VEER NARMAD SOUTH GUJARAT UNIVERSITY

B.E. Mechanic

Semester - VII

SYLLABUS OF SEVENTH SEMESTER

New Scheme w.e.f. Aug. 1999.			Theory Examinations		Practical / Term work / Sketching / Viva / Quiz			
Subject	**Subject Code**	**L T P (Hrs)**	**Duration (Hrs)**	**Marks**	**Tutorial**	**Cont. Evaluation**	**Exam. (Pract)**	**Total Marks**
Tool Design.	MED 701P	3 0 4	3	100	00	40	60	100
Metal Forming Technology	MED 702P	3 0 2	0	100	00	20	30	50
Design of Machine Tool Elements.	MED 703P	3 0 4	3	100	00	40	60	100
Project Preliminaries.	MED 704P	0 0 3	0	000	00	20	30	50
Industrial Training Report Evaluation.	MED 705P	0 0 1	0	000	00	20	30	50
Quantitative Techniques in Prodct. Management.	MED 706P	3 1 0	3	100	25	00	00	25
Elective-I	MED 71*P	3 1 0	3	100	25	00	00	25
TOTAL		15 2 14		500	50	140	210	400
Total Contact Hours = 31			**Total Mark = 900**					

Subject Code	Name of Subject
MED 711P	Industrial Robotics
MED 712P	Theory of Plasticity
MED 713P	Heat Treatment and Surface Coating Processes
MED 714P	Hydraulic and Pneumatic Control
MED 715P	Material Management

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MED 701 P Tool Design			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	3	0	4
Examination Scheme Marks	100	00	Continuous Evaluations 40 Examination 60

1. Design of Jigs and Fixtures. :
2. Basic principle of location – locating methods & devices – principles, methods
3. Devices for clamping – types of drill jigs.
4. Types of fixtures – design of milling, turning and other fixtures - methods of construction of jigs & fixtures.
5. Design of Press – Tools. :
6. Power press types – cutting action in punch & die operations – Die clearance – Blanking & piercing dies, pilots, strippers – strip layout – Bending die construction & design – Drawing operations and die design – variables affecting metal flow in drawing – fixture design for numerically controlled machine tools
7. Design Of Broach :
8. Geometrical elements of broach teeth – cutting variables in broaching Internal and external broaches – Design of key way and cylindrical broaches.
9. Cam design for single spindle automatic lathes.
10. Design of single point cutting tools.

REFERENCES

1. Donaldson, Lecain & Goold, "Tool Design", Tata McGraw Hill, (1980).
2. Fundamentals of Tool Design By A S T M E.
3. Arshinov & Alekseev, "Metal Cutting Theory & Cutting Tool Design", Mir Publishers, Moscow.

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MED 702 P Metal Forming Technology			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	3	0	2
Examination Scheme Marks	100	00	Continuous Evaluations 20 Examination 30

1. Introduction to Metal Processing.
2. Stress analysis stress tensor, Mohr's circle for stress transformation.
3. Strain analysis, strain Tensor, Isotropic Elasticity.
4. Stress – Strain relationship, strain energy. Yield criteria Tresa & Von-Mises Criterion, Effective Stress & Strain Flow rules or Plastic Stress-Strain relationship, work hardening, Mechanical properties, Determination of work hardening expression, strain rate & temperature.
5. Some Methods of Solution of Forming Problem.

- Uniform Plastic -& deformation energy.
- Slab Method of Solution.
- Experimental method for stress & strain rate determination.
- Slip Line Field Theory.
- Equilibrium in Plane Strain.
- Hencky – Prandtl Nets.
- Properties of slip lines.
- Boundary value problems.
- Contraction of slip line Nets.
- Continuity equations along slip lines.
- Velocity discontinuity at certain slip lines.
- Velocity diagram or Holograph.

7. Forging – classification, plane strain & Axisymmetric strain in upsetting, forging load calculation for plane strain & axisymmetric forging. Uniform energy method. Forging defects. Open die & close die forging, forging die design.
8. Extrusion – Introduction, calculation of extrusion load using slab method, energy method & upper bond method. Defect in extrusion, Direct & Indirect extrusion.
9. Wire Drawing: Introduction, Defects, Maximum possible reduction Wire Drawing load calculation using slab method.
10. Rolling Classification, Types of mill, calculation of roller separating force, torque & power, angle of bite, maximum reduction in rolling, rolling defects, Roll flattening, roll camber.
11. . Sheet Metal forming :

- Bending of plates, Bendability, spring back, bending force, bending moment for real material, stress & strain in bending.
- Blanking, punching, _ Derivation & calculation of optimum clearance, Blanking force.
- Deep drawing – stress in deep drawing – Drawability. Drawing load, stretch forming, plastic stress – strain relations, Anisotropy, Deep drawing tool Design.
- Unconventional forming – explosive, Magnetic pulse forming etc
- Friction & lubrication in forming.

REFERENCES:

1. William F. Hosford & R. M. Caddell, "Metal Forming Mechanical & Metallurgy," Prentice Hall, (1993).
2. R. Narayanasamy, "Metal Forming Technology", Ahuja Book Publishers & Distributors, (1997).
3. Edword M. Mielnik, "Metal Working science & Engineering", McGraw Hill, (1991).
4. G. E. Dieter, "Mechanical Metallurgy", McGraw Hill, (1988).
5. P. N. Rao, "Manufacturing Technology", Tata McGraw Hill, (1990).

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MED 703 P Design of Machine Tool Elements			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	3	0	4
Examination Scheme Marks	100	00	Continuous Evaluations 40 Examination 60

1. Principles of machine tool design in general Cutting Tool forces for various machining processes.
2. Kinematics of machine tools. Selection of speeds & feeds. Design of gear box. Stepless drives.
3. Design of machine tool structures. Principles, materials, static & dynamic stiffness. Shapes of machine tool structures. Design of beds, columns, housings, tables, ram etc.
4. Design of guideways & power screws. Design of slideways.
5. Design of spindles, Materials of spindles. Machine tool compliance. Anti friction bearings. Sliding bearings.
6. Introduction to Dynamics of Machine Tools.

REFERENCES:

1. N. K. Mehta, "Machine Tool Design", Tata McGraw Hill, (1984).
2. S. K. Basu, D. K. Pal, "Design of Machine Tools", Oxford & IBH Publishing Co., (1983).
3. Achertan, N., "Machine Tool Design" Vol.- I-IV, Mir Publishing, Moscow, (1968).
4. Koenigsberger, F. "Design principles of metal cutting machine tools", Pergamon Press, (1964).
5. G. C. Sen & A. Bhattacharyya, "Principles of Machine Tools", New Central Book Agency, (1971).
6. Tobias, S. A., "Machine tool vibration", Blackie Oxford, London.

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MED 704 P Project Preliminaries			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	0	0	3
Examination Scheme Marks	0	0	Continuous Evaluations 20 Examination 30

This shell consist of preliminary work pertaining to project, such as study of literature , design calculations , sketch and drawing , material procurement , preparation of fabrication , planning and preparation of experiments , addition and alteration of existing test rigs , industrial visits etc.

The work done shall be compiled in the form of a brief report and shall be submitted to the H.O.D. at the end of semester VII for the purpose of evaluation .

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MED 705 P Industrial Training Report Evaluation			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	0	0	1
Examination Scheme Marks	0	0	Continuous Evaluations 20 Examination 30

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MED 706 P Quantitative Techniques in Production Management			
	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination Scheme Marks	100	25	Continuous Evaluations 00 Examination 00

1. Linear Programming problems and their Graphic Solution. Simplex Method – Duality – Post Optimality Analysis.
2. Transportation and Transshipment Problems. Methods of solving transportation problems.
3. The assignment problem and methods of solution. Application of Assignment problem to solve Travelling salesman problems.
4. Integer programming problems. All integer, Mixed integer and Zero-One programming and methods of solution.
5. Sequencing problems – Flow shop and Job shop problems, solution methods for solving various categories of sequencing problems.
6. Project Management by CPM/PERT: Drawing of Network, Fulkerson's rule, CPM technique, Floats and Slacks, crashing of Network, PERT technique.
7. Queuing Theory – General structure of Queuing systems. Operating characteristics of Queuing systems, Analysis of M/M/1 model.
8. Simulation, process of Simulation, Montecarlo simulation, Applications of Simulation.

REFERENCES:

1. S. D. Sharma, "Operations Research", Kedarnath – Ramnath & Co., (1996).
2. N. D. Vohra, "Quantitative Techniques in Management", Tata – McGraw Hill, (1990).
3. J. K. Sharma, "Mathematical Models in Operations Research", Tata – McGraw Hill, (1989).
4. N. R. Dave & A. K. Mangalani, "Operations Research", Acharya Publication, (1990).
5. S. K. Hazrachoudhari et al, "Production Management", Media Promoters and Publishera, (1990).

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MED 711 P (Elective-I), Industrial Robotics			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	3	1	0
Examination Scheme Marks	100	25	Continuous Evaluations 00 Examination 00

1. History of Robotics.
2. Basic Robotics, types, anatomy, Robot systems – Drives, Trajectory, control, kinematics, dynamics.
3. End effectors, sensing device and sensors.
4. Introduction to Robot programming and vision system.
5. Robot application in manufacturing, material transfer, machine loading and unloading.
6. Process operations, assembly and inspection.
7. Future applications.

REFERENCES:

1. K.S. Fu., R.C. Gonzalez, C.S.G. Lee. "Robotics", Mc Graew Hill, (1987).
2. Groover, Weiss, Nagel and odrey, "Industrial Robotics", Mc Graw Hill (1988).

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MED 712 P (Elective-I) Theory of Plasticity			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	3	1	0
Examination Scheme Marks	100	25	Continuous Evaluations 00 Examination 00

Definition of stress-stain, electric version plastic deformation, stress invariants, Mohr's Circle, Virtual work, Basic stress-strain relationship in electricity condition of yielding – Tresca criterion,Von Mises Criterion effective stress-strain – state of plastic strain-strain rate. Stress-strain relation in plasticity – plastic Anisotropy – stress-strain relations for strain hardening metals saint venant's theory of plastic flow – Reuss Theory of electric plastic deformation – Hencky's theory of small plastic deformation plasticity conditions – experiments on thin walled tube for combined loading – experimental verification of saint venant's theory of plastic flow-Thick wall tube & spherical shell under internal pressure Considering ideally plastic materials. Rotating cylinders & Disks in plastic state Torsion & Bending. Two dimensional plastic flow problems plastic flow problem for strain hardening materials – Torsion & bending – Buckling of compressed bars-Instability in tension-Theory of metal forming Two dimensional problem of steady motion – Non steady motion – Axial symmetry plastic anisotropy.

REFERENCES

1. R. Hill, "The mathematical theory of plasticity", Oxford at the clarendon Press, London, (1971).
2. O, Hoffman & G. sachs , "Introduction to the Theory of Plasticity for engineers," McGraw Hill, NY, (1953).
3. Z.M. Mielnik, "Metalworking Science & Engineering", McGraw Hill, NY, (1991).

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MED 713 P (Elect-I) Heat Treatment & Surface Coating Processes			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	3	1	0
Examination Scheme Marks	100	25	Continuous Evaluations 00 Examination 00

1. Heat treatment. Processes of heat treatment for Improvements of properties. Equilibrium diagrams. Morphology of steel. Reasons for heat treatments. Heat treatment cycles specifications.
2. Heat treatment to tool steels. Identification & classification. Tool steel Metallurgy. Tool steel properties. Comparison of tool steel properties. Tool steel selection. Heat treatment cycles to the tool steel. Specification of tool steels. Tool steel defects.
3. Heat treatment to certain other special steels like stainless steel, Hadfield steel, Low alloy steels, High alloy steels, Metallurgy of stainless steel. Physical properties. Mechanical properties. Alloy Identifications. Heat treatment before welding & after welding.
4. Heat treatment to some important non ferrous metals & alloys like copper and its alloys. Copper products. Metallurgy, properties and wear resistance. Heat treatment to alloys selection of Aluminum & its alloys. General characteristic. Aluminum products metallurgical Characteristic, Heat treatment, surface treatments, surface and local hardening processes.
5. Plating and conversion coatings. Electroplating coating selection, plating specifications etc.
6. Surface treatment/coatings for prevention's against failure: Mechanical surface treatments thermal surface treatments, chemical surface treatments, Metallic coatings, Dipping, spraying electrochemical deposition, Electroless deposition plasma techniques, Chemical vapour deposition and physical vapour deposition. Ion beam bond deposition techniques.

REFERENCES:

1. Zakha Rao -, "Heat treatments",
2. Lowenna, "Electroplating",
3. Charlie R. New York, " Heat treatment for ferrous Alloys", Hemisihere Publishing Co. (1979).
4. "Heat treating, cleaning & finishing :" metals Hand book Vol. 2 Metals park ohio American Society for Metals. (1966).
5. Unlig, Herberth, New York , John Willey & Som, "Corrosion & Corrosion control", (1963).
6. Clarck & Varney, "Physical Metallurgy.

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MED 714 P (Elective-I) Hydraulic Pneumatic Control			
	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination Scheme Marks	100	25	Continuous Evaluations 00 Examination 00

1. Importance of Hydraulic & Pneumatic Control system in industries.
2. Basic components of Hydraulic & Control system such as Direction control valves, pumps, Linear actuators, Pressure control & flow control, Rotary actuators, Accumulators, Reservoirs ect.
3. Hydraulic & Pneumatic symbols for ckt components.
4. System and pipeline layouts.
5. Automation and principles of circuit design.
6. Electrical control in Hydraulic & Pneumatic circuit.
7. Maintenance and trouble shorting in H & P ckt.
8. Elementary ideas of application of Microprocessor in Hydraulic & Pneumatic ckts.

REFERENCES:

1. S. R. Majumdar, "pneumatic system Principles and Maintenance", Tata Mc Graw Hill, 1995.
2. J. J. Pippernger & T. G. Hick, "Industrial Hydraulics", Mc Graw Hill,
3. F.D. Yeaple, "Hydraulic and Pneumatic power and control", Mc Graw Hill, 1966.
4. V.P. Rohner, "Industrial Hydraulic control", Prentice Hall, 1986.
5. E.W. Reed, I. S. Larman, "Fluid power with Microprocessor control", Prentice Hall, 1985.

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MED 715 P (Elective-I) Materials Management			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	3	1	0
Examination Scheme Marks	100	25	Continuous Evaluations 00 Examination 00

1. Material management introduction - scope & importance - integrated systems approach to materials management.
2. Fundamental of materials management & purchasing - material specification - selection of supplier.
3. Specification, standardization & variety reduction - Importance and forms of specification - Indian standard - certification - types of coding.
4. Purchase management - purchasing functions and principles - six rights - purchase systems. Materials planning & budgeting - Factors affecting materials planning - techniques - materials budgeting & accounting.
5. Cost reduction through materials management - standardization and variety reduction - budgetory control - wastage control - scrap disposal.
6. Make or buy decisions - influencing factors - cost considerations.
7. Inventory management. ABC, XYZ, HML, VED, SDE, GOLF & SOS classification. Safety stock calculations, inventory management under risk & uncertainly.
8. Evaluation of materials management and performance - efficiency indices.;

REFERENCES:

1. N. M. Shah, "An Integrated Concept of Materials Management" , Tata Mc Graw Hill Publishing Co. P. Ltd., New Delhi, 1988.
2. Gopalkrishnan & M. Sundaresan, "Material Management - An Integrated Approach", Prentice Hall of India P. Ltd., New Delhi. 1992.
3. Donald W. Dobler, Lamer be Jr. & David N. Bart, "Purchasing & Materials Management" , Tata Mc Graw Hill Publishing Co. Ltd., New Delhi. 1994.