| S.No. | Contents | Contact Hours |
|-------|---|---------------|
| 1. | Overview of Nuclear Systems- Various types [LWR, PHWR, GCR, FBR, Fusion], Materials – Selection, Nature of Materials, Crystal Structure, Imperfections, Diffusion in Solids, Radiation Damage, Binary Elastic Collisions, Displacements due to PKA. | 13 |
| 2. | Properties of Materials, Mechanical Properties, Fracture, Fatigue and Creep, SCC (& corrosion), Dislocation Theory, Types, Stress Fields and Strain Energy, Forces on Dislocations, Dislocation Interactions, Dislocation Sources and Pile-ups, Hardening: Dislocation, Precipitation, Grain-boundary, Solution, Strain. | 15 |
| 3. | Radiation Effects, Microstructural Changes, Friction and Source Hardening, Fracture and DBTT, Embrittlement and Fracture, Reactor Materials, LWR Core Materials Radiation Growth – Zircalloys, Void Swelling (Stainless Steels), Radiation Induced vs Radiation Enhanced Creep, Pressure Boundary Materials, Fusion Materials | 14 |
| | Total | 42 |

11.Suggested Books

| S.No. | Name of Books/ Authors | Year of Publication/ Reprint |
|-------|--|---------------------------------|
| 1. | Fundamental Aspects of Nuclear Reactor Elements by D.R. Olander NTIS, ERDA | 1975 |
| 2. | Introduction to Dislocations by D.Hull and D.J. Bacon Pergamon Press | 1965 |
| 3. | Nuclear Reactor Materials by C.O. Smith/Addison-Wesley | 1967 |
| 4. | Materials Science and Engineering by W.D. Callister/Wiley | 1991 |
| 5. | Fundamentals of Radiation Materials Science by G.S. Was/Springer | 2007 |