

# CHHATTISGARH SWAMI VIVEKANANAD TECHNICAL UNIVERSITY, BHILAI

## DIPLOMA PROGRAMME IN MECHANICAL ENGINEERING

### Semester-III

#### COURSE OF STUDY AND SCHEME OF EXAMINATION

S. NO.	Board of Study	Subject Code	Subject	Periods / week (In Hours)			Scheme of Examination					Credit L+ (T+P)/2	
				L	T	P	Theory			Practical			Total Marks
							ESE	CT	TA	ESE	TA		
1.	Mechanical Engineering	237311 (37)	Machine Drawing	3	1	-	100	20	20	-	-	140	4
2.	Mechanical Engineering	237312 (37)	Strength of Materials	4	1	-	100	20	20	-	-	140	5
3.	Mechanical Engineering	237313 (37)	Thermal Engineering	4	1	-	100	20	20	-	-	140	5
4.	Electrical Engineering	237314 (24)	Basic Electrical & Electronics	3	1	-	100	20	20	-	-	140	4
5.	Mechanical Engineering	237315 (37)	Industrial Engineering	4	1	-	100	20	20	-	-	140	5
6.	Mechanical Engineering	237321 (37)	Machine Drawing Lab	-	-	4	-	-	-	50	25	75	2
7.	Mechanical Engineering	237322 (37)	Strength of Materials Lab	-	-	3	-	-	-	50	25	75	2
8.	Mechanical Engineering	237323 (37)	Thermal Engineering Lab	-	-	3	-	-	-	50	25	75	2
9.	Electrical Engineering	237324 (24)	Basic Electrical & Electronics Lab	-	-	3	-	-	-	50	25	75	2
<b>TOTAL</b>				<b>18</b>	<b>5</b>	<b>13</b>	<b>500</b>	<b>100</b>	<b>100</b>	<b>200</b>	<b>100</b>	<b>1000</b>	<b>31</b>

**L : Lecture hours, T : Tutorial hours, P : Practical hours,  
ESE : End of Semester Exam, CT: Class test, TA : Teacher's Assessment**

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI,  
CHHATTISGARH**

- A) SEMESTER : III  
 B) COURSE TITLE : MACHINE DRAWING  
 C) CODE : 237311 (37)  
 D) BRANCH/DISCIPLINE : MECHANICAL ENGINEERING  
 E) RATIONALE :

This course in mechanical drafting has been prepared with a view to developing elementary drafting skills in the students. Looking to the professional needs of the technicians, more emphasis has been given on the use of I.S. code of practice and reading and interpretation of drawings. The topics on multi-view representation, dimensioning and tolerance and sectional views of machine parts are included to build foundation for production drawing. The topic of pipe drafting will help the students to understand the importance and functions of piping system in Industry. Tracing and blue Printing will develop in them the skill of preserving important drawings.

Computer Graphics is a modern concept in Mechanical Drafting and knowledge of display technology, detailed drawing assembly and dimensional transfer scaling is considered essential for the technician's level

**F) TEACHING AND EXMINATION SCHEME:**

Course Code	Periods/Week (In Hours)			Scheme of Examination						Credit [L+(T+P)/2]
	L	T	P	Theory			Practical		Total Marks	
				ESE	CT	TA	ESE	TA		
237311 (37)	3	1	-	100	20	20	-	-	140	4
237321 (37)	-	-	4	-	-	-	50	25	75	2

**G) DISTRIBUTION OF MARKS AND HOURS:**

Chapter No.	Chapter Name	Hours	Marks
1	Projection and Multi-view Representation	08	15
2	Sectional Views	08	15
3	Dimensioning, Tolerancing, Machining & Welding Symbols	08	15
4	Production Drawing and Pipe Drafting	14	20
5	Gear Drawing	08	10
6	Reproduction and Preservation of Drawings, Graphs & Charts	08	10
7	Computer Graphics	10	15
	Total	64	100

## **H) DETAILED CONTENTS:**

### **Chapter – 1 : Projection and Multi-view Representation**

- ?? Projection, orthographic projection.
- ?? First and Third Angle Projection,
- ?? Superfluous view, choice of views, Auxiliary views-full and partial
- ?? Conversion of pictorial views into orthographic views
- ?? Conventional representation as per IS 696.

### **Chapter – 2 : Sectional Views**

- ?? Full section, half section, partial or broken section, revolved sections, removed section, offset section.
- ?? Sectioning conventions, section lines. Hatching Procedure for different materials as per IS code 689-1972.
- ?? Sectional views of assembled parts choosing from IC engine such as steam engine parts, valves, couplings, clutches, brackets, bearings etc. (use 1<sup>st</sup> and 3<sup>rd</sup> angle projections both.)

### **Chapter – 3 : Dimensioning, Tolerancing, Machining and Welding Symbols**

- ?? Types of dimension (size and location)
- ?? Dimensioning terms and notation (use of I.S. code 696 and 2709)
- ?? General rules for dimensioning and practical hints on dimensioning, systems of dimensioning
- ?? Dimensioning of cylinder, holes, arcs of circle, narrow space, angles, counter sunk hole, screw thread, taper etc.
- ?? Application of tolerances (use I.S. code 696), machining marks, finish marks, counter sunk, counter boring, spot facing and figures. Representation of characteristics machining (circularity, angularity etc.) (refer I.S. 696)
- ?? Representation of welding joints, welding symbols, tolerance of forms and position.
- ?? Procedure of drawing fits, limits, size, tolerance, etc.

### **Chapter – 4 : Production Drawing and Pipe Drafting**

- ?? Detailed drawing, Assembly drawing, scale, finish, tolerances, procedures, notes etc.
- ?? Title block, tool list, gauge list, style list, parts list zoning,
- ?? Preparation of production drawing for pattern shop, forging shop, machine shop
- ?? Preparation of assembly drawing from detailed drawing.
- ?? Exploded views, sectional pictorial views.
- ?? Assembly drawing of plummer block, flange coupling, stepped pulleys, foot step bearing, universal coupling, stuffing box, eccentric of steam engine, connecting rod, piston of I.C. engine, stop valves, feed check valves, dead weight safety valve for boiler, cross heads.
- ?? Preparation of detailed drawing from assembly drawings and assembled pictorial views, interpretation of production drawings.
- ?? Various symbols used in pipe line work as per IS code of practice, C.I. flanged joint, socket and spigot joint, gland and stuffing box, expansion joint, pipe fittings, typical pipe bends, pipe supports and accessories. Piping diagram for a small pump house.

## **Chapter – 5 : Gear Drawing**

- ?? Gear terminology such as pitch, pitch circle diameter, module, addendum, root circle diameter, hole depth, blank diameter etc.
- ?? Construction of cycloidal, involutes teeth-profiles
- ?? Pinion and rack meshing, spur gear meshing.

## **Chapter – 6 : Re-production and Preservation of Drawings, Graphs and Charts**

- ?? Tracing, Blue printing, Brown print, white print, ammonia printing, xerography, photographic reproduction, micro films.
- ?? Indexing, folding and codification methods. (Use IS code of practice 696 –1972)
- ?? Classification of charts, graphs and diagrams, Quantitative and qualitative charts and graphs. making titles, legends, notes etc.
- ?? Procedure for making a Graphical Representation in Ink.
- ?? Logarithmic Graphs, Semi logarithmic Graphs, Bar charts, Area (percentage) charts, Pie Chart, Polar charts, Trainer chart, Pictorial chart, Alignment charts (Nomographs)- Forms and construction, construction of functional scale, parallel scale charts for equations of the Form Three-scale alignment chart, Graphical construction of a z-chart, Four variable Relationship-parallel scale Alignment chart.

## **Chapter – 7 : Computer Graphics**

- ?? Introduction to computer graphics geometric modeling - Types of commands
- ?? Methods of Representing objects in geometric modeling.
- ?? Automatic Drafting-Generating hard copy engineering drawing direct form CAD base
- ?? Graphic features of CAD helpful in automatic drafting.
- ?? Graphic terminal and other hardware for computer graphics their function and use.
  - Types of graphic terminals.
  - Input devices – cursor control, input functions, digitizer, keyboard, terminals.
  - Plotters and other output devices - Familiar with a set of commands for generating simple orthographic views.

### **D) SUGGESTED INSTRUCTIONAL STRATEGIES:**

- ?? Extensive use of media like models, charts and actual working models
- ?? Enhance the student visualization power with the help of demonstration of three dimensional views
- ?? Arrange demonstration for effective use of CAD software for generating orthographic views
- ?? Arrange workshop/industrial visit showing the real jobs like spur gear, plumber block, flange coupling, stepped pulleys, foot step bearing, universal coupling, stuffing box, eccentric of steam engine, connecting rod, piston of I.C. engine, stop valves, feed check valves, dead weight safety valve for boiler etc.
- ?? Demonstrate one industrial production drawing to have a feel of actual industrial drawing.

## SUGGESTED LEARNING RESOURCES.

### Reference Books :

S.No.	Title	Author and Publisher
1.	Elements of Machine Drawing	N.D.Bhatt. Anand Charotkar
2.	Machine Drawing	R.K.Dhawan, S. Chand
3.	Fundamentals of Engineering Drawing	Warren J Luzadder (Prentice-Hall)
4	Mechanical Drawing	Giesecke, Mitchell Spicer, Hill (Collier Macmillan Internal Edition)
5	Engineering Graphics.	Giesecke/Mitchell/Spencer/Hill/Lo ving (Macmillan)

**COURSE TITLE : MACHINE DRAWING LAB**

**PRACTICAL CODE : 237321 (37)**

**TOTAL HOURS :64**

**LIST OF LAB. WORK**

Following shall be list of sheets to be prepared as machine drawing lab. work

- ?? One Sheet on multi view representation
- ?? Two sheets on sectional views of assembled parts on like I.C.engine parts and steam engine parts
- ?? One sheet on welding symbols
- ?? One sheet on dimensioning, limits and tolerancing
- ?? Two sheets on detailed drawing like drill jigs, fixtures, screw jack etc.
- ?? Two sheets on assembly drawing like flange coupling, stepped pulleys, foot step bearing, universal coupling, etc.
- ?? One sheet on Pipe joints and pipe fittings
- ?? Two sheet on production drawing from any of the following using CAD-
  - Hexagonal nut
  - Spur gear
  - Stepped pulley
  - Connecting rod
  - Stop valve
  - Stop valve
  - flange coupling
  - safety valve
  - Fly wheel(Show the following parameters in the above drawing – tolerance, surface finish, part number, machining sequences)

## CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

- A) SEMESTER : III  
 B) SUBJECT TITLE : STRENGTH OF MATERIALS  
 C) CODE : 237312 (37)  
 D) BRANCH/DISCIPLINE : MECHANICAL ENGINEERING  
 E) RATIONALE :

As a technician, it becomes very essential to understand the effects of loads on any part to predict about the strength, reliability and durability of a component. Machine parts are subjected to various types of loads resulting in development of stresses and strains. If, these stresses and strains are allowed to develop beyond the safe limit, the concerned part may fail. The technicians from Mechanical Engineering discipline are especially expected to know much about this subject so as to fulfill their job functions of design engineer efficiently. The knowledge is very essential for those who are engaged in Design, Maintenance, shop floor, Inspection, quality control and production departments. This course includes the study of behavior of Engineering materials and stresses produced due to various types of loading system.

**F) TEACHING AND EXAMINATION SCHEME:**

Course Code	Scheme of Examination								Total Marks	Credit [L+(T+P)]
	L	T	P	Theory			Practical			
				ESE	CT	TTA	ESE	PTA		
237312 (37)	4	1	-	100	20	20	-	-	140	5
237322 (37)	-	-	3	-	-	-	50	25	75	2

**G) DISTRIBUTION OF MARKS AND HOURS:**

Chapter No.	Chapter Name	Hours	Marks
1.	Simple Stresses and Strains	12	10
2.	Mechanical Properties & Testing of Materials	08	10
3.	Shear Force and Bending Moment	12	10
4.	Bending Stresses in Beams	08	10
5.	Shear Stresses in Beams	08	10
6.	Deflection of Beams	08	10
7.	Torsion of Shaft	06	10
8.	Springs	06	10
9.	Columns and Struts	06	10
10	Stresses in Frames, Thin Pressure Vessels	06	10
	<b>Total</b>	<b>80</b>	<b>100</b>

## **H) DETAILED COURSE CONTENTS:**

### **Chapter- 1: Simple Stresses and Strains:**

- ?? Introduction,
- ?? Types of loads and deformation,
- ?? Types of stresses and strains,
- ?? Hooke's law, stress-strain diagram for ferrous and non-ferrous materials,
- ?? Modulus of elasticity (E), Modulus of rigidity (G) and Bulk modulus (K) of materials,
- ?? Stresses in Bars of varying cross sections, composite sections,
- ?? Thermal stresses and strains, thermal stresses in composite sections,
- ?? Poisson's ratio, volumetric strain, Relation between E, G and K,
- ?? Strain energy, Resilience, Proof resilience, Modulus of resilience,
- ?? Suddenly applied loads and Impact loads.

### **Chapter – 2: Mechanical Properties and Testing of Materials:**

- ?? Definitions of various mechanical properties.
- ?? Necessity of testing of materials,
- ?? Different Types of tests - destructive and non-destructive tests.
- ?? Tensile test, Compression test, , Bending test, Shear test,
- ?? Hardness test, Impacts test, Fatigue test.

### **Chapter – 3: Shear Force & Bending Moment Diagrams:**

- ?? Definitions, types of loading, types of beams,
- ?? Shear force and bending moment, sign conventions,
- ?? S.F. and B.M. diagrams for Cantilever, Simply supported and subjected to
  - ?? Point loads,
  - ?? Uniformly distributed loads and
  - ?? Combination of these loads
- ?? Point of contraflexure, numerical problems on above.

### **Chapter – 4: Bending Stresses in Beams :**

- ?? Theory of simple bending, assumptions made in simple bending theory,
- ?? Position of Neutral axis and neutral surface, Moment of resistance,
- ?? Section Modulus of symmetrical sections such as rectangular, circular & I- sections,
- ?? Bending stresses in symmetrical section and simple problems,
- ?? Beam of uniform strength.

### **Chapter – 5: Shear Stresses in Beams :**

- ?? Introduction,
- ?? Shear stress equation, assumptions made,



- ?? Distribution of shear stresses over various sections, such as rectangular, circular, I, L & T sections,
- ?? Simple numerical problems.

### **Chapter – 6: Deflection of Beams:**

- ?? Introduction, Strength and Stiffness of a beam,
- ?? Curvature of a bent beam,
- ?? Derivation of equation for slope and deflections of beam in case of cantilever & simply supported beam loaded with point loads, UDL
- ?? Simple numerical problems,
- ?? Importance of deflection and practical applications.

### **Chapter – 7: Torsion of Shaft:**

- ?? Definition of torsion,
- ?? Relation between stress, strain and angle of twist, Assumptions made,
- ?? Strength of solid and hollow circular shafts, polar moment of inertia,
- ?? Calculation of shaft diameter on the basis of strength and stiffness for given power transmitted,
- ?? Torsional Rigidity, Maximum torque comparison of solid and hollow shaft,
- ?? Size of shaft for a given torque.

### **Chapter – 8: Springs:**

- ?? Definition, types and use of springs,
- ?? Spring classification based on size, shape and load- leaf spring, helical and spiral spring,
- ?? Stiffness of a spring and maximum Shear stress,
- ?? Deflection of spring.

### **Chapter – 9: Columns and Struts:**

- ?? Definition,
- ?? Crippling load, different end conditions, Slenderness ratio, equivalent length, radius of gyration,
- ?? Euler's theory, Limitation of Euler's formula,
- ?? Rankine's formula, Rankine constant, for different materials,
- ?? Simple problems & D.T.S. code for columns.

### **Chapter – 10: Stresses in Frames, Thin Pressure Vessels:**

- ?? Definition of frame, perfect, deficient and redundant frames,
- ?? Assumptions made in finding stresses in members,
- ?? Bows notation, solution of problems using these methods,
- ?? Cylindrical and spherical vessels subjected to internal pressure,
- ?? Hoop stress, longitudinal, Stress,
- ?? Volumetric strain, change in volume.

**D) SUGGESTED INSTRUCTIONAL STRATEGIES:**

**?? Lecture method**

- Teaching through models charts, transperancies.
- LCD Projectors.
- Video CD packages.

**?? Industrial visits**

- Visit to a nearby material testing lab..

**?? Experts Lecture**

- Through different field managers, engineers, site officers.

**?? Demonstration**

- Seminar on selected topics.
- Testing of various specimen
- Fractured specimen.

**J) SUGGESTED LEARNING RESOURCES:**

**(a) Reference Books**

<b>S.No.</b>	<b>Title</b>	<b>Author, Publisher, Edition &amp; Year</b>
1.	Strength of materials	B.C. Punamia
2.	Strength of materials	R.S. Khurmi
3.	Strength of materials	Sadhu Singh
4.	Strength of materials	K.D. Saxena
5.	Strength of materials	S. Ramamurutham
6.	Strength of materials	I.B. Prasad
7.	Strength of materials	Timoshenko & Young
8.	Laboratory Experiments in Strength of materials	B.P. Sharma.
9	Testing of Metallic materials by	Surya Narayan

**SUBJECT TITLE : STRENGTH OF MATERIALS LAB**

**PRACTICAL CODE: 237322 (37)**

**TOTAL HOURS: 48**

**LIST OF PRACTICALS / TUTORIALS:**

1. Study of Universal Testing Machine (UTM).
2. Study of Extensometer.
3. Study of Brinell & Rockwell hardness testers.
4. Study of Charpy & Izod Impact testing machines.
5. Tensile testing of mild steel using UTM.
6. Compression testing of C.I./wood on UTM.
7. Single shear & Double shear on Mild Steel bars using UTM
8. Hardness testing of Ferrous and Non-Ferrous metals.
9. Impact testing of Mild Steel, Cast Iron & Aluminium specimen.
10. Fatigue testing of material on Fatigue testing machine.

## CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

- A) SEMESTER : III  
 B) COURSE TITLE : THERMAL ENGINEERING  
 C) CODE : 237313 (37)  
 D) BRANCH/DISCIPLINE : MECHANICAL ENGINEERING  
 E) RATIONALE

Thermal Engineering incorporates the basic principles of thermodynamics and its application. These applications are important to mechanical engineers and have wide application in industries and power plants. It plays foundation for other important courses to be taught later to the Mechanical Engineering students. Its principles are used in the designing of energy converting devices such as Steam engines, Internal combustion engines, Steam and Gas turbines, Non-conventional energy resource, Air-conditioning, Heat transfer and Nuclear plants.

### F) TEACHING AND EXMINATION SCHEME:

Course Code	Periods/Week (In Hours)			Scheme of Examination						Credit [L+(T+P)/2]
	L	T	P	Theory			Practical		Total Marks	
				ESE	CT	TA	ESE	TA		
237313 (37)	4	1	-	100	20	20	-	-	140	5
237323 (37)	-	-	3	-	-	-	50	25	75	2

### G) DISTRIBUTION OF MARKS AND HOURS:

Chapter No.	Chapter Name	Hours	Marks
1	Dimensions and Basic Concepts of Thermodynamics	06	10
2	First Law of Thermodynamics.	10	10
3	Second Law of Thermodynamics.	10	10
4	Thermodynamic Cycles.	08	10
5	Two Phase System.	08	10
6	Steam Generators.	06	10
7	Steam Turbine.	08	10
8	I.C. Engines.	10	10
9	Air Compressors.	10	10
10	Heat Transfer.	04	10
	Total	80	100

## H) DETAILED CONTENTS:

### Chapter – 1 : Dimensions and Basic Concepts of Thermodynamics

- ?? Definition and importance of Thermodynamics
- ?? Thermodynamic system open, close and isolated system, Boundary and surroundings
- ?? Forms of energy.
- ?? Point and path functions
- ?? Properties of system, intensive and extensive properties, definition of work, Heat and work as energies in transitions
- ?? Thermal, mechanical, chemical and thermodynamic equilibrium
- ?? Zeroth law of Thermodynamic.
- ?? Quasi-static process, work done during Quasi-static process.
- ?? Definition of an ideal gas, gas law, characteristics, gas equation, specific and universal gas constant, specific heat at constant pressure and constant volume.

### Chapter – 2 : First Law of Thermodynamics

- ?? Concept of heat reservoir, Heat source and heat sink
- ?? Statement of first law-mathematical representation
- ?? Application of first law to open and closed system.
- ?? Concept of internal energy and its calculation, relationship between heat transfer, work transfer and change in internal Energy
- ?? Steady flow energy equation and its application to various units such as Boiler, Nozzle, Turbine, Compressor
- ?? Enthalpy.
- ?? Ideal gas processes-isobaric, isochoric, isothermal, adiabatic, polytropic, and throttling process as applied to open and close system, representation of these processes on P-V diagram and T-S diagram
- ?? Computation of net heat transfer and work done and enthalpy.

### Chapter – 3 : Second Law of Thermodynamics

- ?? Limitations of First law.
- ?? Statement of second law-Kelvin planck's and clausius Statements
- ?? Concept of heat pump, refrigerator and heat engine
- ?? Thermal Efficiency, Parameters affecting Thermal efficiency, Means of increasing efficiency
- ?? Equivalence of Kelvin Planck and clausius statements.
- ?? Thermodynamics reversible and irreversible processes. Factors that makes a process irreversible.
- ?? Reversible cycle, Carnot cycle, its efficiency and limitations, carnot theorem, clausius inequality, concept of Entropy, Principle of increase of entropy, determination of increase of entropy.
- ?? T-S and H-S diagrams computation of change in entropy.

## **Chapter – 4 : Thermodynamics Cycles**

- ?? Air-Standard cycles-definition and its purpose
- ?? Carnot, Otto, Diesel and Dual cycles their representation on P.V & T.S. diagrams.
- ?? Derivation of air standard efficiency and their comparison and limitation.

## **Chapter – 5 : Two Phase System**

- ?? Pure substance, phase, phase changes, steam as a two phase system, steam formation and its representation on the enthalpy plane, properties changes,
- ?? Representation of wet, dry and saturated and superheated steam on PV,T-S and h-s planes.
- ?? Dryness fraction of steam, methods of determination of dryness fraction-separating and throttling calorimeter.
- ?? Use of steam tables and Mollier's diagram.
- ?? Determination of change in properties such as entropy, enthalpy, internal energy and work and heat transfer in the following processes-Isobaric, Isochoric, Isothermal, Isentropic, Polytropic, Throttling etc.
- ?? Representation of various processes on p-v, T-s and H-s planes.
- ?? Rankine cycle-modified Rankine cycle – their representation on P.V., T.S. and H.S. planes
- ?? Derivation of Expression for thermal efficiency.

## **Chapter – 6 : Steam Generators**

- ?? Definition, classification
- ?? Working of Babcock and Wilcox boiler and Lancashire boiler
- ?? Mountings and accessories.

## **Chapter – 7 : Steam Turbine**

- ?? Classification, working principle
- ?? Difference between impulse and reaction turbine
- ?? Compounding of steam turbine, velocity diagram (introductory) and its use.
- ?? Governing of steam turbine.

## **Chapter – 8 : Internal Combustion Engines**

- ?? Introduction, classification
- ?? I.C. engine components and their function
- ?? Working of two-stroke and four stroke cycle engines and their comparison.
- ?? Indicator diagram, calculation of IHP, BHP, Thermal Efficiency, Mechanical efficiency and relative efficiency
- ?? Governing and lubrication of I.C. engines.

## **Chapter – 9 : Air Compressors**

- ?? Industrial uses of compressed air
- ?? Classification of compressors and their field of application
- ?? Description of reciprocating compressor
- ?? Work done in single stage reciprocating compressor
- ?? Volumetric, Isothermal and Isentropic efficiencies of reciprocating air compressor.
- ?? Advantages of isothermal compression.
- ?? Multistage compression and its advantages
- ?? Inter cooling necessity and advantages.

## **Chapter – 10 : Heat Transfer**

- ?? Modes of heat transfer
- ?? Fourier's law of heat conduction, temperature gradient
- ?? Expression for determination of heat transfer across a flat plate, thermal conductivity and thermal resistance
- ?? Newton's law for heat transfer by convection, Free and Forced Convection
- ?? Heat transfer by radiation, Stefan- Boltz man law of thermal radiation
- ?? Define the terms- absorptivity, refractivity and transmissivity, Black body, Emissive power, Grey body.

### **D) SUGGESTED INSTRUCTIONAL STRATEGIES**

- ?? Lecture Method.
- ?? Expert Lecture.
- ?? As far as possible concepts are to be visualized by extensive use of charts, models, transparencies etc.
- ?? More emphasis to be kept on practical/real life problem situation.
- ?? Field visit are to be arranged to observe and to identify and analyse the practical problems
- ?? Students are to be asked to do market survey and bring manufacturers specifications of various I.C. Engines, steam turbine, steam generator, air compressors etc.

## J) SUGGESTED LEARNING RESOURCES.

### Reference Books

S.No.	Title	Author and Publisher
1.	Thermal Engineering	P.L. Ballancy - Khanna Publisher's
2.	A Course in Thermodynamics and Heat Engines	Kothanandran, Khajuria and arrora.
3	Thermodynamics and heat Engines - Vol-I	R Yadav, Central Book Depot, Allahabad.
4	Thermal Engineering – Vol-I & II	R.K.Kapoor, Tata McGraw Hill
5.	Thermodynamics	V.M.Domkundwar, Dhanpat Rai & Sons
6	I.S. 2986 – 1966	BIS, New Delh
7	Engineering Thermodynamics	P.K.Nag, TMH
8	Thermodynamics (उष्मागतिक) In Hindi	Dr. Abhitab Dubey

**COURSE TITLE : THERMAL ENGINEERING LAB**

**PRACTICAL CODE : 237323 (37)**

**TOTAL HOURS : 48**

### LIST OF PRACTICALS / TUTORIALS:

- ?? Study of Lancashire boiler.
- ?? Study of Babcock & Wilcox boiler
- ?? Study of separating and throttling calorimeter.
- ?? Study of steam Turbine.
- ?? Study of different types of I.C. Engines (Four stroke and two Stroke Engine)
- ?? Study of various systems of I.C. engines.
  - Fuel supply system.
  - Cooling System.
  - Ignition system.
  - Governing system.
  - Lubrication system.
  
- ?? Study of
  - Fuel pump
  - Fuel Injector
  - Carburetor
- ?? Study of two stage reciprocating – air compressor.



## CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

- A) SEMESTER : III  
 B) COURSE TITLE : BAISC ELECTRICAL AND ELECTRONICS  
 C) CODE : 237314 (24)  
 D) BRANCH/DISCIPLINE : MECHANICAL ENGINEERING  
 E) RATIONALE :

A Mechanical Engineering Diploma in his job in industry has to interact with many electrical and electronics gadgets in operation of various machine tools and machine control system and basic knowledge about electrical and electronics engineering relevant to his job requirement of operation and maintenance in industry will give him a new confidence to perform his job efficiently.

### F) TEACHING AND EXMINATION SCHEME:

Course Code	Periods/Week (In Hours)			Scheme of Examination						Credit [L+(T+P)/2]
	L	T	P	Theory			Practical		Total Marks	
				ESE	CT	TA	ESE	TA		
237314 (24)	3	1	-	100	20	20	-	-	140	4
237324 (24)	-	-	3	-	-	-	50	25	75	2

### G) DISTRIBUTION OF MARKS AND HOURS:

Chapter No.	Chapter Name	Hours	Marks
1	D.C. Circuit	04	10
2	D.C. Machine	06	10
3	A.C. Circuit	08	10
4	Three Phase A.C. System	08	10
5	Transformer	08	10
6	Three Phase A.C. Machine	08	10
7	Single Phase Motors	06	10
8	Electrical Measuring Instruments	06	10
9	Semiconductor Devices	06	10
10	Rectifier and Filters	04	10
	Total	64	100

## **H) DETAILED CONTENTS:**

### **Chapter – 1 : D.C. Circuit**

- ?? Concept of Electrical Engineering – Electrical Phenomena and their causes, electrical current, potential and voltage
- ?? Methods of voltage generation, type of voltage and voltage measurement,
- ?? Types of current, effect of electric current, current measurement
- ?? Power resistance, D.C Circuit, Kirchhoffs' Law, Resistance law

### **Chapter – 2 : D.C. Machine**

- ?? Constructional feature of D.C Machine, Significance of e.m.f., and e.m.f. equation
- ?? Characteristics of D.C series and shunt motors, Application of D.C. motor
- ?? Method of speed control of D.C Motor
- ?? D.C. Motor starter and efficiency of D.C. Motor
- ?? D.C. Generators – Construction, working principle and types of D.C. Generators

### **Chapter – 3 : A.C. Fundamental**

- ?? A.C Circuit , A.C Circuit wave forms, Root Mean Square (RMS) value, Average Value, Power in A.C. Circuits and Power Factor
- ?? RLC in A.C Circuit-series R-L-C circuit, & parallel AC circuit.

### **Chapter – 4 : Three Phase A.C. System**

- ?? Three Phase /Star and Delta connection
- ?? Different types of AC supply
- ?? Different method for three phase power mmt., two watt meter method.

### **Chapter – 5 : Transformer**

- ?? Construction of Transformer, its working principle and types
- ?? Efficiency of transformer
- ?? Transformer ration and e.m.f. equation
- ?? Transformer Testing - Open circuit test and short circuit test

### **Chapter – 6 : Three phase A.C Machine**

- ?? Constructional Feature of Induction Motor
- ?? Types of induction motor - Cage type and slip ring type
- ?? 3 phase Slipping induction motor and its application
- ?? Alternator, Synchronous Motor - Constructional and their Working Principle

## Chapter – 7 : Single Phase Motor

- ?? Working principle and operation
- ?? Single Phase Capacitor Start, Capacitor run Motor, Shaded Pole Motor & Universal motor
- ?? Application of motors

## Chapter – 8 : Electrical Measuring Instruments

- ?? Working principle of moving iron and moving coil meter
- ?? Commonly used electrical measuring instruments (Ammeter, voltmeter, wattmeter and Energy meter) their working principle and constructional features
- ?? Dynamometer instruments.
- ?? Multi meter

## Chapter – 9 : Semi Conductor Devices

- ?? Semi conductor Device –pn junction, diode, transistor, SCR, and their application.
- ?? Amplifier action of transistor, S.C.R and its application.

## Chapter – 10 : Rectifier & filters

- ?? Controlled and uncontrolled rectification (H.W. F.W.), Bridge rectifier.
- ?? Filters and power supply.

### D) SUGGESTED INSTRUCTIONAL STRATEGIES:

- ?? **Lecture Method.**
- ?? **Demonstration.** The course shall be taught using the laboratory side by side. Underpinning laws and principles should be explained using working instruments. Special emphasis should be given on Laboratory experiments.
- ?? **Industrial visits;** Industrial/field visit are to be arranged to observe the applications of Transformer, Single & Three phase A.C. motors, Semiconductor devices, Rectifiers etc.. Students will be asked to measure current, voltage, power resistance energy speed etc. in different electrical machines.

### J) SUGGESTED LEARNING RESOURCES.

#### Reference Books

S.No.	Title	Author and Publisher
1.	Electrical Technology	B.L Therja
2	Electrical Technology	S.L Uppal, Khanna Publisher
3	Electrical measurement	J.BGupta Dhanpat Rai & Sons Publisher
4	Elementary electrical engineering	H. Pratab

5	Electrical Machine	S.K Bhattacharya ( Tata Mc Hill )
6	Basic electronics	S.K Bhattacharya ( Tata Mc Hill )
7	Electronic Devices	V.K. Mehta
8	Electrical Machines	Nagrath & Kothari

**COURSE TITLE : BAISC ELECTRICAL AND ELECTRONICS**

**PRACTICAL CODE : 237324 (28)**

**TOTAL HOURS : 48**

**LIST OF PRACTICALS / TUTORIALS:**

- ?? Study of D.C machine
- ?? Study of D.C motor Starters
- ?? Speed control of D.C motor by (i.) Shunt field Control (ii.) armature voltage control
- ?? Study of Induction Motor Slip ring and Cage type
- ?? Connection of various measuring instrument of the motor circuit and measure A,V&W (Current, Voltage, & Power)
- ?? Study of a H.W&F.W rectifier and measure input/output voltage with the help of multi meter
- ?? Use of multi meter to be encouraged in all practical use for measurement of Resistance, Current, Voltage in AC & DC circuit
- ?? Study of Various electronic component /device
- ?? Find out transformer ratio.
- ?? Verification of KCL
- ?? Verification of KVL
- ?? Perform open circuit Test & short circuit Test

## CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

- A) SEMESTER : III  
 B) SUBJECT TITLE : INDUSTRIAL ENGINEERING  
 C) CODE : 237315 (37)  
 D) BRANCH/DISCIPLINE : MECHANICAL ENGINEERING  
 E) RATIONALE :

Industrial Engineering is a subject, which can significantly contribute towards the cost saving and help in increasing the productivity of an industry. Adequate opportunities have been planned for the technician to apply theory to solve practical/simulated industrial problems. The course is kept with a view to appreciate the changes and alternation proposed by Industrial Engineering for shop floor-methods and processes.

### F) TEACHING AND EXAMINATION SCHEME:

Course Code	Teaching Scheme (Hrs./week)				Scheme of Examination						Credit [L+(T+P)] 2
	L	T	P	Total Hours	Theory			Practical		Total Marks	
					ESE	CT	TTA	ESE	PTA		
237315 (37)	4	1	-	-	100	20	20	-	-	140	5

### G) DISTRIBUTION OF MARKS AND HOURS:

Chapter No.	Chapter Name	Hours	Marks
1.	Productivity & Work Study	08	10
2.	Method Study	10	10
3.	Principles of Motion Economy & Micro-Motion Study	07	10
4.	Material Handling and Plant Layout	08	10
5.	Work Measurement	06	10
6.	Performance Rating and Work Sampling	08	10
7.	Job Evaluation, Wages and Incentives	08	10
8.	Statistical Quality Control	08	10
9.	Control Charts for Variables & Attributes	08	10
10.	Acceptance Sampling and Reliability	09	10
	Total	80	100

## **H) DETAILED COURSE CONTENTS:**

### **Chapter- 1: Productivity and Work Study:**

- ?? Definition of Industry and Industrial Engineering,
- ?? Scope and role of industrial engineering, fields of application,
- ?? Production and productivity,
- ?? Production systems and their impact on productivity, significance and benefits of higher productivity,
- ?? Long term and short term factors affecting productivity, Productivity cycle,
- ?? Aims, objectives and application of work study,
- ?? Basic procedure and techniques of work study,
- ?? Human factors in work study,
- ?? Role of manager, supervisor and workers,
- ?? Working conditions, environment of industry affecting work-study.

### **Chapter- 2: Method Study:**

- ?? Definition, objectives of method study,
- ?? Basic procedures & Recording techniques of method study,
- ?? Operation process chart, flow process chart, man-machine chart, Flow diagrams, String Diagrams, two hand process charts,
- ?? Questioning techniques procedure to develop, install and maintain new methods.

### **Chapter- 3: Principles of Motion Economy and Micro Motion Study:**

- ?? Meaning & basic rules of design of efficient work-place-layout,
- ?? Classification of human body movements and their preferred order,
- ?? Definition and objectives micro motion Study,
- ?? Techniques of micro motion Study,
- ?? Therbligs, their symbols & use,
- ?? SIMO Chart and its application.

### **Chapter- 4: Material Handling and Plant Layout:**

- ?? Importance and its effect on productivity,
- ?? Requirements of good material handling system
- ?? Classification and selection of material handling equipment,
- ?? Requirements of good layout, effect of bad layout,
- ?? Factors affecting plant layout,
- ?? Types of layout,
- ?? Advantages and limitations of each type of layout,
- ?? Selection of layout, factors affecting the plant location.

## **Chapter- 5: Work Measurement:**

- ?? Definition, basic procedure and techniques of work measurement,
- ?? Stop watch time study & its types,
- ?? Factors considered in selecting a job for time study,
- ?? Qualified and representative workers,
- ?? Procedure of stop watch time study,
- ?? Job element and their need of identification,
- ?? General rules for break down of job into elements,
- ?? Work cycle, methods of time measurement,

## **Chapter- 6: Performance Rating and Work Sampling**

- ?? Performance rating, its meaning, standard rating, Rating of operators,
- ?? Conditions for operators, Variation at work place, rating Scales, rating factors, calculation of basic time,
- ?? Allowances-Purpose & types,
- ?? Calculation of standard time using synthesis method- meaning, data, advantages and limitations,
- ?? PMTS- Definition, principle and use, calculation of standard time.
- ?? MTM- Meaning, tables and use, application of MTM analysis for LH-RH charts, Calculation of standard time,
- ?? WORK/ACTIVITY SAMPLING- Definition, statistical basis determination of number of observations for given accuracy, sources of error, Application and calculation of standard time.

## **Chapter- 7: Job Evaluation, Wages and Incentives:**

- ?? Definition, need and scope of job evaluation,
- ?? Job Evaluation systems and their comparative merits and demerits,
- ?? Wage- Definition & components,
- ?? Wage fixation, Real, Minimum and Fair wage,
- ?? Financial and non-financial incentives and their examples,
- ?? Wage plans-Halsey, Taylor, Differential plan, Gantt task and Bonus plan, 100% Premium plan.

## **Chapter- 8: Statistical Quality Control:**

- ?? Definition of quality and total quality,
- ?? Three stages of quality, quality control and SQC,
- ?? Difference between inspection and Quality control,
- ?? Concept of variability natural variation, its importance to quality control, classification of quality characteristics,
- ?? Basic tools of S.Q.C. and their applications,
- ?? Frequency distribution, measures of central tendency and dispersion, their need and calculations,
- ?? NORMAL CURVE: Definition, characteristics, calculation of area under normal curve and its applications,

- ?? Statistical tolerancing - their calculation and application,
- ?? Process capability-meaning, calculation and use.

### **Chapter- 9: Control Charts for Variables & Attributes:**

- ?? Statistical basic for control charts for variables,
- ?? Construction of X and R charts- their interpretation,
- ?? Use of X and R chart in establishment of process capability,
- ?? Limitation of X and R charts,
- ?? Meaning, use and advantages of attributes,
- ?? Calculation, Construction, interpretation & application of P, C & P<sup>0</sup> charts,
- ?? Need of calculating the revised values of mean, and control limits and their calculation.

### **Chapter- 10: Acceptance Sampling and Reliability:**

- ?? Meaning, different techniques of sampling,
- ?? Procedure involved, sampling, inspection -meaning and comparison with 100% inspection,
- ?? Factors affecting sampling and their effects,
- ?? Single and double sampling plans, use of IS codes.
- ?? O.C. Curve : Meaning, terms used, their definition, construction and use,
- ?? Selection of sampling plans,
- ?? Reliability: Definition, quality control and reliability,
- ?? Factors affecting reliability of product,
- ?? Measure to ensure reliability of a product,
- ?? Effect of product reliability marketing,
- ?? M.T.B.F. and M.T.T.F.<sub>2</sub> – Definition, programmed for reliability.

### **I) SUGGESTED INSTRUCTIONAL STRATEGIES:**

#### **?? Lecture method**

- Teaching through models charts, transparencies.
- LCD Projectors.
- Video CD packages.

#### **?? Industrial visits**

- Plant visits to observe above concepts.

#### **?? Experts Lecture** - Through different field managers, engineer, site officers

#### **?? Demonstration**

- Seminar on selected topics.

#### **?? Suggested List of Tutorials**



1. Preparation of flow process chart for existing and improved process.
2. Preparation of Man and Machine Chart for existing and improved process.
3. Preparation of L.H. and R.H. charts for existing and improved process.
4. Use of decimal minute watch.
5. Performance rating.
6. Establishing standard time for given operation using time study techniques.
7. Use of shewhart bowl and actual production for frequency distribution.
8. Preparation of X and R charts.
9. Preparation of p-charts and c-chart.
10. Proof of sampling techniques.
11. Acceptance sampling by attributes (single and double sampling plans).
12. Determination of the percentage utilization of equipments (work-sampling).

**J) SUGGESTED LEARNING RESOURCES:**

**(a) Reference Books**

<b>S.No.</b>	<b>Title</b>	<b>Author, Publisher, Edition &amp; Year</b>
1.	Introduction to Industrial Engineering	Phillip Hicks, McGraw Hills.
2.	Productivity means property	Asian Productivity Organization, Tokyo
3.	Introductive to work study	International labor office.
4.	Work study	M.D. Schmid & Subramaniam.
5.	Motion & time study	Ralph M. Barnes, John Willey, New York
6.	Work study	Dalela.
7.	Wage Administration	D.K. Roy, N.P.C. Pub.
8.	Quality Assurance Engineering	M.D. Schmid & Subramaniam
9.	S.Q.C.	E.L. Grant.
10.	S.Q.C.	R.C. Gupta.
11.	Industrial Engineering & management	O.P. Khanna.
12.	Industrial Engineering	Saxena.
13.	Material handling Equipment	N. Rudenki Place Pub.
14.	Learning package in Industrial Engineering	C.D.C., N.T.T.T.I. Bhopal
15.	Laboratory manual Industrial Engineering	C.D.C., N.T.T.T.I. Bhopal.