TRIBOLOGY

Subject Code

:

06ME831

IA Marks

:

25

No. of Lecture Hrs./ Week

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

Unit - 1

Introduction to Tribiology: Properties of oils and equation of flow: Viscosity, Newton's Law of viscosity, Hagen-Poiseuille Law, Flow between parallel stationary planes, viscosity measuring apparatus. Lubrication principles, classification of lubricants.

6 Hours

Unit - 2

Hydrodynamic Lubrication: Friction forces and power loss in lightly loaded bearing, Petroff's law, Tower's experiments, idealized full journal bearings.

6 Hours

Unit - 3

Mechanism of pressure development in an oil film: Reynold's investigations, Reynold's equation in two dimensions. Partial journal bearings, end leakages in journal

bearing, numerical problems.

7 Hours

Unit - 4

Slider / Pad bearing with a fixed and pivoted shoe: Pressure distribution, Load carrying capacity, coefficient of friction, frictional resistance in a pivoted shoe bearing, influence of end leakage, numerical examples.

7 Hours

PART - B

Unit - 5

Oil flow and thermal equilibrium of journal bearing: Oil flow through bearings, self-contained journal bearings, bearings lubricated under pressure, thermal equilibrium of journal bearings.

6 Hours

Unit - 6

Hydrostatic Lubrication: Introduction to hydrostatic lubrication, hydrostatic step bearings, load carrying capacity and oil flow through the hydrostatic step bearing.

6 Hours

Unit - 7

Bearing Materials: Commonly used bearings materials, properties of typical bearing materials. **Wear:** Classification of wear, wear of polymers, wear of ceramic materials, wear measurements, effect of speed, temperature and pressure.

7 Hours

Unit - 8

Behavior of tribological components: Selection, friction, Wear of ceramic materials, wear measurements, effects of speed, temperature and pressure.
Tribological measures
, Material selection, improved design, surface engineering

7 Hours

TEXT BOOKS:

1. **Fundamentals   of Tribiology**   , Basu S K., Sengupta A N., Ahuja B. B., , PHI 2006

2. **Introduction   to Tribiology Bearings,** Mujumdar B. C., S. Chand company pvt. Ltd 2008.

REFERENEC BOOKS:

1. **Theory and   Practice of Lubrication for Engineers,** Fuller, D., New York company 1998
2. **Principles and   Applications of Tribiology,**   Moore, Pergamaon press 1998
3. **Tribiology in Industries,** Srivastava S., S Chand and Company limited, Delhi 2002
4. **Lubrication of   bearings – Theoretical Principles and Design,** Redzimovskay E I., Oxford press company   2000

Written by Administrator
Wednesday, 04 November 2009 07:57 -

FRACTURE MECHANICS

Subject Code

:

06ME832

IA Marks

:

25

No. of Lecture Hrs./ Week

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

Unit - 1

Fracture Mechanics Principles: Introduction, Mechanisms of Fracture, a crack in structure, the Griffith's criterion, modern design – strengths, stiffness and toughness. Stress intensity approach

6 Hours

Unit - 2

Stress Analysis for members with Cracks: Linear elastic fracture mechanics, Crack tip stress and deformations, Relation between stress intensity factor and fracture toughness, Stress intensity based solutions. Crack tip plastic zone estimation, Plane stress and plane strain concepts. The Dugdale approach, the thickness effect.

7 Hours

Unit - 3

Elastic – Plastic Fracture Mechanics: Introduction, Elasto–plastic factor criteria, crack resistance curve, J-integral, Crack opening displacement, crack tip opening displacement. Importance of R-curve in fracture mechanics, experimental determination of J-integral, COD and CTOD.

7 Hours

Unit - 4

Dynamic and Crack Arrest: Introduction, the dynamic stress intensity and elastic energy release rate, crack branching, the principles of crack arrest, the dynamic fracture toughness.

6 Hours

PART - B

Unit - 5

Fatigue and fatigue crack growth rate: Fatigue loading, various stages of crack propagation, the load spectrum, approximation of the stress spectrum, the crack growth integration, fatigue crack growth laws.

7 Hours

Unit - 6

Fracture Resistance of Materials: Fracture criteria, fatigue cracking criteria, effect of alloying and second phase particles, effect of processing and anisotropy, effect of temperature, closure.

6 Hours

Unit - 7

Computational Fracture Mechanics: Overview of numerical methods, traditional methods in computational fracture mechanics – stress and displacement marching, elemental crack advance, virtual crack extension, the energy domain integral, finite element implementation. Limitations of numerical fracture analysis.

7 Hours

Unit - 8

Fracture toughness testing of metals: Specimen size requirements, various test procedures, effects of temperature, loading rate and plate thickness on fracture toughness. Fracture testing in shear modes, fatigue testing, NDT methods.

6 Hours

TEXT BOOKS:

   1. **Introduction   to Fracture Mechanics**, Karen   Hellan McGraw Hill Pub.2000
   2. **Fracture of   Engineering Brittle Materials,** Jayatilake, Applied Science, London. 2001.

REFERENCE BOOKS:

   1. **Fracture   Mechanics – Fundamental and Application,** T.L. Anderson, CRC press 1998
   2. **Elementary   Engineering Fracture Mechanics**, David Broek, Artinus Nijhoff, London 1999.

3. **Fracture and   Fatigue Control in Structures**, Rolfe and Barsom, Printice Hall 2000.

4. **Fundamentals   of Fracture Mechanics**, Knott,   Bureworth 2000.

CRYOGENICS

Subject Code

:

06ME833

IA Marks

:

25

No. of Lecture Hrs./ Week

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

Unit - 1

Introduction to Cryogenic Systems: Applications Areas of Cryogenic Engineering

Low temperature properties of engineering materials – Mechanical properties, Thermal properties, Electrical properties.

Introduction The Thermodynamically Ideal system Production of low temperatures – Joule Thompson Effect, Adiabatic expansion.

6 Hours

Unit - 2

Gas liquification systems: Liquification systems for Air Simple Linde – Hampson System, Claude System, Heylndt System, Dual pressure, Claude.

Liquefaction cycle Kapitza System. Comparison of Liquefaction Cycles Liquefaction cycle for hydrogen, helium and Neon, Critical components of liquefaction systems.

7 Hours

Unit - 3

Gas cycle Cryogenic refrigeration systems: Classification of Cryo coolers Stirling cycle Cryo – refrigerators, Ideal cycle – working principle. Schmidt's analysis of Stirling cycle Various configurations of Stirling cycle refrigerators Integral piston Stirling cryo-cooler, Free displacer split type Stirling Cryo coolers, Gifford Mcmahon Cryo- refrigerator, Pulse tube refrigerator, Solvay cycle refrigerator, Vuillimier refrigerator, Cryogenic regenerators.

6 Hours

Unit - 4

Gas separation and gas purification systems: Thermodynamic ideal separation system, Properties of mixtures, Principles of gas separation, Linde single column air separation. Linde double column air separation, Argon and Neon separation systems. Adsorption Process, PSA systems.

7 Hours

PART - B

Unit - 5

Ultra low temperature Cryo – Refrigerators: Magneto Caloric Refrigerator ^{3}He-^{4}He Dilution refrigerator. Pomeranchuk cooling.

Measurement systems for low temperatures, Temperature measurement at low temperatures, Resistance thermometers, Thermocouples, Thermistors, Gas Thermometry. Liquid level sensors.

6 Hours

Unit - 6

Vacuum Technology: Fundamental principles. Production of high vacuum, Mechanical vacuum pumps, Diffusion pumps, Cryo-pumping, Measurement of high vacuum level.

Cryogenic Insulation: Heat transfer due to conduction, Evacuated porous insulation Powder & Fibers Opacified powder insulation, Gas filled powders & Fibrous materials Multilayer super-insulation, Composite insulation.

7 Hours

Unit - 7

Cryogenic fluid storage and transfer systems: Design of cryogenic fluid storage vessels, Inner vessel, Outer Insulation, Suspension system, Fill and drain lines. Cryogenic fluid transfer, External pressurization, Self pressurization, Transfer pump.

7 Hours

Unit - 8

Application of cryogenic systems: Cryogenic application for food preservation – Instant Quick Freezing techniques 11.2 Super conductive devices, Cryogenic applications for space

technology.

6 Hours

Text Books:

1.   **Cryogenic Systems,** Randall Barron – Oxford Press, 1985

2.   **Cryogenic Engineering,** Thomas M. Flynn, Marcel Dekker, Inc N.Y. Basal 1997

Reference Book:

1.   **Cryogenic Process Engineering,** Klaus D. Timmerhaus & Thomas M. Flynn, Plenum Press, New York & London 1989.

NANOTECHNOLOGY

Subject Code

:

06ME834

IA Marks

:

25

No. of Lecture Hrs./ Week

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

Part - A

Unit - 1

An overview of Nanoscience & Nanotechnology – historical background – nature, scope and content of the subject – multidisciplinary aspects – industrial, economic and societal implications.

5 Hours

Unit - 2

Experimental Techniques and Methods for investigating and manipulating materials in the nano scale – electron microscope – scanning probe microscope – optical and other microscopes – light scattering – x-ray diffraction.

7 Hours

Unit - 3

Fullerenes – discovery, synthesis and purification – chemistry of fullerenes in the condensed phase – orientational ordering – pressure effects – conductivity and superconductivity – ferromagnetism – optical properties.

Carbon Nanotubes – synthesis and purification – filling of nanotubes – mechanism of growth – electronic structure – transport properties – mechanical and physical properties –

applications.

7 Hours

Unit - 4

Self-assembled Monolayers – monolayers on gold – growth process – phase transitions – patterning monolayers – mixed monolayers – applications.

Gas Phase Clusters – history of cluster science – formation and growth – detection and analysis – type and properties of clusters – bonding in clusters.

7 Hours

Part - B

Unit - 5

Semiconductor Quantum Dots – synthesis – electronic structure of nanocrystals – how quantum dots are studied – correlation of properties with size – uses.

5 Hours

Unit - 6

Monolayer-protected Metal Nanoparticles – method of preparation–characterization – functionalized metal nanoparticles – applications – superlattices.

Core-shell Nanoparticles – types – characterization – properties – applications.

Nanoshells – types – characterization – properties – applications.

8 Hours

Unit - 7

Nanobiology – interaction between biomolecules and nanoparticle surfaces – materials used for synthesis of hybrid nano-bio assemblies – biological applications – nanoprobes for analytical applications – nanobiotechnology – future perspectives. **Nanosensors** – what make them possible – nanoscale organization for sensors – characterization – nanosensors based on optical properties – nanosensors based on quantum size effects – electrochemical sensors – sensors based on physical properties – nanobiosensors – sensors of the future.

Nanomedicines – approach to development – nanotechnology in diagnostic and therapeutic applications.

8 Hours

Unit - 8

Molecular Nanomachines – covalent and non-covalent approaches – molecular motors and machines – other molecular devices – single molecular devices – practical problems involved.

Nanotribology – studying tribology on the nanoscale – applications.

5 Hours

Text books:

1. **NANO: The Essentials – Understanding Nanoscience and Nanotechnology;** T Pradeep (Professor, IIT Madras); Tata McGraw-Hill India (2007)

2. **Nanotechnology:** Richard Booker & Earl Boysen; Wiley (2005).

Written by Administrator
Wednesday, 04 November 2009 07:57 -

Reference Books:

   1. **Introduction to Nanoscale Science and   Technology [Series: Nanostructure Science and Technology],**
Di Ventra, et   al (Ed); Springer (2004)

   2. **Nanotechnology Demystified,** Linda   Williams & Wade Adams; McGraw-Hill (2007)

   3. **Introduction to Nanotechnology,**   Charles P Poole Jr, Frank J Owens, Wiley India
Pvt. Ltd., New Delhi, 2007.

ORGANISATIONAL BEHAVIOUR & PROFESSIONAL COMMUNICATION

| **Subject Code** |

| : |

| **06ME835** |

| **IA Marks** |

Written by Administrator
Wednesday, 04 November 2009 07:57 -

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25

No. of Lecture Hrs./ Week

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Written by Administrator
Wednesday, 04 November 2009 07:57 -

Exam Marks

:

100

PART - A

Unit - 1

Introduction: Definition of Organization Behaviour and Historical development, Environmental context (Information Technology and Globalization, Diversity and Ethics, Design and Cultural, Reward Systems).

6 Hours

Unit - 2

The Individual: Foundations of individual behaviour, individual differences. Ability. Attitude, Aptitude, interests. Values   .

7 Hours

Unit - 3

Learning: Definition, Theories of Learning, Individual Decision Making, classical conditioning, operant conditioning, social learning theory, continuous and intermittent reinforcement
.

7 Hours

Unit - 4

Perception: Definition, Factors influencing perception, attribution theory, selective perception, projection, stereotyping, Halo effect   .

7 Hours

PART - B

Unit - 5

Motivation： Maslow's Hierarchy of Needs theory, Mc-Gregor's theory X and Y, Hertzberg's motivation Hygiene theory, David Mc-Clelland's three needs theory, Victor Vroom's expectancy theory of motivation   .

6 Hours

Unit - 6

The Groups: Definition and classification of groups, Factors affecting group formation, stages of group development, Norms, Hawthorne studies, group processes, group tasks, group decision making .

6 Hours

Unit - 7

Conflict & Stress management: Definition of conflict, functional and dysfunctional conflict, stages of conflict process . Sources of stress, fatigue and its impact on productivity. Job satisfaction, job rotation, enrichment, job enlargement and reengineering work process .

8 Hours

Unit - 8

Principles of Communication: Useful definitions, communication principles, communication system, role of communication in management, barriers in communication, how to overcome the barriers, rule of effective communication .

6 Hours

TEXT BOOKS:

1. **Organizational   Behaviour,** Stephen P Robbins, 9th Edition, Pearson Education Publications, ISBN-81-7808-561-5 2002

2. **Organizational   Behaviour,** Fred Luthans, 9th Edition, Mc Graw Hill   International Edition, ISBN-0-07-120412-12002

REFERENCE BOOKS:

1. **Organizational   Behaviour,** Hellriegel, Srocum and Woodman, Thompson Learning, 9 th Edition, Prentice Hall India, 2001
2. **Organizational   Behaviour,** Aswathappa - Himalaya Publishers. 2001
3. **Organizational   Behaviour,** VSP Rao and others, Konark Publishers.2002
4. **Organizational   Behaviour,** (Human behaviour at work) 9th Edition, John Newstron/ Keith Davis. 2002

COMPUTER GRAPHICS

Subject Code

:

06ME836

IA Marks

:

25

No. of Lecture Hrs./ Week

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

Unit - 1

Scan Conversion and Clipping Representation of points, lines, Line Drawing Algorithms: DDA algorithm, Bresenham's integer line algorithm, Bresenham's circle algorithm, mid point line and circle, Polygon filling algorithms: scan conversion, seed filling, scan line algorithm. Viewing transformation, Clipping –points, lines, text, polygon, Cohen-Sutherland line clipping, Sutherland-Hodgmen algorithm.

7 Hours

Unit - 2

Two Dimensional Transformations Representation of points, Transformations: Rotation, Reflection, Scaling, Combined Transformations, Translations and Homogeneous Coordinates, A geometric interpretation of homogeneous coordinates, Over all scaling, Points at infinity, rotation about an arbitrary point, Reflection through an arbitrary line.

6 Hours

Unit - 3

Three Dimensional Transformations and Projections 3D Transformation matrix: general matrix, Translation, scaling, Shearing, Rotation, Reflection, Multiple transformations, Rotation about an axis parallel to coordinate axis, Rotation about an arbitrary axis in space, Reflection

through an arbitrary plane, Orthographic, Parallel projection Transformations, one, Perspective projections- one point, two point and three point.

6 Hours

Unit - 4

Plane and Space Curves Curve representation, Nonparametric curves, parametric curves, parametric representation and generation of line, circle, ellipse, parabola, hyperbola, generation of circle, ellipse, parabola, hyperbola,   Cubic spline, normalized cubic splines, Bezier curves: blending function, properties, generation, B-spline curves- Cox-deBoor recursive formula,properties,open uniform basis functions, Non-uniform basis functions, periodic B-spline curve.

7 Hours

PART - B

Unit - 5

Types and Mathematical Representation of Solids, Solid Models, Solid entities, Solid representation, Solid modeling- set theory, regularized set operations, set membership classification, Half spaces, Half spaces of plane, cylinder, sphere, conical half-space, Boundary representation, Constructive Solid Geometry- basic elements, Building operations.

7 Hours

Unit - 6

Visual Realism-I: Introduction, hidden line removal- visibility of object views, Visibility techniques: minimax test, containment test, surface test, Silhouttes, Homogeneity test, Sorting, Coherence, Hidden line priority algorithm, Hidden surface removal- Z-buffer algorithm, Warnock's algorithm, Hidden solid removal- ray tracing algorithm.

6 Hours

Unit - 7

Visual Realism-II: Shading, shading models- diffuse reflection, specular reflection, ambient light, Shading surfaces- constant shading, gourmand shading, Phong shading, Shading enhancements, Shading Solids- Ray tracing for CSG, z- buffer algorithm for B-rep and CSG, octree encoded objects, Colouring- RGB, CMY, HSV, HSL colour models.

7 Hours

Unit - 8

Computer Animation: Introduction, Conventional animation-key frame, Inbetweening, Line testing, Painting, Filming, Computer animation- entertainment and engineering animation, Animation system hardware, software architecture, Animation types- frame buffer, colour table, zoom-pan-scroll, cross bar, real time play back, Animation techniques- key frame, skelton. Path of motion and p-curves.

6 Hours

Text Books:

1   **CAD/CAM-Theory and Practice,** Ibraham Zeid, McGraw Hill, 2006

2   **Mathematical Elements for Computer Graphics**, Rogoer's Adams, McGraw Hill. 1990

Reference Books:

Written by Administrator
Wednesday, 04 November 2009 07:57 -

1.   Computer Graphics, Xiang z, Plastock, R. A., Schaums outlines,   McGraw Hill. 2007.

2.   **Computer Graphics, principles and practice,** .Foley, Van- Damn, Finner and Hughes, Addison Wesley. 2000

3.   **Computer Graphics,** Sinha A. N., Udai A. D., Tata McGraw Hill, 2008.

4.   **Computer Graphics,** C Version- Doneld Heran, M. Pauline Baker, 2nd Edition, Pearson.

RAPID PROTOTYPING

Subject Code

:

06ME837

ELECTIVE-IV (GROUP D)

Written by Administrator
Wednesday, 04 November 2009 07:57 -

IA Marks

:

25

No. of Lecture Hrs./ Week

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Written by Administrator
Wednesday, 04 November 2009 07:57 -

Exam Marks

:

100

PART - A

Unit - 1

Introduction: Need for the compression in product development, history of RP systems, Survey of applications, Growth of RP industry, and classification of RP systems.

Stereo Lithography Systems: Principle, Process parameter, Process details, Data preparation, data files and machine details, Application.

7 Hours

Unit - 2

Selective Laser Sintering: Type of machine, Principle of operation, process parameters, Data preparation for SLS, Applications.

Fusion Deposition Modelling: Principle, Process parameter, Path generation, Applications.

7 Hours

Unit - 3

Solid Ground Curing: Principle of operation, Machine details, Applications. Laminated Object Manufacturing: Principle of operation, LOM
 materials. Process details, application.

6 Hours

Unit - 4

Concepts Modelers: Principle, Thermal jet printer, Sander's model market, 3-D printer. Genisys Xs printer HP system 5, object Quadra systems.

6 Hours

PART - B

Unit - 5

Rapid Tooling: Indirect Rapid tooling, Silicone rubber tooling, Aluminum filled epoxy tooling, Spray metal tooling, Cast kirksite, 3Q keltool, etc. Direct Rapid Tooling Direct. AIM.

6 Hours

Unit - 6

Rapid Tooling: Quick cast process, Copper polyamide, Rapid Tool, DMILS, Prometal, Sand casting tooling, Laminate tooling soft Tooling vs. hard tooling.

6 Hours

Unit - 7

Software for RP: STL files, Overview of Solid view, magics, imics, magic communicator, etc. Internet based software, Collaboration tools.

6 Hours

Unit - 8

Rapid Manufacturing Process Optimization: factors influencing accuracy. Data preparation errors, Part building errors, Error in finishing, influence of build orientation.

8 Hours

TEXT BOOKS:

   1. **Stereo Lithography and other RP &   M Technologies,**   Paul F. Jacobs: SME, NY 1996.
   2. **Rapid Manufacturing,** Flham D.T   & Dinjoy S.S Verlog London 2001.

Written by Administrator
Wednesday, 04 November 2009 07:57 -

REFERENCE BOOKS:

1. **Rapid Prototyping,** Terry Wohlers   Wohler's Report 2000" Wohler's Association 2000.
2. **Rapid Prototyping Materials,** Gurumurthi,   IISc Bangalore.
3. **Rapid Automated,** Lament wood. Indus press New York

FOUNDRY TECHNOLOGY

| Subject Code |

:

| 06ME838 |

| IA Marks |

Written by Administrator

Wednesday, 04 November 2009 07:57 -

:

25

No. of Lecture Hrs./ Week

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

Unit - 1

Foundry Metallurgy: Oxidation of liquid metals, gas dissolution in liquid metals, methods of degassing, fluidity, factors affecting fluidity, fluidity tests, hot tearing, shrinkage of liquid metals.

6 Hours

Unit - 2

Casting design: Introduction to casting design, redesign considerations, design for minimum casting stresses, design for directional solidification, design for metal flow, safety factors, design for low pattern cost and model making as an aid in design.

6 Hours

Unit - 3

Solidification of castings: Crystallization and development of cast structure - nucleation, growth and dendritic growth. Structure of castings - significance and practical control of cast structure, grain shape and orientation, grain size, refinement and modification of cast structure. Concept of progressive and directional solidification, solidification time and derivation of Chvorinov's equation, influence on mold characteristics and cast metal.

7 Hours

Unit - 4

Risering and Gating: Need for risering, general considerations of risering, riser shapes, riser size, and location. Requirements of a riser. Sand, insulating, and exothermic materials used for risers. Riser feeding distance and theory of risering. Internal chills, external chills, use of mould materials of different chill capacities, padding for directional solidification. Open type and blind

risers. Riser treatment using exothermic and insulating compounds. Gating system – theoretical consideration of gating, laws of fluid flow, turbulence in gating system, use of ceramic foam filters in gating, need for tapered sprue, gating ratio, simple problems.

7 Hours

PART - B

Unit - 5

Special Moulding Techniques: Principles, materials used, process details and application of no-bake sand systems, vacuum moulding, flaskless moulding, and high pressure moulding.

Cupola Melting: Developments in cupola melting – hot blast cupola, water cooled cupola, balanced blast cupola, cokeless cupola, cupola charge calculations.

7 Hours

Unit - 6

Ferrous Foundry: Melting procedures, casting characteristics, production, specification, and properties of some typical steels, grey cast iron, malleable iron, and spheroidal graphite cast iron castings.

7 Hours

Unit - 7

Non-Ferrous Foundry: Melting procedures, casting characteristics, production, specification, and properties of some typical aluminum, copper, and magnesium based alloy castings.

6 Hours

Unit - 8

Modernization and mechanization of foundry: Need for modernization, and mechanization,

moulding and core making,   melting, pouring, shake out equipment and fettling, dust and fume control, material handling equipments for sand moulds and   cor es, molten metal and

castings, reclamation of sands. Pollution control – norms, and agencies.

6 Hours

Text Books:

1.   **Principles of metal casting,** Heine Loper & Rosenthal TMH - 2005

2.   **Principle of Foundry Technology**, P. L. Jain, TMH – 2006.

Reference books:

1.   **Castings,** John Campbell, Second edition, Elseivier

2.   **Foundry Technology,** P. N. Rao

3.   **Manufacturing Process,** I, Dr. K. Radha Krishna 5th Edn. Sapna Book House,

Written by Administrator
Wednesday, 04 November 2009 07:57 -

Bangalore