Jabalpur Engineering College, Jabalpur

Semester V Credit Based Grading System (CBGS) w.e.f. July 2017

Scheme of Examination

Bachelor of Engineering B.E. (Industrial and Production Engineering)

Subject wise distribution of marks and corresponding credits

Scheme of Examination w.e.f. July-2017 Academic Session-2017-18

S. No.	Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours / week.			Total Credits	Total Marks
			Theory			Practical		Total Marks					
			End Sem	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work		L	T	P		
1	**IP5001**	Operations Management	70	20	10	-	-	100	3	1	-	4	
2	**IP5002**	Turbo Machines	70	20	10	30	20	150	3	1	2	6	
3	**IP5003**	Tool Engineering & Machine Tools	70	20	10	30	20	150	3	1	2	6	
4	**IP5004**	Metal Cutting Science	70	20	10	30	20	150	3	1	2	6	
5	**IP5005**	Elective-I	70	20	10	-	-	100	3	1	-	4	
6	**IP5006**	Departmental Lab-II (Metrology & Quality Control)	-	-	-	30	20	50	-	-	2	2	
7	**IP5007**	Management Skill Development	-	-	-	-	50	50	-	-	2	2	
8	**IP5008**	Evaluation of Industrial Training (Internal Assessment)	-	-	-	-	50	50	-	-	2	2	
Total			**350**	**100**	**50**	**120**	**180**	**800**	**15**	**5**	**12**	**32**	**800**

MST: Minimum of two mid semester tests to be conducted.

L: Lecture **T: Tutorial** **P: Practical**

Elective-I	
Subject Code.	**Subject Name**
IP5005A	Metrology & Quality Control
IP5005B	Sequencing and Scheduling
IP5005C	Productivity Management
IP5005D	Strategic Entrepreneurship

B.E.CBGS V SEMESTER
OPERATIONS MANAGEMENT

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Operations Management	IP5001	Min. "D"	Min. "D"	5.0

Unit-I:

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-II: 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-III: 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-IV: 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-V: Economic Analysis:

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

Books Reference:

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.

B.E.CBGS V SEMESTER
TURBO MACHINES

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Turbo Machines	IP5002	Min. "D"	Min. "D"	5.0

Unit-I:

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-II: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-III:

Water turbines: Classification, Pelton, Francis and Kaplan turbines, Vector diagrams and Workdone, 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-IV: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-V: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.

Books 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

TURBO MACHINES

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.

B.E.CBGS V SEMESTER
TOOL ENGINEERING & MACHINE TOOLS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Tool Engineering & Machine Tools	IP5003	Min.“ D”	Min. “D”	5.0

Unit-I: Basic Features and Kinematics of Machine Tools:

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

Unit-II: 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-III: 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-IV: 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-V: 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.

Books 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.
7. Wilson. Fundamentals of Tool Design. ASTME.

TOOL ENGINEERING & MACHINE TOOLS

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.

B.E.CBGS V SEMESTER
METAL CUTTING SCIENCE

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Metal Cutting Science	IP5004	Min. "D"	Min. "D"	5.0

Unit-I: 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-II: 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-III: 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-IV: 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-V:

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.

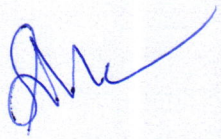
Books References:

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 HM

METAL CUTTING SCIENCE

List of Experiments:

1. Study of Cupola (Melting Practices, capacity, operation, zones and Efficiency of cupola)
2. Study of crucible furnaces and types of crucible furnaces.
3. Study of various Casting systems (Permanent mould casting, slush casting, die casting, centrifugal casting, investment casting, continuous casting).
4. Study of various Metal Forming process.
5. Study of various Abrasive processes. (Specification, characteristics, abrasive types, grinding operation, cylindrical grinding, surface grinding, centre less grinding, form grinding, internal cylindrical grinding)
6. Study of various Forging process. (forging operations, forging design, drop forging, die design, die inserts)
7. Study of various Extrusion process. (extrusion- principle, forward and backward extrusion, impact extrusion, hydrostatic extrusion)



B.E.CBGS V SEMESTER
(ELECTIVE-I) METROLOGY & QUALITY CONTROL

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	(Elective-I) Metrology & Quality Control	IP5005A	Min. "D"	Min. "D"	5.0

Unit-I: 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-II: Linear and angular measurements:

Slip gauges, Micrometers, Dial gauges, Surface plate 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-III: 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-IV: 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-V: 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,.

Books 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.

B.E.CBGS V SEMESTER
(ELECTIVE-I) SEQUENCING AND SCHEDULING

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	(Elective-I) Sequencing And Scheduling	IP5005B	Min. "D"	Min. "D"	5.0

Unit –I:

Single machine models - Scheduling function and theory – scheduling problem: objectives, constraints– pure sequencing – performance measures, sequencing theorems - SPT, EDD sequence minimization of mean flow time, mean tardiness etc – branch and bound algorithm –assignment model.

Unit- II:

Parallel machine models - Independent jobs, Minimizing make span.Job shop models – dynamic job shop simulation.

Unit –III:

Flow shop models - Johnson's problem – Extension of Johnsons's rule for 3 machine problem – Jackson's method – algorithm – Palmer's method.

Unit –IV:

Other models - Scheduling of intermittent production: Resource smoothing – Giffler Thomson algorithm – Branch and Bound method – Scheduling of continuous production - Line balancing.

Unit –V:

Industrial problems of Sequencing and Scheduling, Use of software in solving Sequencing and Scheduling problems.

Books References:

1. Michael Pinedoo, Scheduling: theory, algorithms and systems, Prentice Hall, New Delhi, 1995.
2. King, J.R. Production planning and control, Pergamon International Library, 1975.
3. Kenneth R.Baker, Introdution to sequencing and scheduling, John Wiley and Sons, 1974.

B.E.CBGS V SEMESTER
(ELECTIVE-I) PRODUCTIVITY MANAGEMENT

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	(Elective-I) Productivity Management	IP5005C	Min. "D"	Min. "D"	5.0

Unit –I: Introduction: Productivity Basics:

Concern and the Significance of Productivity Management, the Rationale of Productivity Measurement, Productivity: Some Perspectives, Productivity Measurement: A Case for Re-appraisal.

Unit –II: Productivity Measurement: A Conceptual Framework:

Objectives of Productivity Measurement, Management by Objectives (MBO) and Productivity Measurement, Systems Approach to Productivity Measurement, Performance Objectives – Productivity (PO-P) : The Concept, PO-P: The Model, PO-P: The Methodology.

Unit –III: Productivity Measurements in Manufacturing Sector:

Productivity Measurement in Manufacturing Sector, Productivity Measurement in a Medium Sized Organization, Productivity Measurement in a Large Sized Organization.

Unit –IV: PO-P Application : Productivity Measurement in Service Sector:

Need for measuring Productivity in Service Sector, Difficulties in measuring productivity,Productivity of an R&D System, Productivity of an Educational Institution.

Productivity Management : The Role of External Environment External Environment and Organization, Impact of external Environment, External Environment: Its Sub-systems, Approaches to measure Impact of External Environment.

Unit –V: Productivity Management and Implementation Strategies:

Productivity Management System, Productivity Policy, Productivity: Organisation & Planning, Productivity Measurement, Productivity Measurement Evaluation, Productivity Improvement Strategies, Productivity Audit and Control

Books References:

1. Productivity Management by Prem Vrat, G.D.Sardana and B.S.Sahai
2. Production and Operations Management by S.A.Chunawalla and D.R.Patel

B.E.CBGS V SEMESTER
(ELECTIVE-I) STRATEGIC ENTREPRENEURSHIP

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	(Elective-I) Strategic Entrepreneurship	IP5005D	Min. "D"	Min. "D"	5.0

Unit- I: Small Scale Industries:

Definition and types of SSI's ; Role, scope and performance in national economy; Problems of small scale industries.

Industrial Sickness

Definition; Causes of sickness; Indian scenario, Government help; Management strategies; Need for trained entrepreneurs

Unit- II: Entrepreneurship Development Programmes:

Introduction, Origin of EDP's , Organizations involved in EDP's, Objectives of EDPs, Implementation of EDP's, Short comings of EDP's, Role in entrepreneurship development.

Unit –III: Business Incubation:

Introduction, Origin and development of business incubators in India and other countries, types of incubators, success parameters for a business incubator, Benefits to industries, institutes, government and society; future prospects. A few case studies (at least 2).

Unit –IV: Special Aspects of Entrepreneurship:

Entrepreneurship, Social entrepreneurship, International entrepreneurship, Rural entrepreneurship, Community Development, Women entrepreneurship.

Unit- V: Network Marketing:

Introduction, E-business, E-commerce, E-auction, A basic internet e-business architecture, A multi tiere-business architecture.

Books References:

1. Strategic Entrepreneurship by P.K. Gupta, (Everest Publishing House)
2. Project Management – Strategic Design and Implementation by David Cleland (McGraw Hill)
3. Entrepreneurship-New Venture Creation by David H Holl (Prentice Hall of India)
4. Sustainable Strategic Management by Steed & Steed (Prentice Hall of India)
5. Marketing Management by Kotler (Prentice Hall of India)
6. Management of Technology by Tarek Khalil (McGraw Hill)
7. Engineering Economic Principles by Henry Steiner (McGraw Hill)

B.E.CBGS V SEMESTER
DEPARTMENTAL LAB –II (METROLOGY & QUALITY CONTROL)

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Departmental Lab – II (Metrology & Quality Control)	IP5006	Min. "D"	Min. "D"	5.0

List of Experiments:

1. To study various measuring gages and their design and conduct experiments.
2. To study Interferometer.
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 cur