

# **SWAMI VIVEKANAND UNIVERSITY, SIRONJA, SAGAR (M.P.)**



## **SYLLABUS**

**For**

**Diploma in Mechanical Engg.  
Semester -V**

**Swami Vivekanand University, Sironja Sagar  
2014-2015**

PROGRAMME NAME :MECHANICAL ENGG(DIPLOMA)

Scheme of Studies and Examinations for :FIFTH SEMESTER

COURSE CODE	COURSE TITLE	PAPER CODE	THEORY COMPONENT							PRACTICAL COMPONENT						TOTAL CREDIT	TOTAL CREDIT	ALOF MARKS
			LECTURES	CONTINUOUS EVALUATION			END OF THE TERM/ SEMESTER EVALUATION			THEORY CREDIT Practical/Week	CONTINUOUS EVALUATION	END OF THE TERM/ SEMESTER EVALUATION						
				Hrs. Per Week	TERM WORK QUIZ,	MID TERM TEST (TWO)		THEORY PAPER				LAB. WORK QUIZ,	PRACTICAL / ORAL EXAMINATION (VIVA)					
			ASSIGNMENT			I	II	1	2	3	ASSIGNMENT		1	2	3			
DME501	PROCESS PLANNING ESTIMATING AND COSTING	04	10	10	10	01	70	3 hrs	04	04	20	01	30	3hrs	2	06	150	
DME502	MACHINE TOOL TECHNOLOGY	04	10	10	10	01	70	3 hrs	04	04	20	01	30	3hrs	2	06	150	
DME503	ENGINEERING MEASUREMENT AND MAINTENANCE PRACTICES	04	10	10	10	01	70	3 hrs	04	04	20	01	30	3hrs	2	06	150	
DME504	MODERN PRACTICES IN MANUFACTURING AND MANAGEMENT	04	10	10	10	01	70	3 hrs	04	04		01		3hrs	2	06	100	
DME 505	INDUSTRIAL ENGINEERING	04	10	10	10	01	70	3 hrs	04	04		01		3hrs			100	
DME506	PROFESSIONAL ACTIVITY (INDUSTRIAL TRAINING)										50						50	
Total			20	50	50	50		350		20	20	110		90		10	30	700

Theory Credits	: 20	Theory Marks	: 350
Practical Credits	: 10	Practical Marks	: 90
Total Credits	: 30	Quiz, Mid Term, Lab. Work	: 260
		Total	: 700

Minimum Pass Grade	(Theory & Practical 'D')
in	

## **ME-501 ROCESS PLANNING ESTIMATING AND COSTING**

**Introduction to Planning:** Process engineering, its scope and relation with product engineering and manufacturing, production system, types and characteristics.

**Selecting and Planning the Process of Manufacture:** Function, fundamental rules for the manufacturing process, basic design of product, influence of process engineering on product design, rechecking specifications, how materials selected affect process cost, using materials more economically, material cost balance sheet, eliminating operations, combined operations, selecting the process tooling, availability of equipment, make or buy decisions

**Determining the Manufacturing Sequence:** Operation, classifications and the manufacturing sequence, purpose of major process sequence.

**Operation Routing** - Routing uses, routing descriptions

**Elements of Costs and their Allocation :** Definition and objective of Estimating & costing, desirable conditions for a costing system, advantages of costing, elements of cost, , direct material cost, direct labour cost, direct expenses, prime cost overheads, indirect materials, indirect labour, indirect expenses administrative and selling expenses, analysis of total cost fixed cost and variable cost. Break even analysis.

**Depreciation:** Definition & Concept, causes of depreciation methods of depreciation calculation

**Profit:** Profit methods of increasing profit, effects of the methods on production, market and sales.

**Budget :** Definition, departmental budget and purpose of budgetary control.

**Overhead Allocation:** Definition and classification of overheads, methods of overheads allocation viz- direct material cost, direct labour cost, man hour rate and machine hour rate, selection of appropriate method limitation of various methods

**Actual Cost Estimation:** Process Materials and Manpower - Terminology associated with estimation, Calculation of volume, weight and cost of materials.

**Machine Shop:** Process, Materials and Man power - Terminology used in machine shop estimation, use of standard table to determine time elements for various machining processes, use of formulas to calculate actual machining time for different operations of machine tools, Calculation of production operation time per product per cycle, batch production time

**Foundry Shop:** Process, Materials and Man- power - Pattern cost, production time for casting, material cost of casting, moulding cost, batch production time

**Forging Shop:** Process, Materials and Man power - Forging gross and net weight of forging, forging losses, materials cost, labour cost and batch production cost.

**Welding shop-** process, materials and Man-power Gas and Arc. Welding terminology, production operation time, labour cost, materials cost, cost elements, batch production cost.

## REFERENCE BOOKS

- 1 Cost Control by G. R. Sharma. ( National Productivity Council)
- 2 Engineer' s Glude to Costing ( Institute of cost works Accounts )
- 3 Mechanical Estimating And Costing by T.R. Banga and & S. C. Sharma  
( Khanna Pub. )
- 4 Mechanical Estimation and Costing by R.L. Shrimali & P.C. Jain ( Jain Pub. House)
- 5 Mechanical Estimation And Costing ( Resource Persons of Hill Publishing Co. T.T.T.L, Madars Tata McGraw Hill )
- 6 Machine Shop Estimation by Nordoff .
- 7 Learing Packing In Costing And Estimating ( T.T.T.I. Bhopal Publication)
- 8 Process Engineering For Manufacturing By Eary and Johnson ( Prentice Hall)
- 9 Fundamentals of Process Engineering by Benjaman W. Nicbel, Alon & Ropy
- 10 Produce Design And Process Engineering ( McGraw Hill)
- 11 Yantriki Abhyantriki Abhikalpan ( Hindi) by K. D. Saxena. ( Deepak Prakashan, Morar, Gwalior ) .

## **ME502 MACHINE TOOL TECHNOLOGY**

**Introduction** : Concept of machine tool technology, needs, area of use etc

**Metal Cutting Theory** : Stages in cutting, factors affecting cutting, types of chips, built up edge ( BUE) formation conditions and effect upon surface finish, definition of cutting force, feed force, radial force with the help of merchant circle diagram. Power requirement for each type of force. Tool geometry and influence of tool angles, desirable properties of cutting tool materials and their influences on the choice of tool material.

Primary and secondary function of cutting fluids and properties of cutting fluids commonly used, types of cutting fluids. Cutting variables, tool wear and tool life. Taylor's tool life equation and cutting speed calculation. Economy of metal cutting.

**Lathe:** Basic difference between centre, turret and Capston lathes, constructional details and specification. working principles and features of mechanical hydraulic and electrical copying system, rate of production, skill requirement, accuracy and cost of production. Working principles and types of automatic lathes, work holding and tool holding and tooling used for Capston and turret lathes, operation planning and tool layout for

**Shaper, Drilling & Boring Machine.** Shaper- Construction, operation. application, Types of Drilling Machines, construction, operation and application, Horizontal and vertical boring machines constructional features, Jig boring machine, its construction, operation and application

**Milling Machines:** Define milling, Classification of milling machines, Principles, parts and their functions, types of table movement in universal milling machine, specifications of milling M/C. Conventional and climb milling, different milling operations and their application, milling cutters and tool angles, specification and cutter materials, use of arbor, collets and adapters machine attachments, methods of mounting the cutter, work holding devices, dividing heads. Direct, simple and differential indexing, selection of cutters, speed feed, procedure for setting up operations and inspections, maintenance of milling.

**Grinding Machines and Finishing processes** : Definition of grinding and cutting action in grinding, types of abrasive materials and their properties, binding materials, grinding wheel classification and standard marking system, conditions for selection of grinding wheels. Balancing of grinding wheels, glazing and loading, methods of dressing and tracing, Principles of working of grinding machines, types of grinding process, functions of tool and work holding devices, feed arrangement, table drive in surface and cylindrical grinders.

Types of lubricants and coolants used in grinding, grinding defects, their remedy and safety practices. Definition of honing, lapping, super finishing methods, equipments involved, Materials used, tolerances obtained and limitations, applications of honing and lapping processes.

**Special purpose Machines:** Difference between forming and generation of gears, principle of gear shaping, hobbing and shaving, rate of production accuracy and limitations. Thread production : thread rolling and thread milling. Broaching Machines : Definition of Broaching, types of broaches, broaching machines, advantages and limitations.

**Jigs and Fixtures :** Functions of Jigs and fixtures, 3-2-1 principle of location, Design criteria for simple jigs and fixtures

**Machine Tool Drives :** Requirements of machine tools, elements of machine tools and their purpose  
Drive Systems : Stepped and step less drives, advantages and limitations of the gear box drives, function of feed box, types of feed gear boxes, working and advantages. Principle of straight line motion, multihandle, single lever and pre-selective control system

## REFERENCE BOOKS

1. Workshop Technology Vol. I & II by Hajra Chaudhary, (Media Promoters & Publishers Pvt. Ltd. Mumbai)
2. Workshop Technology Vol. I , II and III by W.A.J. Chapman, ( ELBS )
3. Manufacturing Processes & Systems by Phillip F. Ostwald & Jairo Minoz (John Willey & Sons.)
4. Production Technology – HMT Handbook (HMT)
5. Production Technology by Jain Gupta, (Khanna Publishers, New Delhi )
6. Manufacturing Processes by Begeman Amstead, (Wiley.)
7. Manufacturing Processes by Rusinoff, (Tata McGraw Hill Publishing Co. Ltd.)
8. Advanced Manufacturing Technology by Kalpakjian ( Addison Wesley )
9. Manufacturing Technology – Metal Cutting & Machine Tools by P. N. Rao ( TMH).
10. Workshop Technology Vol. II by Bawa H. S. ( TMH ).
11. Manufacturing Science and Technology Vol. I & II. by Suresh Dalela (Umesh Publication).
12. Workshop Technology Vol. I and II by B. S. Raghuvanshi (Dhanpat Rai & Sons).
13. Production Technology by R. K. Jain (Khanna Publishers, Delhi ).
14. Vijayvargiya P.N."Machine Tool" Shilp Vigyan ( Hindi)

## **ME-503**

### **ENGINEERING MEASUREMENTS AND MAINTENANCE PRACTICES**

**Inspection:** Meaning and application of inspection, daily life examples of inspection, concept of inspection as applied in industries. Effect of absence of inspection in an industry. Classification of inspection, function, meaning and advantages of each concept of inspection applied to metrology. Definition & meaning of precision. accuracy and error, need of precision measurement in industry, relationship between cost and accuracy, Interchangeability and selective assembly.

**General Measurement Concept:** Limits, fits and tolerances, selection of fit, calculation of fundamental deviation, tolerance and limits, selection of limits, tolerances and allowances.

**Linear Measurement:** Standards of length, classification and use of slip gauges, wringing process , precautions to be observed while using slip gauges, classification of linear measuring instrument, direct and indirect, construction and working of vernier callipers, micrometers, vernier height gauge, dial vernier and dial height gauge, finding least count, precautions. Dial gauge-types, construction, principle, accuracy and precautions, comparators - principle, types, working and field of application of Mechanical, electrical, optical and pneumatic comparators.

**Angular Measurement:** Need of angular measurement , various instruments used. Methods of measurement and field of application of protractor, angle gauges, Sine bars, spirit levels, clinometers and angle dekkor.

**Straightness, Flatness, Squareness and Roundness Testing:** General concept straight edge method, light gap and feeler gauge method, wedge method, use of V- Block and dial indicator for checking roundness.

**Surface Roughness:** Definition of primary and secondary texture , CLA value, R.M.S value, Types of surface measuring instrument, Working principle of Tomlinson mechanical surface finish recorder .

**Screw Thread Measurement:** Types of screw threads, threads nomenclatures, errors in screw thread, equipment required for measuring pitch, effective diameter and angle- procedure, advantages, limitation and precautions of each method

**Limit Gauges:** Definition of gauge and gauging, necessity of gauging in industrial practice, types according to use (shop inspection and reference gauge), limit gauges for specific use - screw pitch gauge, template feeler gauge, working tolerance of gauges, maximum and minimum metal conditions to tolerance. Selection and specification as per IS 2251, 3455, 3484 Wear allowances and its selection for design, Taylor's principle for design of ' Go ' and ' No Go ' gauges . Calculation of gauge dimensions form formula given in IS 3455 and selection of parameters necessary for

**Transducers:** Meaning, function, primary and secondary transducers . Classification- mechanical electrical, active, passive . Comparison of electrical and mechanical transducers, Working principle and application of resistance type, inductance type, capacitance type and piezo electric type.

**Temperature measurement:** Principle on which temperature measuring devices work- example of each type. Comparison of resistance thermometer and thermister. Thermocouple- Principle, material, and working. Working principle of optical and radiation pyrometers.

**Introduction to Plant Maintenance:** Introduction to maintenance, its need and scope, functions of the maintenance department. Different maintenance practices, procedure of corrective or break down maintenance, scheduled maintenance, preventive maintenance and predictive maintenance, methods of keeping records for condition of equipment, maintenance and replacement of parts, standard data for maintenance form, time standards ( time to complete the maintenance job).

**Fault Tracing:-** Trouble Shooting and Remedies, Sequence of activities in fault finding, methods and procedures of repair, various measures to prevent repetition of similar faults. Various remedial actions.

**Maintenance Cost:** Definition, classification, Kelvin graph, procedures for obtaining cost data, maintenance cost control.

**Wear and its effect:** Definition of wear and types of wear, causes of wear, effects of wear on performance, wear reduction and component replacement.

**Lubrication and Lubricating Systems:** Need, properties of lubricant, selection criteria, principle of lubrication, centralized and decentralized lubrication systems, boundary, layer and hydrodynamic lubrication, use of greases and oil. Methods of preserving lubricants, handling of lubricants.

## REFERENCE BOOKS

1. Engineering Metrology. by R.K. Jain ( Khanna Pub. Delhi)
2. Engineering Metrology. by I.C. Gupta (DANPAT RAI & SONS)
3. Inspection & Gauging by Kennedy ( The Industrial Press, 93, Wortinstreet, New york)
4. Engineering Metrology by K.J. Hume. ( Macdonald & Co. Ltd. London)
5. Practical Metrology by K.J. Hume . ( Macdonald & Co. Ltd. London)
6. Hand book of Industrial Metrology by R.S.T.M.E. ( Prentice Hall of India)  
a. .Metrology & Gauging S.A.J. Parsons. . ( Macdonald & Erass . Ltd. London) .
7. Industrial Instrumentation by D.P. Eckman ( Wiley Easter Ltd. New Delhi)
8. Measurement Techniques in Mechanical Engineering by R.J. Sweeny  
i. ( jon wiley & Sons, New York Addson Wesley Pub. London)
9. Mechanical Measurement by Becjwith Buck ( Addson Wesley Pub. London)
10. Instruments For Measurement Control by W.G. Holzbock ( Rainold Pub. Co-operation )
11. Mechanical & Industrial Measurement R.K. Jain ( Khanna Publishers New Delhi)
12. IS Code: 2986, 5979, 5876, 5939
13. Maap Vigyan Avum Yantrikaran ( Hindi) by Yogendra Varshneya. ( Deepak Prakashan, Morar,Gwalior)
14. Industrial maintenance – H.P. Garg (S. CHAND & Company Ltd )
15. Accident Prevention Manual For industrial Operations by Frank E. McElroy, P.E., C.S.P.



**ME 504 MODERN PRACTICES IN MANUFACTURING AND MANAGEMENT**

**Unconventional Machining Methods:** Limitations of conventional machining. Working Principle, operating parameters and application of unconventional machining. Electro Chemical Machining, Chemical Machining, Electric Discharge Machining, Electron beam Machining, Ultra Sonic Machining, Abrasive Jet Machining, LASER Beam Machining, Plasma Arc Machining.

**Coating & Deposition processes:** plating & related processes, physical vapor deposition, chemical vapor deposition, Organic Coating,

**Rapid Prototyping:** Need, Fundamentals, Technologies and applications.

**Manufacturing Automation:** Introduction to Numerical control, Computer Numerical control, Direct Numerical Control, CNC Millings M/c, CNC Turning M/c, Turn mill centers, flexible manufacturing system, Preliminary idea of robotics. Introduction to G and M code as used in part programming. Use of Canned cycles. Simulation of parts, drawing generated through CAD, its modeling and transfer

**Flexible Manufacturing systems:** Elements, Limitations, Feature & Characteristics, New development.

**Robotics:** Introduction to robotics, concept, and application, A4 level automation

Total Quality Management (TQM)-Evolution, definition, preparation stages in TQM implementation, Integrated TQM model, costumer satisfaction, Employee involvement. Continuous Process Improvement, 5s, Kaizen, and KANBAN, Supplier Partnership, Performance Measures. Just in Time systems (JIT) – Introduction, application and advantages

Total Productive Maintenance (TPM)- Introduction, Plan, New Philosophy Improvement needs, Six Major losses Life cycle costing, work groups.

Six Sigma systems: Basics of Six Sigma, competitive advantage of implementing six sigma systems. Briefs of what, why and how six sigma works to initiate and sustain greater productivity, profitability and customer satisfaction rates.

**REFERENCE BOOKS**

1. Fundamentals of Manufacturing processes , G. K. Lal & S. K. Choudhary, Narosa Publishing House.
2. A Text book of production Technology (Manufacturing Processes) by P.C. Sharma, S. Chand & Co.
3. Manufacturing Technology Vol. II By P.N. Rao, Tata McGraw Hill Publishing Co.
4. Fundamentals of Modern Manufacturing By Mikell P. Groover, Wiley Student Edition.
5. Quality Management By Donna C.S. Summers Pearson Prentice Hall
6. Total Quality Management By L. Sugandhi & Anand A. Samuel Prentice Hall of India Pvt. Ltd.

## **ME-505 INDUSTRIAL ENGINEERING**

**Introduction:** Definition of industry and industrial engineering, scope and role of industrial engineering fields of applications.

**Productivity:** Production and productivity, production systems and their impact on productivity, its significance and benefits of higher productivity. Long term and short term factors affecting productivity, productivity cycle.

**Work Study:** Introduction, its relation with productivity 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.

**Method Study:** Definition objectives, basic procedures of methods study. Recording techniques, operation process chart, flow process chart, machine chart, flow diagrams, string diagrams, two hand process charts, questioning technique procedure to develop, install and maintain new methods.

**Principles of Motion Economy:** Meaning, basic rules design of efficient work place- layout, classification of human body movements and their preferred order.

**Material Handling and Plant Layout :** Importance and its effects 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.

**Micro Motion Study:** Definition and objectives, techniques of micromotion study, therbligs and their symbols, use of therbligs, SIMO chart and its application.

**Work Measurement:** Definition, Basic procedure and technique to work measurement. Stop watch time study, types of stop watch study, 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, 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 synthesis method- meaning, data, complication, advantages and limitations.

**PMTS-** Definition principle and use, calculation of standard time.

**MIM -** Meaning, tables and use. Application of MIM analysis for LH-RH charts, calculation of standard time.

**Work/ Activity Sampling:** Definition, statistical basics, determination of number of observation for given accuracy, sources of error, application and calculation of standard time.

**MOST Technique for work measurement:** Definition of terms, concept of the MOST, Basic MOST sequence models, Time Units, Parameter Indexing, Method Accuracy and Sensitivity, Levels of Work Measurement, Compatibility of MOST systems, Application of MOST

**Job Evaluation, Wages and Incentives:** Definition, need and scope of job evaluation. Job evaluation systems and their comparative merits and demerits and limitations.

**Wage:** Definition, wage 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.

**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 SQC and their application, frequency distribution, measures of central tendency and dispersion, their need and calculations.

Normal Curve : Definition, characteristics, calculation of area under normal curve and its application, statistical tolerance their calculation and application. Process capability meaning calculation and use.

**Control Charts for Variables:** 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.

**Control Charts for Attributes:** Limitation of X and R charts, Meaning and use of attributes, their advantages, Calculation, construction, interpretation and application of p- chart, c- chart, ph-chart. Need of calculating the revised values of mean, and control limits and their calculation.

**Acceptance Sampling:** Meaning different techniques 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. Curves : Meaning, terms used, their definition, construction and use of O.C. curves. Selection of sampling plans.

**Reliability:** Definition quality control and reliability factors affecting reliability of product. Measures to ensure reliability of product, effect of product reliability marketing.

M.T.B.F and M.T.T.F. Definition programme for reliability. Maintainability and availability

## REFERENCE BOOKS

- 1 Introduction To Industrial Engineering by Philip Hicks ( McGraw Hills)
- 2 Productivity Means Property ( Asian Productivity Organisation, Tokyo)
- 3 Introduction To Work Study ( International Labour Office)
- 4 Work Study by M.D. Schmid & Subrammaniam
- 5 Motion and Time Study by Ralph M. Barnes John Willey New York
- 6 Work Study by Dalela.

- 7** Wage Administration by D.K. Roy. ( N.P.C. Publication).
- 8** Quality Assurance Engineering by M.D. Schmid & Subramaniam.
- 9** S.Q.C. by E.L.Grant.
- 10** S.Q.C. by R.C. Gupta.
- 11** Industrial Engineering & Management by O. P. Khanna.
- 12** Industrial Engineering by Saxena.
- 13** MOST Work Measurement Systems, Kjell B. Zandin, Marcel Dekkar Inc. New York
- 14** Material Handling Equipment ( N. Rudenki Place Pub)
- 15** Learning Package In Industrial Engineering by O.D.C. , T.T.T.I Bhopal .
- 16** Laboratory Manual Industrial Engineering by O.D.C. , T.T.T.I Bhopal .
- 17** Audyogiki Abhiyantran ( Hindi) by J.C. Varshneya. ( Deepak Prakashan, Gwalior)
- 18** Audyogik Engineering ( Hindi) by K.D. Saxena . ( Deepak Prakashan, Gwalior)