



**INSTITUTE OF TECHNOLOGY  
GURU GHASIDAS VISHWAVIDHALAYA**

(A CENTRAL UNIVERSITY ESTABLISHED BY THE CENTRAL UNIVERSITY ORDINANCE 2009, NO:3 OF 2009)

**DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING  
STUDY & EVALUATION SCHEME**

**W.E.F. SESSION 2010-2011**

**Year: B.Tech. II year  
SEMESTER: III**

| S.N.                  | Course   | SUBJECT                                | PERIODS   |           |           | EVALUATION SCHEME   |     |            | Credits   |
|-----------------------|----------|--|-----------|-----------|-----------|---------------------|-----|------------|-----------|
|                       |          |  | L         | T         | P         | INTERNAL ASSESSMENT | ESE | SUB TOTAL  |           |
| <b>(THEORY )</b>      |          |  |           |           |           |                     |     |            |           |
| 1.                    | IPE-231  | Manufacturing Process                  | 4         | 0         | -         | 40                  | 60  | 100        | 4         |
| 2.                    | IPE-232  | Theory of Machine                      | 3         | 1         | -         | 40                  | 60  | 100        | 4         |
| 3.                    | IPE-233  | Strength of Materials                  | 3         | 1         | -         | 40                  | 60  | 100        | 4         |
| 4.                    | IPE-234  | Materials Science                      | 4         | 0         | -         | 40                  | 60  | 100        | 4         |
| 5.                    | IPE -235 | Metal cutting & Metal working Analysis | 3         | 1         | -         | 40                  | 60  | 100        | 4         |
| <b>Total</b>          |          |  | <b>17</b> | <b>03</b> |           |                     |     | <b>500</b> | <b>20</b> |
| <b>( PRACATICALS)</b> |          |  |           |           |           |                     |     |            |           |
| 6.                    | IPE-236  | Theory of Machine                      | -         | -         | 3         | 30                  | 20  | 50         | 2         |
| 7.                    | IPE- 237 | Strength of Materials                  | -         | -         | 3         | 30                  | 20  | 50         | 2         |
| 8.                    | IPE-238  | Metal cutting & Metal working Analysis | -         | -         | 2         | 30                  | 20  | 50         | 2         |
| <b>Total</b>          |          |  |           |           | <b>08</b> |                     |     | <b>150</b> | <b>06</b> |

Total Credits: 26

Total Contact Hour: 28

Total Marks: 650

INTERNALASSESSMENT-(MSE-Mid Semester Examination of 20 Marks, Class Test/Assignment/Quizzes/Group Discussion etc.)

**L-LECTURE,T-TUTORIAL,P-PRACTICAL,CT-CLASS TEST, E.S.E– END SEMESTERXAMINATION.**

| Category of Course                               | Course Code | Course Title          | Periods/Week |   |   |   | Theory Paper                                |
|--|-------------|-----------------------|--------------|---|---|---|---|
|  |             |                       | L            | T | P | C |   |
| Industrial & Production Engg.<br>B. TECH III Sem | IPE-231     | MANUFACTURING PROCESS | 3            | 1 | - | 4 | Max Marks-60<br>Min Marks-<br>Duration-3Hrs |

## IPE -231 MANUFACTURING PROCESS

### UNIT- I

**Welding:** Classification of welding process, basic principal & scope of application. Liquid & solid phase welding, source of heat in welding process Electrodes and types, metal inert gas (MIG), submerged arc welding, TIG welding.

### UNIT- II

**Foundry:** Moulding method and materials, sand-clay-water system, additives, pattern making and types, pattern allowances and design considerations, types of moulding sand and their properties, testing, cores boxes, core making, moulding machine.

### UNIT- III

**Casting:** Centrifugal and investment casting, shell, plastic and mould methods, melting of cast iron, element of gating system, types and design of riser, solidification of casting, casting defects, clearing of casting, principle of die casting, gravity and pressure die casting, Die casting consideration.

**Melting furnaces and practices:** Melting cast iron, steel and non ferrous material, cupola, charge calculation, open furnaces, converter and crucible furnaces, electric, direct arc furnace, inductive furnace.

### UNIT- IV

**Ferrous and Non Ferrous castings:** Steel casting, foundry practice for plain carbon steel, low alloy and high alloy steel, cast iron casting, foundry practice for grey, ductile and white cast iron and malleable iron, Non-ferrous casting, foundry practice for aluminum, copper etc.

### UNIT- V

**Mechanical working of metals:** Hot and cold working principle, classification of process, rolling principle, rolling load, roll passes, rolling stand arrangement, forging operations and their classification forging design and defects extrusion and types.

Injection, compression and blow moulding.

## Recommended Books:

1. Manufacturing Technology vol.1 , P.N. Rao, T.M.G.H. Publications
2. Manufacturing Science , Ghose and Mallick, , East West press
3. Material and process of Manufacturing, A.Lindberg Roy, PHI Publication

| Category of Course                               | Course Code | Course Title       | Periods/Week |   |   |   | Theory Paper                                |
|--|-------------|--------------------|--------------|---|---|---|---|
|  |             |                    | L            | T | P | C |   |
| Industrial & Production Engg.<br>B. TECH III Sem | IPE-232     | THEORY OF MACHINES | 3            | 1 | - | 4 | Max Marks-60<br>Min Marks-<br>Duration-3Hrs |

## IPE -232 THEORY OF MACHINES

### UNIT- I

**Mechanism and Machines:** Links, Kinematics pair, classification of kinematics pair, kinematics chain, degree of freedom & constrained motion, mechanism inversion, problem of slider crank mechanism & its inversion, four bar chain etc. ,equivalent linkage, mechanism with lower pairs, pantograph, devis & Ackerman's steering mechanism.

### UNIT- II

**Velocity and Acceleration in Mechanism:** plane motion, absolute and relative motion, velocity and acceleration of a point velocity and acceleration of a mechanism by relative velocity diagram, Klein's construction and coriolis components.

### UNIT- III Friction

**Clutch:** single plate and multi plate clutch, cone clutch.

**Breaks:** types and analysis by assuming uniform pressure and uniform ear theory, simple break, band brake, block brake and internal shoe break.

**Belt:** Transmission of power by belt-belt & flat belts, condition for maximum power transmission.

### UNIT- IV

**Gears and gears Train:** classification of gears, spur, helical, bevel, worm, gears, spur gear, conjugate action, law of gearing, involutes and cycloidal tooth's profiles, interface and under cutting, gear train, simple, compound and epicyclical gear trains.

## UNIT- V

**Cams and Followers:** Classification of cams and followers, types of follower motion-uniform, simple, harmonic, parabolic, cycloid, cams profile by graphical method.

**Governors:** Distinction between function of a flywheel and governor, types of governor, Walt, porter proell, hartnell governor.

### Recommended Books:

1. Mechanisms & machines by Ghosh and Mallick, East west Press
2. Theory of machine by Rattan lal T.M.G.H. Publications

| Category of Course                               | Course Code | Course Title         | Periods/Week |   |   |   | Theory Paper                                |
|--|-------------|----------------------|--------------|---|---|---|---|
|  |             |                      | L            | T | P | C |   |
| Industrial & Production Engg.<br>B. TECH III Sem | IPE-233     | STRENGTH OF MATERIAL | 3            | 1 | - | 4 | Max Marks-60<br>Min Marks-<br>Duration-3Hrs |

## ipe -233 STRENGTH OF MATERIAL

### UNIT- I

Mechanical properties of material such as ductility malleability, hardness, toughness, fatigue, creep etc., behavior of materials under tension, compression, bending & shear ductile brittle materials, failure steel & cast iron specimens to tension and torsion, residual stresses and contact stresses.

### UNIT-II

Shear force and bending moment diagram of beams.

Stresses in beam: Theory of bending, modulus of section, bending & shear stress in beams.

### UNIT-III

Slope and deflection of the beams, Macaulay method, area moments method.

Strain energy in tension, compression and shear, strain energy due to principal stresses, strain energy in bending.

## UNIT-IV

Torsion: Determination of shear stress & angle of twist of shaft of circular section, hollow shaft, shafts in series and parallel, open & closed coil springs, calculation of various parameters of springs column & struts, classification, Euler's formula for crippling load.

## UNIT-V

Thin & thick walled pressure vessels, cylindrical & spherical, stresses due to external & internal pressure, change in diameter & volume, compound cylinder & shrink fitting.

### Recommended Books:

1. Strength of materials Ryder, G.H.,
2. Elements of Strength of material Timoshenko, East West press
3. Mechanics of solids, Popove, PHI Publications

| Category of Course                               | Course Code | Course Title                    | Periods/Week |   |   |   | Theory Paper                                |
|--|-------------|---------------------------------|--------------|---|---|---|---|
|  |             |                                 | L            | T | P | C |   |
| Industrial & Production Engg.<br>B. TECH III Sem | IPE-234     | MATERIAL SCIENCE AND METALLURGY | 3            | 1 | - | 4 | Max Marks-60<br>Min Marks-<br>Duration-3Hrs |

### IPE -234 MATERIAL SCIENCE AND METALLURGY

#### UNIT-I Introduction

Classification of engineering materials, metals, non metals, plastic, ceramics and composites, crystalline structure of solid. Concept of unit cell and space lattice, miller indices, B.C.C., F.C.C. & H.C.P. structures, atomic packing factor, crystal structure determination by X-ray diffraction, crystal structure of ferrous and non ferrous metals, crystal imperfections in solids, slip twinning, role of dislocation, strain hardening, stress cracking.

#### UNIT-II Phase Diagrams

Phases, phase rules, concept of equilibrium, phase diagram, lever rule, eutectic eutectoid, peritectic and peritectoid systems, iron-carbon diagram and simplified IC diagram. TTT

diagram, Isothermal decomposition of austenite, Transformations of austenite upon continuous cooling.

### **UNIT-III Heat Treatment**

Annealing, normalizing, hardening, tempering, hardenability of steel, surface hardening, hardenability of steel, quenching, defect in heat treatment surface finish after heat treatment, recovery, re-crystallization and grain growth.

### **UNIT-IV**

**Corrosion**, principles of corrosion, forms of corrosion, factors affecting the rate of corrosion. Corrosive agents and protection, corrosion monitoring and measurement.

**Creep**: Introduction to creep mechanism, types, creep resistant materials powder metallurgy and its methods application.

### **UNIT-V**

Engineering materials.

Ferrous: cast irons, carbon and alloy steels and their coding.

**Non-ferrous**- classification, structure, general properties and applications of polymers, ceramics and composites.

### **Recommended Books:**

1. Raghavan. Material Science and engineering. PHI Publications.
2. Swamp elements of Metallurgy
3. Vanlack, elements of material Science and engineering
4. Aagarwal,B.K.Introduction to engineering Materials Tata McHill

| Category of Course                               | Course Code | Course Title                             | Periods/Week |   |   |   | Theory Paper                                |
|--|-------------|--|--------------|---|---|---|---|
|  |             |  | L            | T | P | C |   |
| Industrial & Production Engg.<br>B. TECH III Sem | IPE-235     | METAL CUTTING AND METAL WORKING ANALYSIS | 3            | 1 | - | 4 | Max Marks-60<br>Min Marks-<br>Duration-3Hrs |

## IPE -235 METAL CUTTING AND METAL WORKING ANALYSIS

**UNIT-I Geometry of cutting tools:** Classification of single point tool, tool nomenclature system, ASA system, orthogonal system, positive & negative rake tools, drill geometry, geometry of milling cutters.

**Principles of metal Cutting** Elements of machining, mechanics of chip formation forced on the chip, theories of mechanics of metal cutting, power & energy calculation, thermal aspects of machining, friction in metal cutting.

**UNIT-II Mechanics of Multipoint tools:** Milling cutters, ups and down milling forces in milling, power required in milling, forces & torque in drilling.

**Theory of machinability:** definition & evaluation of machinability tool life. Taylor's equation, types of tool failure, measurement of tool wear, factors influencing tool life & tool failure. Universal machinability index, economics of metal machining.

**UNIT-III Cutting Tool materials:** requirement of tool material, classification of tool material and their properties.

**Cutting fluids:** function requirements and types of cutting fluids, selection of cutting fluids and method of application of fluids.

**Broaching:** broach, cutting action of broach, broach operations and types & machines calculation of power consumption.

**UNIT-IV Metal working Analysis:** Deformation behavior of metals, type of metal working processes. Yield criteria Tresca and von mises criteria. Flow lines and plastics deformation of metal, slab analysis of sheet drawing, wire drawing axis-symmetric extrusion, forces analysis for strip rolling.

**UNIT-V Unconventional Machining Method:** Classification, Electro chemical machining(ECM),electric discharge machining(EDM), laser beam machining(LBM),Abrasive jet machining( AJM),electro chemical grinding( ECG),principles and applications of unconventional machining.

**Grinding:** characteristic of process, grinding wheel. Specification of wheel, economics of grinding, lapping, honing, super finishing, polishing & buffing, types of grinding process, center less & center type grinding.

**Recommended Books:**

1. Juneja B L Machining Process CBS Publications.
2. Rowe Industrial Manufacturing Process Arnold
3. Surendra Kumar Metal Forming LCUE
4. Pandey & Singh Modern Machine Process TMS
5. Pandey & Singh Production Engg. Science Standard Publishers.
6. Avitzur Metal Working TMH
7. G R Nagpal Machine Tool Engg.