COURSE CONTENT

PROGRAMMING FOR PROBLEM SOLVING								
III Semester: ME								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
2530376	**Foundation**	0	0	2	1	40	60	100
Contact Classes: 26	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisites: Basic knowledge in Physics								

Course Overview:

The course is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. Detailed study of properties of materials and also of interest. Fundamentals of applying equilibrium, compatibility, and force- deformation relationships to structural elements are emphasized. The students are introduced to advanced concepts of flexibility and stiffness methods of structural analysis. The course builds on the fundamental concepts of engineering mechanic's course.

Course Objectives:

1. Learn crystal structures and microstructures of metals and alloys.
2. Understand microstructures of steels and cast irons.
3. Gain skills in mechanical testing of materials.
4. Perform hardness, impact, bending, and torsion tests.
5. Interpret test results for engineering applications.

Course Outcomes: After Completion of the Course, Students should be able to

1. Identify crystal models and microstructures.
2. Explain microstructure–property relationships.
3. Perform mechanical tests (tension, torsion, bending, hardness, impact).
4. Analyze results of hardenability and strength tests.
5. Interpret and conclude experimental data for material selection.

LIST OF EXPERIMENTS:

1. Preparation and study of crystal models for simple cubic, body centered cubic, face centered cubic and close packed structures.
2. Preparation and study of the Microstructure of pure metals like Iron, Cu and Al.
3. Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.
4. Study of the Microstructures of Cast Irons.
5. Hardenability of steels by Jominy End Quench Test.
6. Direct Tension Test
7. Bending test on Simple supported beam.
8. Bending test on Cantilever beam
9. Torsion test
10. Brinell hardness test / Rockwell hardness test
11. Test on springs

12. Izod Impact test / Charpy Impact test.

TEXT BOOKS:

1. Introduction to Physical Metallurgy: Avner,2nded., TataMcGraw-HillEducation,2010.
2. William D. Callister, Jr, Materials Science and Engineering –An introduction, sixth edition, John Wiley & Sons, Inc. 2004.
3. Materials Science and Metallurgy: Kodgire V. D. 25th ed., Everest Publishing House, 2009

REFERENCE BOOKS:

1. Physical Metallurgy: RaghavanV.,2nded., PHI,2006
2. Materials Science and Metallurgy: Khanna O.P.5thed., Dhanpat Rai andSons,2009
3. Lawrence H. Van Vlack, Elements of Materials Science and Engineering, sixth edition, Addison Wesley Longman, Inc. New York, 1998.

ELECTRONIC RESOURCES:

1. https://sm-nitk.vlabs.ac.in/List%20of%20experiments.html
2. http://vlabs.iitkgp.ac.in/scm/

MATERIALS ONLINE:

1. Course template
2. Definitions and terminology