K L University
Department of Mechanical Engineering

MATERIAL SCIENCE AND METALLURGY

Course code: 15 ME 2105 **(L – T – P): 2 - 2 - 2**
Pre Requisite: Engineering Materials (15PH 1001) **Credits: 4**

Syllabus:

Introduction to Engineering materials, Single crystals, polycrystalline, non-crystalline, nano crystalline materials.

Structure, properties and applications of different metals and alloys, Ceramics, Composites, Nano materials, Bio materials, Smart Materials.

Constitution of Alloys, cooling curves, Phase Diagrams- classification, Construction, Invariant reactions.
DEFORMATION: Elastic, Anelastic and Visco-elastic behavior of materials, Deformation by slip & twinning, Mechanism of slip, Dislocation multiplication.

Iron Carbon diagram, TTT and CCT diagrams, Strengthening mechanisms, Heat Treatment of steels, Classification, Cast iron, alloy steels, non ferrous metals and alloys.

Material testing methods: Destructive and Non Destructive, Powder Metallurgy.

Text Books:
1) Sidney.H.Avner "Introduction to Physical Metallurgy" TMH publications, Second Edition.
2) Dr.VD Kodgire and Dr. SV Kodgire "Material science and Metallurgy" EPH, Edition 1.

Reference Books:
1) C. Daniel Yesudian, D G Harris Samuel "Material science and Metallurgy" Scitech Publications, (2006).
2) V.Raghavan " Materials science and Engineering" Fifth Edition ,PHI..
3) R.A.Higgins, "Engineering Metallurgy, Part I" App. Physical Met, ELBS.

K L University
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MANUFACTURING SCIENCE AND TECHNOLOGY

Course code : 15 ME 2208 **Course structure (L – T – P) : 2 - 2 - 2**
Pre Requisite : NIL **Credits : 4**

Syllabus:

Introduction to Manufacturing and its evolution, Metal Casting: Casting-its elements, Die casting, Investment casting, Centrifugal casting, Shell moulding, Gating design, Design of patterns, moulds and cores, Solidification and cooling, melting furnaces. Metal Forming: Basic Principles of forging, rolling, drawing and extrusion; Fundamentals of hot and cold working processes; Load estimation for bulk metal forming processes, High energy rate forming; Joining Methods: Principles of Gas, Arc welding, Brazing & Soldering, Advanced Welding Processes TIG & MIG; Adhesive Joining, Metal and non-metal joining; Weldability; Design considerations in Welding. Machining: Turning, Methods of Screw Production, Drilling, Boring, Milling, Gear Manufacturing, Production of flat surfaces, Grinding & Finishing Processes. Mechanics of Metal Cutting: Mechanics of machining, single and multipoint cutting tools, tool geometry and materials, tool life and wear, Variables affecting Tool Life; Jig & fixtures: Classification of jig & fixtures. Principle of location, types of locators. Principle of guiding elements Types of guiding elements, Principle of clamping elements, Types of clamps. Introduction To Software For Manufacturing Applications: Metal forming and flow analysis software (for metallic /plastic components).

Text Books:

1. S. Kalpakjian, “Manufacturing Processes for Engineering Materials”, Fifth edition. Pearson Education, (2009).
2. Ghosh and Mallick A. K., “Manufacturing Science”. Affiliated East-West Press Pvt. Ltd. (2010).

Reference Books:

1. M. P. Groover, “Fundamentals of Modern Manufacturing: Materials, Processes, and Systems”, Third edition. Wiley India Private Limited, (2009).
2. S. Kalpakjian, “Manufacturing Processes for Engineering Materials”, Fifth edition. Pearson Education, (2009).
3. G. K. Lal and S. K. Choudhury, “Fundamentals Of Manufacturing Process”, Boca Raton, FL: CRC Press, (2011).
4. M.H.A. Kempster, Introduction to Jigs and fixtures design
5. Hoffman, Introduction to Jigs and fixtures.

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KINEMATICS AND DYNAMICS OF MACHINES

Course code: 15 ME 2209 **Course structure (L – T – P) : 2 - 2 - 2**
Pre Requisite: (15ME 1001) Basic Engg. Science -1- Mechanics **Credits : 4**

Syllabus:

Mechanisms and Machines: Introduction to Plane and Space Mechanisms, Kinematic Pairs, Kinematic Chains and their Inversions, Mobility and range of movement - Kutzbach and Grubler's criterion, Grashof's criterion.
Velocity analysis: Velocity analysis using IC and relative velocity method. Acceleration analysis.
Cams: cam profiles of knife edge, roller and offset followers of reciprocating motion.
Gears and Gear trains: Gears – terminology, fundamental law of gearing, involute profile. Interference and undercutting.
Gear Trains – simple, compound and epicyclic gear trains.
Balancing: Introduction, Static balancing, dynamic balancing, transferring of a Force from one plane to another, Balancing of Several Masses in Different planes, Balancing of Reciprocating Mass, Secondary Balancing.
Dynamic force analysis: Force analysis of Slider crank mechanism.
Gyroscopes: Gyroscopic Effect on Naval Ships, Stability of an Automobile, Stability of a Two-Wheel vehicle.

Text Book:

1. David H. Myszka "Machines and Mechanisms-Applied Kinematic Analysis", 4th Edition, Prentice Hall
2. Robert Norton "Kinematics and Dynamics of Machinery" 1st Edition, Tata McGraw - Hill Education, (2009)
3. Shigley J.E., and Uicker J.J "Theory of Machines and Mechanisms", McGraw Hill, (1995).

Reference books:

1. Thomas Bevan "Theory of Machine" CBS Publications.
2. Rao, J. S "The Theory of Machines through Solved Problems", New Age International.
3. A.Ghosh and A.K.Mallik "Machanisms and Machine Theory",3rd edition, EWP Pvt.Ltd.
4. S.S.Rattan "Theory of Machine", Mc.Graw Hill
5. NPTEL lectures : http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-Delhi/Kinematics of Machine/index.htm

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APPLIED THERMODYNAMICS

Course code :15 ME 2210 **Course structure (L – T – P) : 2 -2 - 2**
Pre Requisite : (15ME 1003) Thermodynamics **Credits : 4**

Syllabus:

PURE SUBSTANCE: Vapour-liquid-solid phase equilibrium, independent properties, Equations of state, Tables of thermodynamic properties.

VAPOUR POWER CYCLES: Rankine cycle, Effect of pressure and temperature, Regenerative cycle, Binary vapour cycle.

STEAM NOZZLES & CONDENSERS: Types of nozzles, isentropic flow through nozzles, effect of friction, nozzle efficiency, critical pressure ratio and maximum discharge, throat and exit areas using Mollier diagram, Condensers - Jet and surface condensers, condenser vacuum and vacuum efficiency, condenser efficiency, thermodynamic analysis.

IC ENGINES: Engine nomenclature, classification of I.C. Engines, working principles of S.I. and C.I. Engines (both 4 stroke and 2-stroke) - valve and port timing diagrams - Differences between SI & CI and 2 stroke & 4 stroke engines and combustion in S.I and CI engines.

REFRIGERATION & AIR CONDITIONING : Methods of refrigeration, Refrigerator & heat pump, Reversed carnot and bell-coleman cycles, Refrigerating effect, COP, Vapour compression and vapour absorption refrigeration systems, Psychrometric properties, psychrometric chart and air-conditioning process.

TEXT BOOKS:

1. cengel & Boles “Engineering Thermodynamics”,Mc Graw Hill Publishers
2. P.K.Nag “Basic and Applied Thermodynamics”, TMH, New Delhi
3. V.Ganesan “I.C. Engines”, T.M.H.,

REFERENCE BOOKS:

1. Vasandhani & D.S.kumar “A treatise on Heat Engineering”, Metropolitan Book publishers
2. P.K.Nag “Engineering Thermodynamics”, TMH, New Delhi
3. R.Yadav “Applied Thermodynamics” CBH, Allahabad
4. P.K.Nag “Power Plant Engineering (Steam and Nuclear)”, TMH.
5. Kearton “Steam Turbines Theory and Practice”-, ELBS

Note: use of steam tables and refrigeration and air-conditioning tables is permitted in university examinations.

K L University
Department of Mechanical Engineering
EMPLOYABILITY SKILLS

Course Code: 15EN2204 **L-T-P : 0-0-4**
Pre-requisite: NIL **Credits : 2**

Speaking skills - Group Discussions Level 2 Speaking and listening exercises From *Effective Speech by* Richard W Clark.

Know yourself as a Communicator, Communicating with others, Group Discussion, Interactive Listening.

Writing skills- Writing Proposals, Product and process description, Agenda, Minutes and Scheduling meetings, Technical Writing Skills - Report Writing, Types of reports, Formats, How to write good reports, Résumé and Job Application.

Reading skills - Reading Comprehension (GRE, GMAT Pattern) - Identifying the author's purpose, Main Idea/ Theme, Suitable Title, Specific information, not mentioned/ Negative factual information, Tone, Attitude and Style, Structure / Organization. Vocabulary in context - Signpost words, Pejorative Signals and Complimentary Signals, Continuation Signals, Contrast signals, Sentence Completion, Text completion, Sentence Equivalence (Single blank, double blank, three blank, two answer Questions)

People skills - Initiating and ending conversations, Expressing and creating interest, practicing therapeutic listening, Breaking good/bad news.

Text book

1. Material prepared by the Department

References

1. Raymond V.Leisikar, Marie. E. Flatley "Business Communication: Connecting in a Digital World"l. 13 Editions ,Mc Graw Hill Education, (2015)
2. Business Communication, Mallika Nawal, Cengage Learning Pvt Limited, Delhi, 2014 print.
3. GMAT for Dummies, Lisa Zimmer Hatch, Scott Hatch, John Wiley & Sons, 2012.
4. Study Reading: A Course in Reading Skills for Academic Purposes, Eric H. Glendinning, Beverly Holmström, Cambridge University Press, 2004.
5. Personality Development and soft skills, Sunitha Mithra, OUP 2012.

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ENGINEERING GRAPHICS

Course code : 15 ME 1002 **Course structure (L – T – P): 0-0-6**
Pre Requisite : Nil **Credits : 3**

INTRODUCTION: Types of projections, First and Third angle systems of orthographic projections.
Orthographic Projection –Introduction to Orthographic projections, orthographic projection of different objects.-lap tee joint,mortise and tenon joint,simple objects.
CARPENTARY-Hands on practice on wood working operations using hand tools-
lap tee joint, mortise and tenon joint, simple objects
AUTOCAD:Autocad practice of simple orthographic objects.

Isometric projection – Theory of isometric projection, isometric view, isometric views from orthographic views for simple objects. –square- fit ,L-fit
FITTING: Hands on practice on preparing fits-square fit,,L-fit- By using isometric views .
AUTOCAD:Autocad practice of simple isometric views.

Introduction to Computer Aided Drafting, AutoCAD Commands, Types of lines, Dimensioning,Practice problems on house wiring and resisters connection in series and parallel in autocad, civil drawings
HOUSE WIRING: Hands on practice on house wiring connections
AUTOCAD:Autocad practice of House wiring circuits

Development of Surfaces of solids: methods of development of lateral surfaces,development of truncated prisims& cylinders.
TINSMITY-Hands on practice on sheet metal working-lateral surface development of truncated cylinder for-pipe-T-joint, truncated cone
AUTOCAD:Autocad practice of lateral developments of truncated cylinder and pyramids

Projection of Planes – Types of planes, projection of planes, various position of planes w.r.t. reference planes
Projection of Solids – Types of solids, Projections of solids in simple position ,projection of solids with axis inclined to one reference plane and parallel to other
Sections of solids: section of Prism, Pyramid, Cylinder, & Cone cut by plane parallel to reference planes, section plane inclined to reference plane

Text Books:

1) N.D.Bhatt "Engineering Drawing" 52nd edition, Charotar Publishing House Pvt. Ltd (2013)
2) P.kanniah and K.L.Narayana"engineering practice laboratory"

Reference books:

1). Dhananjay A Jolhe "Engineering Drawing with an introduction to AutoCAD" ,Tata McGraw- Hill Publishing company limited
2) D. M. Kulkarni, A. P. Rastogi and A.K.Sarkar "Engineering Graphics with AutoCAD by; PHI Learning Private Limited, New Delhi, (2009).
3) B S Nagendra parashar and R K Mitall "Elements of manufacturing process"