



# GOVERNMENT POLYTECHNIC, KORAPUT

## DEPARTMENT OF MECHANICAL ENGINEERING

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| <b>Discipline:</b><br>MECHANICAL<br>ENGG    | <b>Semester:</b><br>3 <sup>RD</sup>           | <b>Name of the Teaching Faculty:</b> M. KRISHNA RAO        |
| <b>Subject:</b><br>ENGINEERING<br>MATERIALS | <b>No. of days/per week class allotted:</b> 4 | <b>Semester From date:</b> 02/9/20 <b>To Date:</b> 19/3/22 |
|   |   | <b>No. of Weeks:</b>                                       |

**COURSE OUTCOMES**

CO1: UNDERSTAND THE MATERIAL REQUIREMENTS.  
 CO2: UNDERSTAND THE APPS OF FERROUS, NON-FERROUS & ALLOYS.  
 CO3: UNDERSTAND THE EFFECT OF HEAT TREATMENT PROCESSES.  
 CO4: UNDERSTAND THE IRON-CARBON EQUILIBRIUM DIAGRAM.  
 CO5: UNDERSTAND THE EVOLUTION OF ENGINEERING MATERIALS.

| Week            | Class Day       | Theory/Practical Topics  |
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| 1 <sup>ST</sup> | 1 <sup>ST</sup> | MATERIAL CLASSIFICATION INTO FERROUS AND NON FERROUS CATEGORY AND ALLOYS.                            |
|                 | 2 <sup>ND</sup> | PROPERTIES OF MATERIALS: PHYSICAL , CHEMICAL AND MECHANICAL.   |
|                 | 3 <sup>RD</sup> | PERFORMANCE REQUIREMENTS.  |
|                 | 4 <sup>TH</sup> | MATERIAL RELIABILITY AND SAFETY.   |
| 2 <sup>ND</sup> | 1 <sup>ST</sup> | QUIZ & ASSIGNMENT - I  |
|                 | 2 <sup>ND</sup> | CHARACTERISTICS AND APPLICATION OF FERROUS MATERIALS.  |
|                 | 3 <sup>RD</sup> | CLASSIFICATION, COMPOSITION AND APPS. OF LOW CARBON STEEL, MEDIUM CARBON STEEL AND HIGH CARBON STEEL |
|                 | 4 <sup>TH</sup> | ALLOY STEEL: LOW ALLOY STEEL, HIGH ALLOY STEEL, TOOL STEEL AND STAINLESS STEEL                       |
| 3 <sup>RD</sup> | 1 <sup>ST</sup> | TOOL STEEL: EFFECT OF VARIOUS ALLOYING ELEMENTS SUCH AS CR, MN, NI, V, MO.                           |
|                 | 2 <sup>ND</sup> | QUIZ & ASSIGNMENT - II   |
|                 | 3 <sup>RD</sup> | CONCEPT OF PHASE DIAGRAM.  |
|                 | 4 <sup>TH</sup> | CONCEPT OF PHASE DIAGRAM (CONTD...)  |
| 4 <sup>TH</sup> | 1 <sup>ST</sup> | CONCEPT OF COOLING CURVES.   |
|                 | 2 <sup>ND</sup> | CONCEPT OF COOLING CURVES. (CONTD...)  |
|                 | 3 <sup>RD</sup> | FEATURES OF IRON-CARBON DIAGRAM.   |
|                 | 4 <sup>TH</sup> | FEATURES OF IRON-CARBON DIAGRAM (CONTD...)   |
| 5 <sup>TH</sup> | 1 <sup>ST</sup> | SALIENT MICRO-CONSTITUENTS OF IRON AND STEEL OF IRON-CARBON DIAGRAM.                                 |
|                 | 2 <sup>ND</sup> | QUIZ & ASSIGNMENT - III  |
|                 | 3 <sup>RD</sup> | CRYSTAL DEFINES, CLASSIFICATION OF CRYSTALS, IDEAL CRYSTAL AND CRYSTAL IMPERFECTIONS.                |
|                 | 4 <sup>TH</sup> | CLASSIFICATION OF IMPERFECTION: POINT DEFECTS, LINE DEFECTS, SURFACE DEFECTS AND VOLUME DEFECTS.     |
| 6 <sup>TH</sup> | 1 <sup>ST</sup> | TYPES AND CAUSES OF POINT DEFECTS: VACANCIES, INTERSTITIALS AND IMPURITIES.                          |
|                 | 2 <sup>ND</sup> | TYPES AND CAUSES OF LINE DEFECTS: EDGE DISLOCATION AND SCREW DISLOCATION.                            |
|                 | 3 <sup>RD</sup> | EFFECT OF IMPERFECTION ON MATERIAL PROPERTIES  |
|                 | 4 <sup>TH</sup> | DEFORMATION BY SLIP AND TWINNING.  |
| 7 <sup>TH</sup> | 1 <sup>ST</sup> | DEFORMATION BY SLIP AND TWINNING. (CONTD...)   |



|                  |                 | EFFECT OF DEFORMATION ON MATERIAL PROPERTIES.  |  |
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| 8 <sup>TH</sup>  | 2 <sup>ND</sup> | EFFECT OF DEFORMATION ON MATERIAL PROPERTIES. (CONTD...)   |  |
|                  | 3 <sup>RD</sup> | EFFECT OF DEFORMATION ON MATERIAL PROPERTIES. (CONTD...)   |  |
|                  | 4 <sup>TH</sup> | QUIZ & ASSIGNMENT - IV   |  |
|                  | 1 <sup>ST</sup> | PURPOSE OF HEAT TREATMENT.   |  |
| 9 <sup>TH</sup>  | 2 <sup>ND</sup> | PROCESS OF HEAT TREATMENT: ANNEALING, NORMALIZING, HARDENING, TAMPERING, STRESS RELIEVING MEASURES.  |  |
|                  | 3 <sup>RD</sup> | PROCESS OF HEAT TREATMENT: ANNEALING, NORMALIZING, HARDENING, AND TAMPERING, STRESS RELIEVING MEASURES. (CONTD...)   |  |
|                  | 4 <sup>TH</sup> | SURFACE HARDENING: CARBURIZING AND NITRIDING.  |  |
|                  | 1 <sup>ST</sup> | SURFACE HARDENING: CARBURIZING AND NITRIDING (CONTD...)  |  |
| 10 <sup>TH</sup> | 2 <sup>ND</sup> | EFFECT OF HEAT TREATMENT ON PROPERTIES OF STEEL.   |  |
|                  | 3 <sup>RD</sup> | EFFECT OF HEAT TREATMENT ON PROPERTIES OF STEEL. (CONTD...)  |  |
|                  | 4 <sup>TH</sup> | HARDENABILITY OF STEEL.  |  |
|                  | 1 <sup>ST</sup> | REVISION.  |  |
| 11 <sup>TH</sup> | 2 <sup>ND</sup> | QUIZ & ASSIGNMENT - V  |  |
|                  | 3 <sup>RD</sup> | ALUMINUM ALLOYS: COMPOSITION, PROPERTY AND USAGE OF DURALMIN, Y- ALLOY.  |  |
|                  | 4 <sup>TH</sup> | ALUMINUM ALLOYS: COMPOSITION, PROPERTY AND USAGE OF DURALMIN, Y- ALLOY. (CONTD...)   |  |
|                  | 1 <sup>ST</sup> | COPPER ALLOYS: COMPOSITION, PROPERTY AND USAGE OF COPPERALUMINUM, COPPER-TIN, BABBIT , PHOSPEROUS BRONZE, BRASS, COPPER- NICKEL.   |  |
| 12 <sup>TH</sup> | 2 <sup>ND</sup> | COPPER ALLOYS: COMPOSITION, PROPERTY AND USAGE OF COPPERALUMINUM, COPPER-TIN, BABBIT , PHOSPEROUS BRONZE, BRASS, COPPER- NICKEL. (CONTD...)  |  |
|                  | 3 <sup>RD</sup> | PREDOMINATING ELEMENTS OF LEAD ALLOYS, ZINC ALLOYS AND NICKEL ALLOYS.  |  |
|                  | 4 <sup>TH</sup> | PREDOMINATING ELEMENTS OF LEAD ALLOYS, ZINC ALLOYS AND NICKEL ALLOYS (CONTD....)   |  |
|                  | 1 <sup>ST</sup> | LOW ALLOY MATERIALS LIKE P-91, P-22 FOR POWER PLANTS AND OTHER 10 HIGH TEMPERATURE SERVICES. HIGH ALLOY MATERIALS LIKE STAINLESS STEEL GRADES OF DUPLEX, SUPER DUPLEX MATERIALS ETC.         |  |
| 13 <sup>TH</sup> | 2 <sup>ND</sup> | LOW ALLOY MATERIALS LIKE P-91, P-22 FOR POWER PLANTS AND OTHER 10 HIGH TEMPERATURE SERVICES. HIGH ALLOY MATERIALS LIKE STAINLESS STEEL GRADES OF DUPLEX, SUPER DUPLEX MATERIALS ETC. (CON..) |  |
|                  | 3 <sup>RD</sup> | REVISION   |  |
|                  | 4 <sup>TH</sup> | QUIZ & ASSIGNMENT - VI   |  |
|                  | 1 <sup>ST</sup> | CLASSIFICATION OF COPPER BASE, TIN BASE, LEAD BASE, CADMIUM BASE BEARING MATERIALS.  |  |
| 14 <sup>TH</sup> | 2 <sup>ND</sup> | COMPOSITION OF COPPER BASE, TIN BASE, LEAD BASE, CADMIUM BASE BEARING MATERIALS.   |  |
|                  | 3 <sup>RD</sup> | PROPERTIES & USES OF COPPER BASE, TIN BASE, LEAD BASE, CADMIUM BASE BEARING MATERIALS.   |  |
|                  | 4 <sup>TH</sup> | CLASSIFICATION OF IRONBASE AND COPPER BASE SPRING MATERIAL.  |  |
|                  | 1 <sup>ST</sup> | COMPOSITION OF IRONBASE AND COPPER BASE SPRING MATERIAL.   |  |
| 14 <sup>TH</sup> | 2 <sup>ND</sup> | PROPERTIES & USES OF IRONBASE AND COPPER BASE SPRING MATERIAL.   |  |
|                  | 3 <sup>RD</sup> | PROPERTIES OF THERMOSETTING AND THERMOPLASTIC POLYMERS.  |  |
|                  | 4 <sup>TH</sup> | APPLICATIONS OF THERMOSETTING AND THERMOPLASTIC POLYMERS.  |  |

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|  |                 | OF ELASTOMERS.  |
|  | 2 <sup>ND</sup> | CLASSIFICATION & COMPOSITION OF PARTICULATE BASED AND FIBER REINFORCED COMPOSITES |
|  | 3 <sup>RD</sup> | PROPERTIES AND USES OF PARTICULATE BASED AND FIBER REINFORCED COMPOSITES.         |
|  | 4 <sup>TH</sup> | CLASSIFICATION AND USES OF CERAMICS.  |

**LEARNING RESOURCES:**

- 01 O.P KHANNA A TEXTBOOK OF MATERIAL SCIENCE AND METALLURGY DHANPAT RAI.  
 02 R.K RAJPUT ENGINEERING MATERIALS AND METALLURGY S.CHAND.  
 03 S.K HAZRA CHOUDHRY MATERIAL SCIENCE & PROCESS INDIAN BOOK DISTRUBUTING.

*M. Krishna Sagar*

Sign. Of Faculty  
concerned

*Sharmila Mishra*

Sign. Of HOD /C

*D*  
Principal