



RAJIV GANDHI PROUDYOGIKI VISHWA VIDYALAYA, BHOPAL

DIPLOMA IN AUTOMOBILE ENGINEERING

SEMESTER: FIFTH SEMESTER

SCHEME: JUL. 2008

COURSE CODE 501

PAPER CODE:

NAME OF THE COURSE:

AUTOMOTIVE DESIGN AND DRAFTING

RATIONALE

Automobile design is an important subject, in order to achieve an exposure of design aspect of various automobile components. Diploma pass outs shall perform design related activities under guidance of design engineers. In service stations while maintaining or repairing vehicle, many times they face design related problems. It will be helpful to them to understand such problems. This subject will give them an idea of how to approach in designing the various components.

For better communication and effective working in Automobile Industries, Motor Garages, service station, transport departments and other related fields the knowledge of auto drafting is very essential.

The student should well conversed with drawing preparation process, drawing development process and drawing modification process

OBJECTIVE

1. To get converse out with basic concept of design practices to be applied to automobile components.
2. To understand the various forces which act on machine elements of any vehicle .
3. To learn to design the various engine and chassis components .
4. To learn to draw free hand sketches , assembly drawing and layout drawing for automobile establishments and vehicle components.



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NAME OF THE COURSE:

AUTOMOTIVE DESIGN AND DRAFTING

SCHEME OF STUDIES

S. No	Topics	Theory Hrs	Practical Hrs	Total Hrs
1	Introduction	10	-	10
2	Design of engine components	18	-	18
3	Design of flywheel & front axle	15	-	15
4	Design of gear & suspension spring	17	-	17
5	Design of clutches & brakes	15	-	15
6	Layouts and free hand sketches	15	-	15
TOTAL		90	-	90



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NAME OF THE COURSE:

AUTOMOTIVE DESIGN AND DRAFTING

Lectures: 06 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
1	INTRODUCTION Auto Design: Definition, Various aspects, Classification, Requirements, general Procedure of design. Engineering materials and their physical properties applied to design, factor of safety, endurance limit, notch sensitivity, principles of design optimization.	10
2	DESIGN OF ENGINE COMPONENTS. Design of engine cylinder, design and drafting of piston, gudgeon pin, connecting rod and crank shaft, crank pin.	18
3	DESIGN OF FLYWHEEL AND FRONT AXLE Determination of mass of a flywheel for a given co-efficient of speed fluctuation. Design of hubs and arms of flywheel. Design of front axle beam.	15
4	DESIGN OF GEAR AND SUSPENSION SPRING Design considerations- Strength of gear teeth. Lewis equation- Dynamic tooth load. Design of spur gear and helical gears. Types of suspension system, suspension springs, and design of laminated leaf spring and Coil spring. Design and drafting of leaf spring and shackle.	17
5	DESIGN OF CLUTCHES AND BRAKES Design of single plate & Multi plate clutch. Design of centrifugal clutch. State the different types of brakes. Design of internal expanding shoe brakes, Explain braking efficiency, The equation for brakes applied to front wheels, rear wheels, and all the four wheels.	15
6	LAYOUTS AND FREE HAND SKETCHES Lay outs of service station (Including fuel pump), Layouts of Garages (Including major repairs & body construction sections), Free hand sketches of spark plug, fuel injector, SU carburetor, connecting rod, piston, valves, air cleaner, fuel pump, wiring diagram	15
	TOTAL	90



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AUTOMOTIVE DESIGN AND DRAFTING

REFERENCE:

1. Heldt, P.M. Torque Converters, Chilton Book Co.
2. Dean Avern, Automobile Chassis Design, Illiffe Book Co.
3. Giri, N.K. Automobile Mechanics, Khanna Publishers, New Delhi.
4. Automobile Engineering Drawing : R.B. Gupta
5. Machine Design : Sharma Agrawal
6. Automotive Machine drawing : Laxmi Narayan & Mathur

EQUIVALENCY

New paper code is equivalent to old paper code of respective branch.



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COURSE CODE 502

PAPER CODE:

NAME OF THE COURSE:

**AUTOMOTIVE ELECTRICAL AND
ELECTRONICS**

RATIONALE

This course is intended to introduce basic principle of electrical mechanism of automotive components. It includes various automotive electrical & electronics components which help in enhancing the knowledge of diploma holders.

OBJECTIVES

1. To understand the electrical mechanisms employed in automotives.
2. To solve electrical problems in machines.
3. To understand the behavior of electrical & electronics components employed in automobile.



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DIPLOMA IN AUTOMOBILE ENGINEERING

SEMESTER: FIFTH SEMESTER

SCHEME: JUL. 2008

COURSE CODE 502

PAPER CODE:

NAME OF THE COURSE:

**AUTOMOTIVE ELECTRICAL AND
ELECTRONICS**

SCHEME OF STUDIES

S.N.	TOPIC	Theory Hrs	Practical Hrs.	Total hrs.
1	Introduction	10	07	17
2	Batteries & Auxiliary System	15	10	25
3	Starting system	12	10	22
4	Charging system	13	08	21
5	Ignition system	10	10	20
	Total	60	45	105



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COURSE CODE 502

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NAME OF THE COURSE:

AUTOMOTIVE ELECTRICAL AND ELECTRONICS

Lectures: 04 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
1	INTRODUCTION Need of Auto electrical system & its components, Conductor, Insulator, Semiconductor, current, voltage, resistance, ohm's law, series & parallel connections, electromagnetism. Introduction to Electrical measuring instruments	10
2	BATTERIES AND AUXILIARY SYSTEMS Principle and construction of lead acid battery, characteristics of battery, rating, capacity and efficiency of batteries, various tests on batteries, maintenance and charging methods. Lighting system: details of head light, tail light and side light, LED lighting system, head light dazzling and preventive methods. Speedometer, Horn, wiper system. Different types of fuel gauges, oil pressure gauges & engine temperature gauges.	15
3	STARTING SYSTEM Requirements of starting system, Principle, construction & working of starting motor, Characteristics of starter motor, Need of starting drive units, bendix, folothru & over running Clutch Drives. Different types of starter switches.	12
4	CHARGING SYSTEM Requirements of charging system, construction & working principle of D.C generator & A.C generator (alternator), Armature reaction, cut-out relay, voltage & current regulator systems. Generation of direct current, shunt generator characteristics, third brush regulation, Difference between DC generator & alternator, Advantages of alternator over DC generator.	13
5	IGNITION SYSTEM Need of ignition system, construction & working of ignition coil, distributor, spark plug, condenser, Types of ignition Systems - battery & magneto ignition system, need of spark advance, construction & working of vacuum & centrifugal spark advance. Basic concept of Electronic ignition system, distributor primary signal, sensor coil (magnetic pickup). Hall effect, spark advance, electronic spark control, electronic spark advanced controls, Distributor less ignition system. Ignition wiring diagram.	10
	TOTAL	60



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COURSE CODE 502

PAPER CODE:

NAME OF THE COURSE:

**AUTOMOTIVE ELECTRICAL AND
ELECTRONICS**

LIST OF EXPERIMENTS

Practical: 03 Hrs. per Week

S.No.	EXPERIMENT	PRACT. Hrs.
1	Study the construction and operation of lead acid battery.	3
2	Fitting and removing battery in vehicle	2
3	Study of construction and operation of starting system .	3
4	Study of working of starting motor drive mechanism.	3
5	Study of alternator operation and functioning of diodes in the alternator.	3
6	Study of working of alternator regulator.	3
7	Checking an alternator if the battery is run down.	2
8	Study of operation of contact point ignition system.	3
9	Location and identify the components of the contact point ignition system on various vehicles.	3
10	Study the construction and operation of centrifugal and vacuum advanced mechanism.	3
11	Study the construction and operation of electronic ignition system of any vehicles.	3
12	Replace a head lamp.	2
13	Aim headlight	2
14	Study the purpose and operation of dimmer switch.	2
15	Study the operation of horn relay.	2



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S.No.	EXPERIMENT	PRACT. Hrs.
16	To test the vehicle battery for serviceability by means of high rate discharge tester and hydrometer.	3
17	To test a vehicle battery for serviceability by measuring its capacity and comparing the results with its rated output	3
	TOTAL	45



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AUTOMOTIVE ELECTRICAL AND
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REFERENCES

1. Young A.P. & Griffiths. L. "Automotive Electrical Equipment", ELBS & New Press-
2. William Broadens "Understanding Automotive Electronics", 5th edition - Butter worth Heinemann Woburn,
3. Bechhold "Understanding Automotive Electronics", SAE,.
4. Crouse, W.H "Automobile Electrical Equipment", McGraw-Hill Book Co., Inc., New York, 3rd edition,.
5. Judge A.W "Modern Electrical Equipment of Automobiles", Chapman & Hall, London,.
6. Kholi.P.L "Automotive Electrical Equipment", Tata McGraw-Hill Co., Ltd., New Delhi,.
7. Robert Bosch "Automotive Hand Book", SAE (5th Edition),.
8. Ganesan.V. "Internal Combustion Engines", Tata McGraw-Hill Publishing Co., New Delhi,



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SEMESTER: FIFTH SEMESTER

SCHEME: JUL. 2008

COURSE CODE 503

PAPER CODE:

NAME OF THE COURSE:

**AUTOMOTIVE MAINTENANCE SERVICE &
REPAIR**

RATIONALE:

Automobile maintenance is a key part of smooth running & optimum life of an automobile. This course is prepared with the aim to develop proper way to maintain a vehicle & to develop the maintenance culture in the students. It consists of topics like troubleshooting & remedies, types of maintenance, safety precautions, and types of wears & methods of repair which will help the students to grasp the correct maintenance procedure and to guide the other automobile users.

OBJECTIVES:

1. To know the importance of procedures of maintenance.
2. To develop the skill of maintenance of an automobile in scientific way to get the smoother operation & optimum life of an automobile.



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SCHEME: JUL. 2008

COURSE CODE 503

PAPER CODE:

NAME OF THE COURSE:

**AUTOMOTIVE MAINTENANCE SERVICE &
REPAIR**

SCHEME OF STUDIES

S. No	Topics	Theory Hrs	Practical Hrs	Total Hrs
1	Introduction	03	04	07
2	Service of cooling & lubrication system	03	04	07
3	Engine testing procedures	03	04	07
4	Engine tune up & trouble diagnosis	03	04	07
5	Valve & valve mechanism service	03	04	07
6	Conn. rod, bearings, piston & rings service	04	06	10
7	Crankshaft & cylinder block service	03	04	07
8	Clutch service	03	04	07
9	Gear box trouble diagnosis & service	05	06	11
10	Differential & rear axle service	03	04	07
11	Steering & suspension service	04	06	10
12	Brakes service	03	04	07
13	Electrical & electronic equipment service	05	06	11
TOTAL		45	60	105



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AUTOMOTIVE MAINTENANCE SERVICE & REPAIR

Lectures: 03Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
1	INTRODUCTION: Maintenance its need, three types participative maintenance, maintenance planning, Maintenance schedules, periodic Checkup, Servicing, daily/ running in maintenance	03
2	SERVICE OF COOLING AND LUBRICATION SYSTEM- Oil consumption erratic oil pressure gauge action, Servicing Lub system oil changes, checking oil level oil filter service. cooling system Trouble diagnosis causes of loss of coolant, causes of engine overheating, cleaning cooling system, repairing radiator leaks, Testing belt.	03
3	ENGINE TESTING PROCEDURES: Introduction, Engine Testing Instruments, Taco meter, cylinder compressor tester, Results of compression Test, Cylinder leakage Tester, Engine vacuum gauge, Exhaust gas analyzer, Ignition timing light, oscilloscope,	03
4	ENGINE TUNEUP & TROUBLE DIAGNOSIS: Introduction, trouble procedure, Engine Analyzer, and Computer testers, Engine Trouble Diagnosis chart. Turns over at normal speed but doesn't start, Engine runs but misses. Engine lacks power, Engine overheats, rough idle. Engine stalls, Engine back fires, Too much HC, CO, in Exhaust gas, Excessive oil consumption, Low oil pressure, excessive fuel consumption. Engine noises.	03
5	VALVE & VALVE MECHANISM SERVICE: Valve clearing, valve troubles, diagnosis chart, valve sticking, valve over heating and burning valve breakage, valve face wear, valve seat Recession valve deposits, valve service, Adjusting valve lifter clearance The complete valve Job.	03
6	CONNECTING ROD, BEARINGS, PISTONS AND RINGS SERVICE: Removing connecting rods, removing ring ridge, removing oil pan, removing piston rod assembly, servicing rods and pistons , attaching rods and piston, installing piston rod assemblies, checking rod side clearance , checking connecting rods, Bearing failure Analysis. Checking rods bearing clearance installing rod bearings. Piston service, cleaning piston inspection, piston resizing, selecting new pistons, filling pins in pistons, rod and piston alignment, fitting piston rings.	04



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S.NO	CONTENT	STUDY Hrs.
7	CRANK SHAFTS AND CYLINDER BLOCKS SERVICE: Removing an engine, replacing engine mounts, crankshafts and bearing service, removing main bearing caps, checking crankshaft journals, inspecting main bearing, measuring main bearing cleaners measuring crankshaft end play installing main bearings, removing crankshaft, Servicing and grinding of crankshaft. Cylinder wear , cleaning and inspecting cylinder block, checking bearing bores, inspecting cylinder walls, refinishing cylinders, installing cylinder sleeves.	03
8	CLUTCH SERVICING: Clutch trouble diagnosis chart, clutch slips while engaged, clutch chatters while engaged, clutch spins or drags when disengaged, clutch noise, clutch pedal pulsates. Disc facing wears rapidly, clutch pedal stiff, clutch linkage adjustments.	03
9	GEARBOX TROUBLE DIAGNOSIS AND SERVICE: The trouble diagnosis chart, G.B. removal and installation G.B. transmission overhauls, shift linkage adjustment, noises. Bearing noise.	05
10	DIFFERENTIAL AND REAR AXLE SERVICE: Differential trouble diagnosis, differential servicing	03
11	STEERING AND SUSPENSION SERVICE: The trouble diagnosis charts, excessive play in steering system, hard steering, car wonder, car pulls to one side when braking, low speed front wheel shimmy , front wheel tramp, steering kick back tyres squeal on turns, improper tyre wear, hard or rough ride, sway on turns, sagging springs, noises, wheel alignment, wheel balance,	04
12	BRAKE SERVICING: The trouble diagnosis charts, brake pedal goes to floor, one brake drags. All brakes drag, car pulls to one side, soft or spongy pedal, excessive pedal force required, sensitive brakes noisier brakes, Air in system, loss of brake fluid, excessive pedal travel, brake pedal play, brake service, adjusting drum brakes, replacing drum brakes shoes, brake drum and wheel cylinder service, master cylinder service, disc brake service, flushing hydraulic system, filling and bleeding hydraulic system.	03



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S.NO	CONTENT	STUDY Hrs.
13	ELECTRICAL AND ELECTRONIC EQUIPMENT SERVICE: BATTERY – Variation in battery terminal voltages, Battery maintenance, cautions for battery service, overcharging, under charging, sulfation, corroded terminals, cable clamps, & battery holders, removing and replacing battery, slow charging. STARTING SYSTEM- Motor doesn't crank engine, engine crank slow by but doesn't start jump starting, removing and installing starter motor. CHARGING SYSTEM- Charging system trouble diagnosis, discharged battery, charging system tests removing and installing alternator. IGNITION SYSTEM: Causes of ignition failure, quick checks of ignition system ignition timing, spark plug service, ignition wiring, contact point service, distributor service, removal and installation. OTHER ELECTRICAL /ELECTRONICS DEVICES: Head light aiming, electrical fault tracing and repair in wiring system.	05
	TOTAL	45



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REPAIR**

Practical: 04Hrs. per Week

S.No.	EXPERIMENT	PRACT. Hrs.
1	Change engine oil and oil filter	1
2	Service the engine oil Pump	2
3	Clear and flush cooling system.	1
4	Locate and repairs leaks in the cooling system	1
5	Replace water pump	1
6	Test the given battery for its conditions	1
7	check and adjust ignition timing	2
8	Adjust or replace contact points.	1
9	Remove/install ignition distributors.	2
10	Identify sources of various engine noises	2
11	Adjust valve clearance	1
12	Replace rocker arm stud of engine head	2
13	Replace camshaft bearings	2
14	Replace pistons rings /con rod bearing/piston pins	2
15	Check connecting rod for bent/twist	2
16	Replace cam shaft main bearings	2
17	Time the injection pump.	2
18	Adjust idle speed of diesel engine	2
19	Replace fuel injection nozzle.	1
20	Service and adjust clutch linkages	1
21	Remove and replace a clutch.	2
22	Adjust gear box linkages.	2
23	Service the given gearbox	3
24	remove and install transfer case	3
25	Check gearbox oil and locate possible points of leakages.	1
26	Replace the given universal joint.	2
27	Disassemble, assemble, adjust differential	4
28	Inspect, replace defective parts, lubricate steering system .	2
29	Replace, service front wheel bearings.	2



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S.No.	EXPERIMENT	PRACT. Hrs.
30	check and adjust wheel alignments.	1
31	Adjust the given brake system.	1
32	Test the brakes..	1
33	Change break fluid and remove the air if there.	2
34	Check and add pressurized Air to tyre tubes.	1
35	Service master cylinder/wheel drum/wheel cylinder assemblies.	2
	TOTAL	60



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**AUTOMOTIVE MAINTENANCE SERVICE &
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REFERENCES

1. Automobile engineering - R B Gupta
2. Automobile engineering - G.B.S Narang
3. Automobile engineering -C.P. Nakra
4. Diesel Engine manual - Black
5. Automobile maintenance & troubleshooting - Venk
6. Workshop manuals of Indian vehicles - TATA, LEYLAND, MAHINDRA, BAJAJ, HONDA, HEROHONDA, YAMAHA.
7. Automobile maintenance & repairs - M/R publication Moscow.
8. Automotive mechanics - William Crouse.

EQUIVALENCY

New paper code is equivalent to old paper code of respective branch.



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DIPLOMA IN AUTOMOBILE ENGINEERING

SEMESTER: FIFTH SEMESTER

SCHEME: JUL. 2008

COURSE CODE 504

PAPER CODE:

NAME OF THE COURSE:

HYDRAULIC AND PNEUMATIC CONTROL SYSTEMS

RATIONALE

In the era of advances in control system in automotives , hydraulic and pneumatic control systems are very popular . Special purpose vehicles are equipped with such systems . It is necessary to give our students exposure of control system. This subject will help them to familiarize with basic requirements, concepts and constructional features of control systems in general.

OBJECTIVE:

To learn about basic concepts and construction of hydraulics and Pragmatic control system.



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SEMESTER: FIFTH SEMESTER

SCHEME: JUL. 2008

COURSE CODE 504

PAPER CODE:

NAME OF THE COURSE:

HYDRAULIC AND PNEUMATIC CONTROL SYSTEMS

SCHEMES OF STUDIES

S. No	Topics	Theory Hrs	Practical Hrs	Total Hrs
1	Introduction	08	06	14
2	Flow measurement	06	06	12
3	Pressure measurement	06	04	10
4	Hydraulics pumps	06	04	10
5	Hydraulic Control System	06	06	12
6	Hydraulic Valves	06	04	10
7	Hydraulic Actuators	06	04	10
8	Pneumatics Control System	10	06	16
9	Logic Control System	06	05	11
	Total	60	45	105



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HYDRAULIC AND PNEUMATIC CONTROL SYSTEMS

Lectures: 04Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
1	INTRODUCTION – Fluid properties density, sp. Weight, specific gravity, viscosity, continuity equation, energies of flowing fluid. Potential, kinetic and pressure energy., Concept of datum pressure, velocity and total head of a fluid particle in motions, Bernoulli’s theorem and equation. Simple problems based on use of formula only.	08
2	FLOW MEASUREMENT- Orifice meter, pitot tube, flow nozzle, venturimeter, their working principle, constructions and formula for discharge measurement, practical applications of above meters, Simple problems based on use of formula only.	06
3	PRESSURE MEASUREMENT- Concept of pressure, intensity of pressure, pressure head, gauge pressure, vacuum pressure, absolute pressure manometer pressure, simple U-tube manometer, differential manometer, Simple numerical problems based on use of formula only.	06
4	HYDRAULIC PUMPS- Centrifugal and reciprocating pumps, their principle construction, working classification and layout, Their comparison, specific speed, selection of pumps, pump operating characteristics, Formula for horse power and efficiency of centrifugal pump. Simple numerical problems based on use of formula only.	06
5	HYDRAULIC CONTROL SYSTEMS- Purpose, function, layout of simple hydraulic system, components viz pump motor, pressure regulator, fluid filter control valve, cylinder, pipes and hoses linear/rotary actuators piston pump, switch plate pump. Comparison of different types of pumps.	06
6	HYDRAULICS VALVES- Purpose, types ,infinite position valve and finite position valve, 4/3 valve, double acting hydraulic cylinder check valves, poppet valves, spool valves, rotary valves, pilot valves, proportional valves electro hydraulic valves,(Solenoid valves) Servo valve.	06
7	HYDRAULIC ACTUATORS- Functions, single cylinder piston arrangement, linear actuators, gear motor. Single acting and double acting actuators.	06



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8	PNEUMATIC CONTROL SYSTEM- Pneumatic system components, air filter, compressor, air treatment unit, reservoir, on /off control valve, pressure regulator air control valve, actuators, four types of linear actuators, single rod single acting, single rod double acting, double rod double acting, rod less double acting, comparison of pneumatics system with hydraulics system, procedure of air treatment. Process control pneumatics.	10
9	LOGIC CONTROL SYSTEM- Introduction to development of various types of simple logical control system in pneumatic or hydraulics mode.	06
	TOTAL	60



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SUGGESTED LIST OF PRACTICALS

S.No.	EXPERIMENT	PRACT. Hrs.
1	Study of various types of oil pumps	6
2	Study of hydraulics control system components.	6
3	Study of Hydraulic valves.	6
4	Study of Hydraulics actuators	6
5	Study of pneumatic control system components	7
6	Study of any logic controlled system based on hydraulics mode	7
7	Study of any logic controlled system based on pneumatic mode	7
	TOTAL	45



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**HYDRAULIC AND PNEUMATIC CONTROL
SYSTEMS**

REFERENCE BOOKS

1. Fluid Mechanics & Hydraulics Machines by Dr. R.K. Bansal
2. Fluid Mechanics & Hydraulics Machines by Modi and Seth
3. Fluid Mechanics & Hydraulics Machines by Jagdish Lal
4. Fluid Mechanics & Hydraulics Machines by A.K. Jain
5. Refrigeration's & Air conditioning by R.S. Khurmi
6. Fluid power and trouble shooting by Hohn A.H.
7. Fluid power theory and application by James A Sullivan
8. Pneumatic control and system by Mazumdar



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SEMESTER: FIFTH SEMESTER

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COURSE CODE: 505

PAPER CODE:

NAME OF THE COURSE:

INDUSTRIAL ENGINEERING

COMMON WITH PROGRAMMES:

M02, R01

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.



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DIPLOMA IN AUTOMOBILE ENGINEERING

SEMESTER: **FIFTH SEMESTER**

SCHEME: **JUL. 2008**

COURSE CODE: **505**

PAPER CODE:

NAME OF THE COURSE:

INDUSTRIAL ENGINEERING

COMMON WITH PROGRAMMES:

M02, R01

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



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M02, R01

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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COMMON WITH PROGRAMMES:

M02, R01

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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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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M02, R01

Lectures: 04 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
14	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.	04
15	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	02



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M02, R01

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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M02, R01

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 Abhyantran (Hindi) by J.C. Varshneya. (Deepak Prakashan, Gwalior)
- 18 Audyogik Engineering (Hindi) by K.D. Saxena . (Deepak Prakashan, Gwalior)



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PROFESSIONAL ACTIVITIES

COMMON WITH PROGRAMMES

M02, R01

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



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COMMON WITH PROGRAMMES

M02, R01

Lectures: 02 Hrs. per Week

S.NO	CONTENT	STUDY Hrs.
1	Industrial Visits 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. The industrial visits may be arranged in the following areas / industries : Sugar Factory / Dairy / Chemical Industry / Thermal Power Plant . i) Machine shop having CNC machines. ii) ST workshop / Auto service station iii) City water supply pumping station iv) Manufacturing unit to observe finishing and super finishing processes.	14
2	Lectures by Professional / Industrial Expert lectures to be organized from any two of the following areas: Interview Techniques. Modern Boilers – Provisions in IBR Applications of Sensors and Transducers Alternate fuels – CNG / LPG , Biodiesel, Ethanol, hydrogen Piping technology	06
3	Information Search : Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report any one topic. Following topics are suggested : i) Engine lubricants & additives ii) Automotive gaskets and sealants iii) Engine coolants and additives iv) Two and Four wheeler carburetor. v) Power steering vi) Filters vii) Different drives/Transmission systems in two wheelers. viii) Types of bearings – applications and suppliers. ix) Heat Exchangers x) Maintenance procedure for solar equipment. Tools holder on general purpose machines and drilling machines.	08



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PROFESSIONAL ACTIVITIES

COMMON WITH PROGRAMMES

M02, R01

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
	Total	60



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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 Hatton	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
13	Chakravarty, Ajanta	Time management	Rupa and Company
14	Harding ham	Working in Teams	A Orient Longman



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COMMON WITH PROGRAMMES

M02, R01

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>
12. http://www.thomasarmstron.com/multiple_intelligences.htm
13. <http://snow.utoronto.ca/Learn2/modules.html>
14. <http://www.quickmba.com/strategy/swot/>