



RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

SCHEME: JUL. 2008

COURSE CODE: 501

COMMON WITH PROGRAMMES:

NAME OF THE COURSE: PROCESS PLANNING

ESTIMATING

PAPER CODE:

AND COSTING

RATIONALE

An engineer is supposed not only to design and produce a product in any industry, but also to give weight age for the economic factors. Knowledge of different manufacturing process only may not fulfil the need in field, but also to select the best process suiting to the technical and economic requirement of situation along with the right type of process selection. Estimation of material and manpower requirement and factors affecting the cost of production are other areas which are quite important from the production point of view. The curriculum of this course of process planning, estimating and costing has been designed to take care of these requirements.



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ESTIMATING

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AND COSTING

SCHEME OF STUDIES

Lectures: 04 Hrs. per Week

S. No	Topics	Theory Hrs	Practical Hrs	Total Hrs
(a) Process Planning				
1	Introduction to planning.	02	-	02
2	Selecting and Planning the Process of Manufacture	04	-	04
3	Determining the Manufacturing Sequence	06	-	06
4	Operation Routing	03	-	03
(b) Estimating and Costing				
1	Elements of costs and their allocation	06	-	06
2	Depreciation	04	-	04
3	Profit	01	-	01
4	Budget	01	-	01
5	Overhead allocation	04	-	04
6	Actual cost estimation	03	-	03
7	Machine shop	08	-	08
8	Welding shop.	05	-	05
9	Forging shop:.	05	-	05
10	Foundry shop	05	-	05
11	Sheet metal shop estimation.	03	-	03
	Total	60	-	60



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Lectures: 04 Hrs. per Week

(A) PROCESS PLANNING		
S.NO	CONTENT	STUDY Hrs.
1	Introduction to Planning: Process engineering, its scope and relation with product engineering and manufacturing, production system, types and characteristics.	02
2	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.	04
3	Determining the Manufacturing Sequence: Operation, classifications and the manufacturing sequence, purpose of major process sequence.	06
4	Operation Routing - Routing uses, routing descriptions.	03



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S.NO	CONTENT	STUDY Hrs
1	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.	04
2	Depreciation: Definition & Concept, causes of depreciation methods of depreciation calculation.	01
3	Profit: Profit methods of increasing profit, effects of the methods on production, market and sales.	01
4	Budget : Definition, departmental budget and purpose of budgetary control.	04
5	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.	03
6	Actual Cost Estimation: Process Materials and Manpower - Terminology associated with estimation, Calculation of volume, weight and cost of materials.	08
7	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,	05



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NAME OF THE COURSE: **PROCESS PLANNING**

**ESTIMATING
AND COSTING**

PAPER CODE:

Lectures: 04 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
8	Welding shop- process, materials and Man-power Gas and Arc. Welding terminology, production operation time, labour cost, materials cost, cost elements, batch production cost.	05
9	Forging Shop: Process, Materials and Man power - Forging gross and net weight of forging, forging losses, materials cost, labour cost and batch production cost.	05
10	Foundry Shop: Process, Materials and Man- power - Pattern cost, production time for casting, material cost of casting, moulding cost, batch production time.	05
11	Sheet Metal Shop Estimation: Sheet Metal shop labour cost, materials cost, production time in piece work.	03



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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** Learning 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 Abhiyantriki Abhikalpan (Hindi) by K. D. Saxena. (Deepak Prakashan, Morar,
Gwalior) .



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SEMESTER: FIFTH SEMESTER

SCHEME: JUL. 2008

COURSE CODE: 502

COMMON WITH PROGRAMMES:

NAME OF THE COURSE: MACHINE TOOL

TECHNOLOGY

PAPER CODE:

RATIONALE

The course "Machine Tool Technology" is of vital importance to practicing of exposing technicians. The course not only gives the opportunity of exposing the fundamentals, but also the latest developments. The focus has been cast to improve effectiveness of the course by introducing various industrial applications.

The accent at technical level should be upon practical and demonstration. Indeed equal emphasis has been placed on this by allocating most of the available time for this course to the practical in the workshop. The study of this course will enable the students to acquire the capability of solving complex problems in the field of manufacturing.



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SEMESTER: **FIFTH SEMESTER**

SCHEME: **JUL. 2008**

COURSE CODE: **502**

COMMON WITH PROGRAMMES:

NAME OF THE COURSE: **MACHINE TOOL**

TECHNOLOGY PAPER CODE:

SCHEME OF STUDIES

Lectures: 03 Hrs. per Week

Practical: 04 Hrs. per Week

S.No	Topics	Theory Hrs	Practical Hrs	Total Hrs.
1	Introduction	02	-	02
2	Metal cutting Theory	06	09	15
3	Lathe.	06	12	15
4	Shaper, Drilling & Boring Machine	06	09	15
5	Milling Machines.	03	09	12
6	Grinding Machines and finishing processes.	04	09	13
7	Special purpose Machines.	06	06	12
8	Jig and Fixtures.	06	-	06
9	Machine Tool Drives.	04	06	13
10	Plastic Moulding	02	-	02
	Total	45	60	105



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COURSE CODE: 502

COMMON WITH PROGRAMMES:

NAME OF THE COURSE: MACHINE TOOL

TECHNOLOGY PAPER CODE:

Lectures: 03 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
1	Introduction : Concept of machine tool technology, needs, area of use etc.	02
2	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.	06
3	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 internal, external threading.	06
4	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.	06



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COMMON WITH PROGRAMMES:

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TECHNOLOGY PAPER CODE:

Lectures: 03 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
5	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.	03
6	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.	04
7	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.	06



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TECHNOLOGY PAPER CODE:

Lectures: 03 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
8	Jigs and Fixtures : Functions of Jigs and fixtures, 3-2-1 principle of location, Design criteria for simple jigs and fixtures	06
9	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	04
10	Plastic Moulding : Types of plastic, Compression moulding, Transfer moulding , Injection moulding, Blow moulding, Vacuum forming, Extrusion	02



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COMMON WITH PROGRAMMES:

NAME OF THE COURSE: **MACHINE TOOL**

TECHNOLOGY PAPER CODE:

LIST OF EXPERIMENTS

Practical: 04 Hrs. per Week

S.No.	EXPERIMENT	PRACT. Hrs.
1	Demonstration of formation of chips on a lathe, continuous, discontinuous and fractured by changing variables like rake angle, speed feed and depth of cut.	03
2	Demonstration of built up edge on the finished tool point by changing speed and depth of cut while machining on a mild steel bar.	03
3	Measuring of angles of a single point tool with reference to main plane with the aid of tin templates.	03
4	Grinding of single point (H.S.S.) tools.	03
5	Demonstration of preparing soluble oil cutting fluid and its use for improving the surface.	03
6	Practice of taper turning and screw cutting on a centre lathe.	03
7	Practice of making the pins or rivets of any size on a capstan lathe.	03
8	Demonstration of making a flanged bush on a capstan lathe including setting.	03
9	Practice of drilling, boring and reaming on a lathe.	03
10	Practice of mounting cutters on the milling m/c and setting of m/s.	03
11	Practice of up milling and down milling operation.	03
12	Practice of cutting the spur gear on milling machine.	03
13	Practice on a shaper square block on a shaper and milling machine (Comparison of surface produced).	03



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TECHNOLOGY PAPER CODE:

LIST OF EXPERIMENTS

Practical: 04 Hrs. per Week

S.No.	EXPERIMENT	PRACT. Hrs.
14	Surface grinding or tapping on a flat surface.	03
15	Practice of cutting a helical gear on a milling m/c.	03
16	Performance test of a lathe by making a long mandrel.	03
17	Study of special purpose machines using web aid	06
18	Study of different machine tool drive using physical machines and web aid	06



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COMMON WITH PROGRAMMES:

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TECHNOLOGY PAPER CODE:

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)
(Deepak Prakashan, Morar Gwalior .)



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SEMESTER: FIFTH SEMESTER

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COURSE CODE: 503

COMMON WITH PROGRAMMES:

NAME OF THE COURSE: ENGINEERING

**MEASUREMENTS PAPER CODE:
AND MAINTENANCE
PRACTICES**

RATIONALE

This subject has earned its importance in the curriculum due to major activities of inspection department. Now a days in almost all factories search is going on for answer to the problems of production materials, design, improved machines, better way of making and assembling parts. Many of these answers are provided by Metrology through accuracy in production high standards of inspection, new and improved use of instrument etc. Metrology therefore is a fast growing, changing and increasingly significance field.

The other part of this subject is maintenance practices. Maintenance of machines prolongs their life as well as their performance. Well maintained machines minimize the breakdowns and production held-ups, thus help in achieving the production targets.

After going through this subject the students would be able to select a most appropriate instrument and make its use for particular application and also be able to maintain the production machines in healthy condition.



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SEMESTER: **FIFTH SEMESTER**

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COURSE CODE: **503**

COMMON WITH PROGRAMMES:

NAME OF THE COURSE: **ENGINEERING**

**MEASUREMENTS PAPER CODE:
AND MAINTENANCE
PRACTICES**

SCHEME OF STUDIES

Lectures: 04 Hrs. per Week

Practical: 04 Hrs. per Week

SNo	Topics	Theory Hrs	Practical Hrs	Total Hrs.
1	Inspection	03	03	06
2	General measurement concept	04	06	10
3	Linear measurement	05	06	11
4	Angular measurement.	05	06	11
5	Straightness, flatness, squareness and roundness testing.	04	04	08
6	Surface roughness.	05	04	09
7	Screw thread measurement.	04	04	08
8	Limit gauges	06	06	12
9	Transducers	04	04	08
10	Temperature measurement	04	04	08
11	Introduction to plant maintenance	03	-	03
12	Fault tracing	03	04	07
13	Maintenance cost	02	-	02
14	Wear and its effects	04	04	08
15	Lubrication and lubricating systems	04	05	09
Total		60	60	120



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COMMON WITH PROGRAMMES:

NAME OF THE COURSE: ENGINEERING

MEASUREMENTS PAPER CODE:
AND MAINTENANCE
PRACTICES

Lectures: 04 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
1	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.	06
2	General Measurement Concept: Limits, fits and tolerances, selection of fit, calculation of fundamental deviation, tolerance and limits, selection of limits, tolerances and allowances.	10
3	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.	11
4	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.	11
5	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.	08



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PRACTICES

Lectures: 04 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
6	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 .	07
7	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	06
8	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 calculation.	10
9	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.	06
10	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.	06



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Lectures: 04 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
11	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).	03
12	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.	05
13	Maintenance Cost: Definition, classification, Kelvin graph, procedures for obtaining cost data, maintenance cost control.	02
14	Wear and its effect: Definition of wear and types of wear, causes of wear, effects of wear on performance, wear reduction and component replacement.	06
15	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.	08



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LIST OF EXPERIMENTS

Practical: 04 Hrs. per Week

S.No.	EXPERIMENT	PRACT. Hrs.
1	Study of application of various types of instruction.	01
2	Study of different type of fits with their practical application	01
3	Study of Indian standards IS: 919 recommended for limit and fits.	02
4	Demonstration of selective assembly.	02
5	Demonstration of concept of interchangeability using different objects.	02
6	Measurement of diameter, length, thickness etc. Using different calipers and steel rule.	04
7	Measurement of various parameters of different objects using vernier caliper & Micro-meter .	04
8	Measurement of various parameters of different objects using combination set.	03
9	Build up gauge blocks to produce different dimensions.	02
10	Measure different angles using vernier protractor .	02
11	Measure of unknown angle with the help of a sine bar and a slip gauge set.	02
12	Measure different angles using angle gauges.	01
13	Check for flatness, and parallelism of an object using a dial indicator and surface plate.	04



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LIST OF EXPERIMENTS

Practical: 04 Hrs. per Week

S.No.	EXPERIMENT	PRACT. Hrs.
14	Check for roundness of an object using a dial indicator and a V-block.	02
15	Examine the surface texture of the machined surface by a microscope.	02
16	Examine the surface roughness of a machined surface using Tomlinson surface meter .	02
17	Use of plug and ring gauges for checking holes and shafts.	02
18	Demonstration and explanation of different types of transducers.	02
19	Study of different types of pyrometers.	03
20	Visit of large/ medium/small scale industries for collecting the information regarding various measurement techniques and instruments .	03
21	Maintenance practice on lathe and shaper m/cs .	03
22	Fault tracing and trouble shooting on tube light , table fan, Room heater, hand drill m/c etc.	03
23	Measurement of wear on flat surfaces by Hydrostatic method.	03
24	Measurement of wear on cylindrical objects by micrometer and Dial indicator & V- block.	02
25	Lubrication practices on different machine tools.	01
26	Visit of large /Medium /Small scale industries for collecting information regarding record keeping for condition of equipment , maintenance scheduling & various practices , lubrication plan , tools & equipments used , safety measure etc.,	02



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**MEASUREMENTS PAPER CODE:
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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. Editor in Chief National Safety Council Chicago, U.S.A.
16. Accident Prevention Manual For Administration And Programs.
i. By Frank E. McElroy, P.E., C.S.P. Editor in Chief National Safety Council Chicago, U.S.A.
17. Commentary on Factories Act with M.P. Rules by Krishanlal Sethi (The law-years Home Indore -7)
18. Industrial Accident Prevention by H.W. Heinrich (Mc Graw Hill Book Company, INC)
19. An Introducton to Safety Engineering and Management by N.V. Krishnan (CPS Pub. Pvt. Ltd. Calcutta)
20. aintenance of Industrial Equipment by B. Gelberg, G. Peklis.
21. Guide to Efficient Maintenance Management by H.V. Mstwatt.
22. Modern Maintenance Management by Miller and Bood.
23. Maintainability by Benjamin S. Blanshard, E. Edward, Lowery
24. Maintenance Engineering Hand Book by Morrow.
25. Repair of Industrial Equipment by B. G. Edberg, G. Peklis.
26. Sanyantra Anurakshan Avum Suraksha Abhiyantriki (Hindi) by Yogendra Varshney (Deepak Prakashan, Morar, Gwalior)



RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FIFTH SEMESTER**

SCHEME: **JUL. 2008**

COURSE CODE: **504**

COMMON WITH

NAME OF THE COURSE: **MODERN PRACTICES** PROGRAMMES:

IN MANUFACTURING

AND MANAGEMENT

PAPER CODE:

RATIONALE

Innovations and improvements are a continuous process. Apart from basic understanding of principles of Engineering and conventional practices, a Diploma Engineer is also required to be exposed to recent developments and concurrent practices in the fields of manufacturing. In the recent past there has been a significant change in approach in industry in the form of emphasis on Quality systems to increase the productivity and profitability. It has now become necessary to adapt proper quality management system to compete and survive. In this course introduction to recent manufacturing practices and management approaches is outlined.



RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FIFTH SEMESTER**

SCHEME: **JUL. 2008**

COURSE CODE: **504**

COMMON WITH

NAME OF THE COURSE: **MODERN PRACTICES** PROGRAMMES:

IN MANUFACTURING

AND MANAGEMENT

PAPER CODE:

SCHEME OF STUDIES

Lectures: 04 Hrs. per Week

Practical: 04 Hrs. per Week

S. No.	Topics	Theory Hours	Practical Hours	Total Hours
1	Unconventional Machining Methods	08	12	20
2	Coating & Deposition processes	02	06	08
3	Rapid Prototyping	04	-	04
4	Manufacturing Automation	06	18	24
5	Flexible Manufacturing systems	04	-	04
6	Robotics	04	-	04
7	Total Quality Management	12	06	18
8	Total Productive Maintenance	04	06	10
9	Introduction to Quality Standards	08	06	14
10	Lean manufacturing	02	-	02
11	Why Why analysis	02	-	02
12	Six Sigma systems	04	06	10
	Total	60	60	120



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DIPLOMA IN MECHANICAL ENGINEERING

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COURSE CODE: 504

COMMON WITH

NAME OF THE COURSE: MODERN PRACTICES PROGRAMMES:

IN MANUFACTURING

AND MANAGEMENT

PAPER CODE:

Part – I

Modern Practices in Manufacturing:

Lectures: 04 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
1	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.	08
2	Coating & Deposition processes: plating & related processes, physical vapor deposition, chemical vapor deposition, Organic Coating,	02
3	Rapid Prototyping: Need, Fundamentals, Technologies and applications.	04
4	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	06
5	Flexible Manufacturing systems: Elements, Limitations, Feature & Characteristics, New development.	04
6	Robotics: Introduction to robotics, concept, and application, A4 level automation	04
7	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	12
8	Total Productive Maintenance (TPM)- Introduction, Plan, New Philosophy Improvement needs, Six Major losses Life cycle costing, work groups.	04



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IN MANUFACTURING

AND MANAGEMENT

PAPER CODE:

Part – II

Modern Practices in Management

Lectures: 04 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
9	Introduction to Quality Standards: ISO 9000- Introduction History, Indian Equivalence, System requirements for ISO 9001, 9002, 9003, steps for installation, How to apply. QS 9000 Quality Management systems. ISO 14001- Introduction, Environment Management system, Background, vocabulary and Application OHSAS 18001- Occupational Health and Safety Assessment Series Introduction, scope, related terms, structure and operating features TS 16949 – Quality system certificate consisting following standard a. APQP – Advance product quality planning b. FMEA - Failure mode and effect analysis c. MSA – Measurement system analysis	08
10	Lean manufacturing : System design for Lean manufacturing adopting.	02
11	Why Why analysis (5W 1 H) : Use of Why Why analysis to know the actual cause of failures and problems.	02
12	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.	04



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IN MANUFACTURING

AND MANAGEMENT

PAPER CODE:

LIST OF PRACTICALS

Practical: 04 Hrs. per Week

S.No.	PRACTICAL WORK	PRACT. Hrs.
1	Visit to a nearby installation / Study and practice at least two of the following: a. ECM b. CM c. EDM d. EBM e. USM f. Laser and Beam Machining g. Abrasive Jet Machining h. Plasma Arc Machining	09
2	Visit to a nearby installation having coating facilities/practical on coating process.	09
3	Visit to a nearby installation / Study and practice at least two of the following: a. NC b. CNC c. DNC d. CNC Milling e. CNC Turning	09
4	Manual part programming (for simple jobs) on a CNC Milling or Turning machine.	09
5	Visit to a nearby factory and estimation of six major losses on the critical machine	06
6	Prepare a plan for getting ISO 9001 Certification for an Industry.	06
7	Seminar on TQM Philosophy, TPM.	06
8	Seminar on Six Sigma practice.	06



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AND MANAGEMENT

PAPER CODE:

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.



RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

SCHEME: JUL. 2008

COURSE CODE: 505

COMMON WITH

NAME OF THE COURSE: INDUSTRIAL

PROGRAMMES:

ENGINEERING

A03, R01

PAPER CODE:

RATIONALE

Industrial engineering is such a subject which can significantly contribute towards the cost-saving and help in increasing the productivity. Adequate opportunities have been planned for the technician to apply theory to solve practical/ simulated industrial problems.

The course is kept under applied technology with a view to appreciate the changes and alternation proposed by Industrial engineering for shop floor methods and process.



RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FIFTH SEMESTER**

SCHEME: **JUL. 2008**

COURSE CODE: **505**

COMMON WITH

NAME OF THE COURSE: **INDUSTRIAL**

PROGRAMMES:

ENGINEERING

A03, R01

PAPER CODE:

SCHEME OF STUDIES

Lectures: 04 Hrs. per Week

Practical: 03 Hrs. per Week

S No.	Topics	Theory Hrs	Practical Hrs.	Total Hrs.
1	Introduction	02	-	02
2	Productivity	03	-	03
3	Work study	04	-	04
4	Method study	04	06	10
5	Principles of motion economy.	02	03	05
6	Material handling and plant layout.	04	-	04
7	Micro-motion study.	02	03	05
8	Work measurement	07	09	16
9	MOST technique for Work Measurement	06	03	09
10	Job evaluation, wages and incentives.	03	03	06
11	Statistical quality control	08	06	14
12	Control charts for variables.	05	03	08
13	Control charts for attributes.	04	06	10
14	Acceptance sampling.	04	03	07
15	Reliability.	02	-	02
	Total	60	45	105



RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

SCHEME: JUL. 2008

COURSE CODE: 505

COMMON WITH

NAME OF THE COURSE: INDUSTRIAL

PROGRAMMES:

ENGINEERING

A03, R01

PAPER CODE:

Lectures: 04 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
1	Introduction: Definition of industry and industrial engineering, scope and role of industrial engineering fields of applications.	02
2	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.	03
3	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.	04
4	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.	04
5	Principles of Motion Economy: Meaning, basic rules design of efficient work place- layout, classification of human body movements and their preferred order.	02
6	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.	04



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DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

SCHEME: JUL. 2008

COURSE CODE: 505

COMMON WITH

NAME OF THE COURSE: INDUSTRIAL

PROGRAMMES:

ENGINEERING

A03, R01

PAPER CODE:

Lectures: 04 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
7	Micro Motion Study: Definition and objectives, techniques of micromotion study, therbligs and their symbols, use of therbligs, SIMO chart and its application.	02
8	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.	07
9	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	06



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SCHEME: JUL. 2008

COURSE CODE: 505

COMMON WITH

NAME OF THE COURSE: INDUSTRIAL

PROGRAMMES:

ENGINEERING

A03, R01

PAPER CODE:

Lectures: 04 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
10	<p>Job Evaluation, Wages and Incentives: Definition, need and scope of job evaluation. Job evaluation systems and their comparative merits and demerits and limitations.</p> <p>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.</p>	03
11	<p>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.</p> <p>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.</p>	08
12	<p>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.</p>	05
13	<p>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.</p>	04



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DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FIFTH SEMESTER**

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COURSE CODE: **505**

COMMON WITH

NAME OF THE COURSE: **INDUSTRIAL**

PROGRAMMES:

ENGINEERING

A03, R01

PAPER CODE:

Lectures: 04 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
14	<p>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.</p> <p>O.C. Curves : Meaning, terms used, their definition, construction and use of O.C. curves. Selection of sampling plans.</p>	04
15	<p>Reliability: Definition quality control and reliability factors affecting reliability of product. Measures to ensure reliability of product, effect of product reliability marketing.</p> <p>M.T.B.F and M.T.T.F. Definition programme for reliability. Maintainability and availability</p>	02



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COURSE CODE: **505**

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NAME OF THE COURSE: **INDUSTRIAL**

PROGRAMMES:

ENGINEERING

A03, R01

PAPER CODE:

LIST OF EXPERIMENTS

Practical: 03 Hrs. per Week

S.No.	EXPERIMENT	PRACT. Hrs.
1	Preparation of flow process chart for existing and improved process.	03
2	Preparation of man and machine chart for existing and improved process.	03
3	Preparation of L.H. and R.H. charts for existing and improved process.	03
4	Use of decimal minute watch.	03
5	Performance rating.	03
6	Establishing standard time for given operation using time study techniques.	03
7	Use of Shewharts bowl and actual production for frequency distribution.	03
8	Preparation of X and R charts.	06
9	Preparation of p- chart and c- chart.	06
10	Work measurement using MOST	03
11	Acceptance sampling by attributes (single and double sampling plans)	03
12	Determination of the percentage utilization of equipment (work sampling) .	03
13	Application of principals of motion economy	03



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COURSE CODE: **505**

COMMON WITH

NAME OF THE COURSE: **INDUSTRIAL**

PROGRAMMES:

ENGINEERING

A03, R01

PAPER CODE:

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 & Subramaniam
- 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)



RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FIFTH SEMESTER**

SCHEME: **JUL. 2008**

COURSE CODE: **506**

COMMON WITH

NAME OF THE COURSE: **PROFESSIONAL
ACTIVITIES**

PROGRAMMES:

A03, R01

PAPER CODE:

RATIONALE:

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive

tests. While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and their attitude, in addition to basic technological concepts. The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

OBJECTIVES:

Student will be able to:

1. Acquire information from different sources
2. Prepare notes for given topic
3. Present given topic in a seminar
4. Interact with peers to share thoughts
5. Prepare a report on industrial visit, expert lecture



RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

SCHEME: JUL. 2008

COURSE CODE: 506

COMMON WITH

NAME OF THE COURSE: PROFESSIONAL
ACTIVITIES

PROGRAMMES:
A03, R01

PAPER CODE:

Lectures: 02 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
1	<p>Industrial Visits</p> <p>Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work.</p> <p>The industrial visits may be arranged in the following areas / industries :</p> <p>Sugar Factory / Dairy / Chemical Industry / Thermal Power Plant .</p> <p>i) Machine shop having CNC machines.</p> <p>ii) ST workshop / Auto service station</p> <p>iii) City water supply pumping station</p> <p>iv) Manufacturing unit to observe finishing and super finishing processes.</p>	14
2	<p>Lectures by Professional / Industrial Expert lectures to be organized from any two of the following areas:</p> <p>Interview Techniques.</p> <p>Modern Boilers – Provisions in IBR</p> <p>Applications of Sensors and Transducers</p> <p>Alternate fuels – CNG / LPG , Biodiesel, Ethanol, hydrogen</p> <p>Piping technology</p>	06
3	<p>Information Search :</p> <p>Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report any one topic.</p> <p>Following topics are suggested :</p>	08

	<ul style="list-style-type: none">i) Engine lubricants & additivesii) Automotive gaskets and sealantsiii) Engine coolants and additivesiv) Two and Four wheeler carburetor.v) Power steeringvi) Filtersvii) Different drives/Transmission systems in two wheelers.viii) Types of bearings – applications and suppliers.ix) Heat Exchangersx) Maintenance procedure for solar equipment. <p>Tools holder on general purpose machines and drilling machines.</p>	
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SEMESTER: FIFTH SEMESTER

SCHEME: JUL. 2008

COURSE CODE: 506

COMMON WITH

NAME OF THE COURSE: PROFESSIONAL

PROGRAMMES:

ACTIVITIES

A03, R01

PAPER CODE:

Lectures: 02 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
4	<p>Student Activities :</p> <p>The students in a group of 3 to 4 will perform any one of the following activities (others similar activities may be considered</p> <p>Activity :</p> <p>i) Collect and study IS code for Engineering Drawing..</p> <p>ii) Collecting information from Market: Nomenclatures and specifications of engineering materials.</p> <p>iii) Specifications of Lubricants.</p> <p>iv) Draw orthographic projections of a given simple machine element using and CAD software</p>	06
5	<p>Seminar :</p> <p>Seminar topic shall be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time – 10 minutes)</p>	08
6	<p>Mini Project / Activities : (any one)</p> <p>a) Prepare one model out of card board paper / acrylic / wood / thermocol / metal such as : i) Elliptical Trammel ii) Pantograph iii) Coupling iv) Cams and Followers v) Geneva mechanism</p> <p>b) Dismantling of assembly (e.g. jig / fixtures , tool post , valves etc.) Take measurement and prepare drawings / sketches of different parts.</p> <p>c) Make a small decorative water fountain unit.</p> <p>d) Toy making with simple operating mechanisms.</p>	18



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SEMESTER: **FIFTH SEMESTER**

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COURSE CODE: **506**

COMMON WITH

NAME OF THE COURSE: **PROFESSIONAL
ACTIVITIES**

PROGRAMMES:
A03, R01

PAPER CODE:

Learning Resources:

Books:

Sr. No	Author	Title of the book	Publisher
1	Marshall Cooks Adams	Time management	Viva Books
2	E.H. Mc Grath , S.J.	Basic Managerial Skills for All	Pretice Hall of India, Pvt Ltd
3	Allen Pease	Body Language	Sudha Publications Pvt. Ltd.
4	Lowe and Phil	Creativity and problem solving	Kogan Page (I) P Ltd
5	by Adair, J	Decision making & Problem Solving	Orient Longman
6	Bishop , Sue	Develop Your Assertiveness	Kogan Page India
7	Marion E Haynes	Make Every Minute Count	Kogan page India
8	Steven L McShane and Mary Ann Glinow	Organizational Behavior	Tata McGraw Hill
9	Stephen P. Robbins	Organizational Behavior	Pretice Hall of India, Pvt Ltd
10	Michael Hatto	Presentation Skills	(Canada – India Project) ISTE New Delhi
11		Stress Management Through Yoga and Meditation	Sterling Publisher Pvt Ltd
12	Richard Hale ,Peter Whilom	Target setting and Goal Achievement	Kogan page India



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COMMON WITH

**NAME OF THE COURSE: PROFESSIONAL
ACTIVITIES**

PROGRAMMES:

A03, R01

PAPER CODE:

INTERNET ASSISTANCE

1. <http://www.mindtools.com>
2. <http://www.stress.org>
3. <http://www.ethics.com>
4. <http://www.coopcomm.org/workbook.htm>
5. <http://www.mapfornonprofits.org/>
6. <http://www.learningmeditation.com> <http://bbc.co.uk/learning/courses/>
7. <http://eqi.org/>
8. <http://www.abacon.com/commstudies/interpersonal/indisclosure.html>
9. <http://www.mapnp.org/library/ethics/ethxgde.htm>
10. http://www.mapnp.org/library/grp_cnfl/grp_cnfl.htm
11. <http://members.aol.com/nonverbal2/diction1.htm>
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