JABALPUR ENGINEERING COLLEGE, JABALPUR (MP)
(An Autonomous Institute of Govt. of M.P.)

Affiliated to Rajiv Gandhi Technological University, Bhopal (MP)

Scheme of Study and Examination (w.e.f. July 2010)

B.E. Third Year **Branch : INDUSTRIAL & PRODUCTION** **Sem : Fifth**

Course Code	Subject	Periods			EVALUATION SCHEME					Credits
					SESSIONAL EXAM			ESE	SUB TOTAL	
		L	T	P	TA	CT	TOTAL			
IP-12	Operations Management	3	1	-	10	20	30	70	100	4
IP-13	Turbo Machines	3	1	-	10	20	30	70	100	4
IP-15	Metrology & Quality Control	3	1	-	10	20	30	70	100	4
IP-17	Tool Engineering & Machine Tools	3	1	-	10	20	30	70	100	4
IP-19	Metal Cutting Science	3	1	-	10	20	30	70	100	4
(PRACTICAL/DRAWING/DESIGN)										
IP-14L	Turbo Machine Lab	-	-	2	20	-	20	30	50	2
IP-16L	Metrology & Quality Control Lab	-	-	2	20	-	20	30	50	2
CS-42L	RDBMS Lab	-	-	2	20	-	20	30	50	2
IP-18L	Tool Engineering and Machine Tool Lab	-	-	2	20	-	20	30	50	2
IP-20L	Industrial Training - I	-	-	2	50	-	50	-	50	2
IP-49L	Seminar/Group Discussion	-	-	2	50	-	50	-	50	2
	Total	**15**	**5**	**12**	**230**	**100**	**330**	**470**	**800**	**32**

T.A. Teachers Assessment, CT- Class Test, ESE - End Semester Examination, Total Marks 800 Total Periods : 32, Total Credits : 32

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	OPERATIONS MANAGEMENT	IP-12	Min "D"	Min "D"	5.0

OPERATIONS MANAGEMENT

Unit 1.

Operations Management : Overview, Definition, Scope and Significance, Systems View of Operations Management, Factors of Production, Resource productivity, Productivity.

Plant Location: Issues in plant location, Plant Location Methods, Factor – Rating Systems, Transportation method, Centroid Method, Break Even Analysis, Plant Layout objectives, Types of layouts: Process layout, Systematic Layout Planning, Computerized Layout Techniques, Product Layout: Assembly line balancing, Cellular Layout, Fixed Position Layout..

Unit 2

Product Design and Development : Stages in Product development, Product life cycle, Product Development Process: Generic process and its Variants, Designing for the Customer: Quality Function Deployment, House of Quality, Product analysis, Standardization, Simplification, diversification and Modular design, Measurement of Product Development Performance, Concurrent Engineering.

Unit 3

Forecasting : Need of forecasting, Costs of Forecasting, Methods of Forecasting, Delphi technique, Nominal Group Technique, Simple moving average, Weighted moving average, Exponential Smoothing, Linear Regression method, Forecasting error its sources and measurement.

Operation Scheduling and Control: Functions of Scheduling and Control, Production Scheduling, Machine Loading, Sequencing, Dispatching, Expediting.

Unit 4

Production Planning: Introduction to Aggregate Production Planning and Master Scheduling, Materials Requirement Planning (MRP), MRP Structure and Output, Applications.Manufacturing Resource Planning (MRP II), Just-In-Time production System, Waste and waste elimination, Kanban System and Conwip shop floor control, Kaizan.

Unit 5

Economic Analysis: Capital budgeting, meaning and significance, types of capital expenditure, analysis, interest and present value concept, depreciation, Capital investment evaluation techniques - pay back period, Rate of return on investment, Net Present value method, Internal rate of return method.

Reference Books :

1. Elements of Production Planning & Control by Eilon McMillan
2. **Production and Operations Management by R.Mayer, McGraw Hill**
3. Production and Operations Management by Buffa, McGraw Hill]
4. Product Design and Process Engineering By Niebel and Draper, McGraw Hill
5. Operations Management, Schaum's Outlines, TMH
6. Operations Management by Richard B. Chase, McGraw Hill
7. Production and Operations Management by Adam & Ebert, PHI.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	TURBO MACHINES	IP-13	Min "D"	Min "D"	5.0

TURBO MACHINES

Unit 1

Basics of turbo machines, Principles of impulse and reaction machines.
Steam turbines: Impulse staging, Velocity and Pressure Compounding, Utilization factor,
Analysis for optimum U.F Curtis stage, and Rateau stage, includes qualitative analysis, Effect of Blade and Nozzle losses on Vane Efficiency, Stage efficiency, Analysis for Optimum Efficiency, Mass Flow and Blade Height.

Unit 2

Reactions staging: Parson's stages, Degree of reaction, Nozzle Efficiency, Velocity
Coefficient, Stage Efficiency, Carry over efficiency, Vane Efficiency, Conditions for Optimum Efficiency, Speed Ratio, Axial thrust, Reheat Factor in Turbines, Governing and Performance Characteristics of Steam Turbines.

Unit 3

Water turbines: Classification, Pelton, Francis and Kaplan turbines, Vector diagrams and Work-done, Draft tubes, Governing of Water Turbines.

Centrifugal Pumps: Classification, Advantage over Reciprocating Type, Definition of Mano-metric head, Gross head, Static head, Vector diagram and work done.

Unit 4

Rotary Compressors: (a) **Centrifugal Compressors** – Vector diagrams, Work done, Temp. and Pressure ratio, Slip factor, Work input factor, Pressure Coefficient, Dimensions of Inlet eye, Impeller and Diffuser.
Axial flow Compressors- Vector Diagrams, Work done factor, Temperature Dimensional Analysis, Characteristics, Surging, Polytrophic and Isentropic Efficiencies.

Unit 5

Gas Turbines: Introduction, Classification, Application. Gas turbine & its components. Closed and open cycle Gas turbines, Optimum Pressure ratio for maximum specific & thermal efficiency in actual Gas Turbine Cycle. Effect of operating variables on thermal efficiency.

References:

1. Venkanna B. K.; Turbomachinery; PHI
2. Hill G Philip and Peterson RC; Mechanics and thermodynamics of propulsion; Pearson.
3. Kadambi V Manohar Prasad; An introduction to EC Vol. III-Turbo machinery; Newage Delhi
4. Ganeshan V; Gas Tuirbines; TMH
5. Yahya SM; Turbines, Compressors and Fans; TMH
6. Shepherd DG; Principles of Turbo machinery; McMillan
7. Bansal R. K; Fluid Mechanics & Fluid Machines; Laxmi Pub
8. Sarvanmulto HIH, Rogers GFC &; Cohen Henry Gas Turbine Theory; Pearson

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	METROLOGY & QUALITY CONTROL	IP-15	Min "D"	Min "D"	5.0

METROLOGY & QUALITY CONTROL

Unit 1

General concept of measurement: Definition-standards of measurement, Errors in measurement, Limit-gauging, various systems of limits, Fits and tolerance, Interchangeability, Tolerance analysis in manufacturing and assembly, ISI and ISO system. Basic principles and design of standards of measuring gauges, Types of gauges and their design, Taylors Principal, Accuracy and precision, Calibration of instruments, Principals of light interference, Interferometer, Measurement and calibration, Tolerance analysis in manufacturing and assembly.

Unit 2

Linear and angular measurements: Slip gauges, Micrometers, Dial gauges, Surface plates, Comparators Mechanical, Electrical, Pneumatic and optical comparators, Angular measuring instruments-Sine bar, Angle gauges, Sprit level, Autocollimators, Clinometers, Measurement of straightness, flatness, squareness, roundness, and symmetry Inspection of screw threads and gears.

Unit 3

Measurement of surface finish and measuring machines: Surface finish-Definitions, types of surface texture, Surface roughness measurement methods, Visual inspection, Surface roughness blocks, Averaging Instruments, Profile-meters, Pneumatics and replica, Measurement of run out and concentricity, Length bar measuring machine, Optical projection, Comprators, Tool makers microscope, Inspection of Screw threads and gears, Measurement of straightness, flatness, roundness, squareness and symmetry.

Unit 4

Statistical Process Control: Basic Discrete and Continuous distributions, Measures of central tendency, Variability and shapes, Sampling, Size and Central value theorem, Control chart structure, Process plotting and stability, Study of out-of-control evidences, Defect detection and prevention, Use of control charts in evaluating past, present and future trends; Variables and Attributes, Concept of Control Charts, Types of Control Charts, Control Charts for Attributes, p Chart, np Chart, c Chart u Chart, Control Charts for Variables x Chart, R Chart.

Unit 5

Process Capability and Sampling Plans: Introduction, Variation in Process, Types of Variations, Factors Contributing Variations ,Analysis of Process Capability, Acceptance sampling, Advantages and limitations of sampling inspection, Sampling methods, Single, Double and Multiple sampling plan, Operating Characteristic curve, Producer Risk and consumer Risk. Quality indices for acceptance sampling plans, Average outgoing quality limit (AOQL), Characteristics of OC curve, Characteristics of good sampling plan,.

References:

1. ASTE.Handbook of Industrial Metrology.PHI Publications.
2. Jain.R.K.Engineering Metrology. khanna Publications.
3. Gupta.I.C.A Text book of Engineering Metrology.Dhanpat Rai and Sons.
4. Galye.G.N.Metrology for Engineers.Elbs Publications.
5. Rajput.R.K.Engineering Metrology and Instrumentation.S.K.Kataria&Sons.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	TOOL ENGINEERING & MACHINE TOOLS	IP-17	Min "D"	Min "D"	5.0

TOOL ENGINEERING & MACHINE TOOLS

Unit 1

Basic Features and Kinematics of Machine Tools: Features of basic machine tools, Construction and operation, types of machine tools, Machine tools motion, and transmission-rotation in to rotation, Rotation in to translation, Kinematical-structures of machine tools, Elementary, Complex and compound structure.

Unit 2

Design of Metal Working Tools: Design of press working tools, Press working terminology, Types of press working dies, Principle of metal shearing in press working operation, Design of Shearing, Piercing and Blanking dies, Press tool shearing operations, Bending, Forming and Drawing dies, Embossing, Coining and Spinning operations, Metal working defects.

Unit 3

Design of jigs and fixtures: Principles of Jigs and Fixture Design, Locating and Clamping, Principles of location, Locating devices, Mean Locators or centralisers, Types of clamping devices, Strap clamps, Hinged clamps, C clamps, Quick acting clamps, Elements of Jigs, Types of Jigs, Drilling jigs, Types of drilling jigs, Milling Fixture, Elements of Milling Fixtures, Classification of Milling Fixtures, Turning Fixtures, Grinding and Broaching Fixture, Materials for Jigs and Fixtures, Usefulness of Jigs and Fixtures.

Unit 4

Gear Cutting: Gear generation process: Gear Shaping, Gear Hobbing, Gear finishing process: Gear Shaving, Gear Burnishing, Gear Grinding, Gear Lapping, Gear Honing.

Broaching: Broaching machines, Broach terminology, Types of Broaches, Method of Broaching.

Thread production methods: Thread chasing, Thread Rolling, Die Threading, Thread Tapping, Thread Milling, Thread Grinding.

Unit 5

Polymer and Composits: Introduction, Plastic processing, Injection, Compression and Blow moulding, Extrusion, calendaring and thermoforming, moulding of composites, Dies and mould design for plastics and rubber parts.

Powder Metallurgy: Production of metal powders, Compacting and Sintering.

Mould Design and Acceptance Tests: Common Instruments used in alignment tests, Test procedures, Installation and Leveling, Testing the quality of Grinding and Bearing surfaces, Testing the main Spindle for running, Axial slip, Alignment between two axes, Parallism between an axis and a surface.

References:

1. Mehta. N.K. Machine Tool Design and Numerical Control.TMH.Publications.
2. Sen. G.C., Bhattacharya. A., Principles of Machine Tools. New Central Book Publications.
3. Donaldson. Tool Design. TMH.Publication.
4. Jain. K.C. A Text Book of Production Engineering PHI. Publication.
5. Juneja, Sekhon & Seth. Fundamentals of Metal Cutting and Machine Tools. New Age Publications.
6. Sharma.P.C. Production Engineering. S.chand Publications.

Wilson. Fundamentals of Tool Design. ASTME.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	METAL CUTTING SCIENCE	IP-19	Min "D"	Min "D"	5.0

METAL CUTTING SCIENCE

Unit 1

Principles of metal cutting: Geometry of single pointed cutting tools, types of cutting tool, tool signature & nomenclature, Orthogonal and Oblique cutting, Measurement of cutting force, Merchant circle and force analysis of single point orthogonal cutting, Cutting tool material, Mechanism of cutting and chip formation, Types of chips, Tool Failure,.

Unit 2

Tool Life and Thermal aspect of cutting: Heat distribution, Shear plane temperature in orthogonal cutting, Determination of tool temperature, Tool life equation, Effect of process parameters on tool life, Tool life tests, Mechanism of tool wear, Types of tool wear, Economics of Machining Process, Machinability.

Unit 3

Cutting Fluids: Types of Cutting Fluid, Composition of Cutting Fluid, Selection of Cutting Fluids, Method of applying cutting fluid, Benefits,

Lathe: Lathe- specification, Components & accessories, various operations on lathes, Lathe parameters, Cutting speed, Depth of cut, Capstan & Turret lathes, tool layout, Machining time calculation, Methods of Screw production.

Unit 4

Milling: Working principle, classification, Specification, Accessories & Attachment, Milling Cutters, Elements of plain milling cutter, up milling and down milling, Thread milling, Universal dividing head, Indexing Methods: Direct Indexing, Plain or Simple Indexing, Compound Indexing, Differential Indexing, Angular Indexing, Machining time calculation.

Unit 5

Shapers: Classification and Specifications, Principle parts, Quick return mechanism, Shaper operations, Cutting speed, Feed, Depth of cut, Machining time calculation.

Drilling: Classification & specification of Drilling Machines, Work holding and Tool holding devices, Drilling Machine Operations, Machining time.

References:

1. Groover MP; Fundamentals of modern manufacturing; Wiley India
2. Kaushish JP; Manufacturing processes; PHI
3. Boothroyd G, Knight WA; Fundamentals of machining and machine tools; CRC-Taylor and francis
4. Munoz J and Oswald PF; Manufacturing processes and systems; Wiley India;
5. Boston; Metal Processing.
6. Hazra Chowdhary; Workshop Technology.II
7. Lindberg – Materials & Processes of Manufacture.
8. Work shop technology by Raghuvanshi-Vol-II
9. Production Processes by HMT

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	TURBO MACHINE LAB	IP- 14L	Min "D"	Min "D"	5.0

TURBO MACHINE LAB

List of Experiments

1. To study various parameters of steam turbine.
2. To study various Performance parameters of Pelton wheel.
3. To study various Performance parameters of Francis Turbines.
4. To study various Performance parameters of Kaplan turbines.
5. To study various Performance parameters of Centrifugal Pumps.
6. To study various Performance parameters of Rotary Compressors**.**
7. To study various Performance parameters of Gas Turbines.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	METROLOGY & QUALITY CONTROL LAB	IP- 16L	Min "D"	Min "D"	5.0

METROLOGY & QUALITY CONTROL LAB

List of Experiments

1. To study various measuring gages and their design and conduct experiments.
2. To study Introferometer.
3. Measurement by linear and Angular Measuring Instruments.
4. To study straightness, flatness, squareness, roundness, of the given symmetry.
5. To construct Control Charts for Attributes and for Control Charts for Variables.
6. To construct Operating Characteristic curve.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	RDBMS LAB	CS-42L	Min "D"	Min "D"	5.0

RDBMS LAB

List of Experiment (Expandable) :

UNIT-I : Introduction: Advantage of DBMS approach, various view of data, data independence, schema and sub-schema, primary concepts of data models, Database languages, transaction management, Database administrator and users, data dictionary, overall system architecture.

ER model: basic concepts, design issues, mapping constraint, keys, ER diagram, weak and strong entity sets, specialization and generalization, aggregation, inheritance, design of ER schema, reduction of ER schema to tables.

UNIT-II : **Domains, Relations and keys:** domains, relations, kind of relations, relational database, various types of keys, candidate, primary, alternate and foreign keys.

Relational Algebra & SQL: The structure, relational algebra with extended operations, modifications of Database, idea of relational calculus, basic structure of SQL, set operations, aggregate functions, null values, nested sub queries, derived relations, modification of Database, join relation,DDL in SQL.

UNIT-III: **Relational Dependencies and Normalization:** basic definitions, trivial and non trivial dependencies, closure set of dependencies and of attributes, irreducible set of dependencies, introduction to normalization, non loss decomposition, FD diagram, first second, third Normal forms, dependency preservation, BCNF, multivalued dependencies and forms normal form dependeny and fifth normal forms. **Distributed Database:** basic idea, distributed data storage, data replication, data fragmentation horizontal, vertical and mixed fragmentation.

UNIT-IV : **Emerging Fields in DBMS :** object oriented Database-basic idea and the model, object structure, object class, inheritance, multiple inheritance, object identity, data warehousing-terminology, definitions, characteristics, data mining and it's overview, Database on www, multimedia Database-difference with conventional DBMS, issues, similarity based retrived continuous media data, multimedia data formats, video servers.

Unit V : **Storage structure and file organizations:** Overview of physical storage media, magnetic disksperformance and optimization, basic idea of RAID, organization, organization of records in files, basic concepts of indexing, ordered indices, basic idea of B-tree and B+-tree organization.

Network and hierarchical models: basic idea, data structure diagrams, DBTG model, implementations, tree structure diagram, implementation techniques, comparision of the three models.

References:

1. A Silberschatz, H.F. Korth, Sudersan "Database System Concept"=, MGH Publication.
2. C.J. Date "An introduction to Database System"=6th ed.
3. Elmasri & Navathe "Foundamentals of Database system"- III ed.

Practical List of RDBMS : 1. Study of DBMS, RDBMS 2. To study Data Definition language Statatements. 3. To study Data Manipulation Statatements. 4. Study of SELECT command with different clauses. 5. Study of SINGLE ROW functions (character, numeric, Data functions).
6. Study of GROUP functions (avg, count, max, min,Sum). 7. Study of various type of SET OPERATORS (Union, Intersect, Minus). 8. Study of various type of Integrity Constraints.
9. Study of Various type of JOINS. 10. To study Views and Indices.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	TOOL ENGINEERING AND MACHINE TOOL LAB	IP- 18L	Min "D"	Min "D"	5.0

TOOL ENGINEERING AND MACHINE TOOL LAB

List of Experiments

1. Draw Kinematical-structures of machine tools.
2. To study Complex and compound structure of machine tools.
3. To study Principle of metal shearing in press working operations.
4. Design of Shearing, Piercing and Blanking dies.
5. Jigs and Fixture Design.
6. To study Gear generation process.
7. To study various Performance parameters of Thread generation methods.
8. To study various methods of Powder Metallurgy.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
IP	INDUSTRIAL TRAINING - I	IP- 20L	Min "D"	Min "D"	5.0

INDUSTRIAL TRAINING - I

The student shall go to an Industry at the end of Fourth Semester during summer and shall prepare a report on the Practical Training undergone there. He has to present the report in Fifth semester and assessment will be done by committee of two members (Headed by H.O.D. of the Department).

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
IP	**SEMINAR/GROUP DISCUSSION**	IP- 49L	Min "D"	Min "D"	5.0

Objectives of Group Discussion & Seminar is to improve the Mass Communication and Convincing/ understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves.

Evaluation will be done by assigned faculty based on group discussion and power point presentation.