Jabalpur Engineering College, Jabalpur
Semester IV 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	MA4101	Mathematics-III	70	20	10	-	-	100	3	1	-	4	
2	IP4002	Theory of Machines & Mechanisms	70	20	10	30	20	150	3	1	2	6	
3	IP4003	Fluid Mechanics-I	70	20	10	30	20	150	3	1	2	6	
4	IP4004	Machine Drawing & CAD	70	20	10	30	20	150	3	1	2	6	
5	IP4005	Machine Design	70	20	10	-	-	100	3	1	-	4	
6	IP4006	Departmental Lab-I (Machine Design)	-	-	-	30	20	50	-	-	2	2	
7	IP4007	Programming Tools (Departmental Choice) (Internal Assessment)	-	-	-	-	50	50	-	-	2	2	
8	IP4008	Professional Ethics/ Security and regulation act (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

- **Students have to go for Industrial Training /Internship of 4 weeks at the end of IV Semester.**

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B.E. (CBGS) IV SEMESTER
INDUSTRIAL AND PRODUCTION ENGINERRING
MATHEMATICS- III

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	Mathematics- III	MA4101	Min. "D"	Min. "D"	5.0

Unit-I:

Analytic functions, Cauchy- Riemann equations in Cartesian and polar coordinates, harmonic and conjugate harmonic functions, Complex integration, line integral, Cauchy's integral theorem, Cauchy integral formula.

Unit –II:

Residue theorem, evaluation of simple real integrals, Taylors and Laurent series, Conformal mappings, mappings of elementary functions, Bilinear transformations, Jock vow ski's transformation, Schwarz – Christ of fel transformation.

Unit –III:

Roots of algebraic and transcendental equations: Bisection method, Regula-Falsi method, Newton-Raphson method, iteration method, Graffes root squaring method. Solution of system of linear equations: Gauss elimination method, Gauss Jordan method, LU decomposition method, relaxation method, Jacobi and Gauss-Seidel methods.

Unit –IV:

Interpolation: Finite difference operator and their relationships, difference tables, Newton, Gauss, Bessel and Stirling's interpolation formulae, Divided differences, Lagrange Interpolation and Newton's divided difference interpolation.Numerical differentiation and Integration: First and second order derivatives by various interpolation formulae, Trapezoidal, Simpsons 1/3rd and 3/8th rules with errors and their combinations, Gauss Legendre 2-points and 3-points formulae.

Unit –V:

Numerical Solution of ordinary differential equations: Solution of ODE by Taylor series, Picard's method, Modified Euller method, Runge-kutta Method, predictor corrector method.Sampling: Brief idea of sampling, t, F and χ^2 distribution and their applications, ANOVA, Statistical quality control, control charts, sampling inspection, acceptance sampling, Producers and consumers risk, O.C. curve, Taguchi method.

Reference Books:

1. Advanced Engineering Mathematics by E. Kreyszig John Willey & Sons

2. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.

3. Numerical Methods in Engineering and science by B.S. Grewal, Khanna Publishers .

4. Higher Engineering Mathematics by B.V. Ramana TMH.

5. Numerical Methods by E. Balagurusamy, Tata Mc Graw- Hill Publishing CompanyLtd., New Delhi.

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B.E. (CBGS) IV SEMESTER
INDUSTRIAL AND PRODUCTION ENGINERRING
THEORY OF MACHINES & MECHANISMS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	Theory of Machines & Mechanisms	IP4002	Min. "D"	Min. "D"	5.0

Unit-I:

Mechanisms and Machines: Mechanism, machine, planer mechanisms, kinematic pairs, kinematic chains and their classification, degrees of freedom, Grubler's criterion, kinematic inversions of four bar mechanism and slider crank mechanism, equivalent linkages, straight line motion mechanisms, pantograph, Davis and Ackermann's steering mechanisms, kinematic analysis of planer mechanisms using graphical techniques, relative velocity method, instantaneous center method and its application, Kennedy's theorem, coriolis component of acceleration.

Unit-II:

Governors: Types, porter, proell, hartnell, wilson- hartnell, effort and power, controlling force, sensitiveness, hunting, isochronisms, and stability of governors. Fly wheel, turning moment diagram, energy stored.

Unit-III:

Gears: Classification of gears, nomenclature, involutes and cycloidal tooth profile properties, synthesis of tooth profile for spur gears, tooth system, conjugate action, velocity of sliding, arc of contact, path of contact, contact ratio, interference and undercutting, helical, spiral, bevel and worm gears.

Unit-IV:

Cams: Classification of followers and cams, radial cam nomenclature, analysis of follower motion (uniform, modified uniform, simple harmonic, parabolic, cycloidal), pressure angle, radius of curvature, synthesis of cam profile by graphical approach, cams with specified contours. Gear Trains: Simple, compound, epicyclic gear trains; determination of gear speeds using vector, analytical and tabular method; torque calculations in simple, compound and epicyclic gear trains.

Unit-V:

Gyroscopic Action in Machines: Angular velocity and acceleration, gyroscopic torque/ couple, gyroscopic effect on naval ships, stability of two and four wheel vehicles, rigid disc at an angle fixed to a rotating shaft
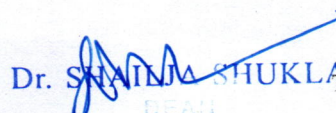
Books References:

1. Rattan SS; Theory of machines; TMH
2. Ambekar AG; Mechanism and Machine Theory; PHI.
3. Sharma CS; Purohit K; Theory of Mechanism and Machines; PHI.
4. Thomas Bevan; Theory of Machines; CBS PUB Delhi.
5. Rao JS and Dukkipati; Mechanism and Machine Theory; New Age Delhi.
6. Dr.Jagdish Lal; Theory of Machines; Metropolitan Book Co; Delhi –
7. Ghosh,A,.Mallik,AK; Theory of Mechanisms & Machines, 2e,; Affiliated East West Press, Delhi.

THEORY OF MACHINES AND MECHANISMS LAB

List of Experiments (Expandable):

1. To study all inversions of four-bar mechanisms using models
2. Draw velocity and acceleration polygons of all moving link joints in slider crank mechanism
3. Determination of velocity and acceleration in above using method of graphical differentiation
4. To study working of differential gear mechanism.
5. To study working of sun and planet epicycle gear train mechanism using models
6. To plot fall and rise of the follower versus angular displacement of cam and vice versa
7. Study of universal gyroscope
8. Analytical determination of velocity and acceleration in simple mechanism using Roven's M.

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B.E. (CBGS) IV SEMESTER
INDUSTRIAL AND PRODUCTION ENGINERRING
FLUID MECHANICS-I

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	Fluid Mechanics-I	IP4003	Min. "D"	Min. "D"	5.0

Unit-I:

Review of Fluid Properties: Engineering units of measurement, mass, density, specific weight, volume and gravity, surface tension, capillarity, viscosity, bulk modulus of elasticity, pressure and vapor pressure. Fluid Static's : Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems on gravity dams and tainter gates); buoyant force, Stability of floating and submerged bodies, Relative equilibrium.

Unit-II:

Kinematics of Flow : Types of flow-ideal & real , steady & unsteady, uniform & non-uniform, one, two and three dimensional flow, path lines, streak-lines, streamlines and stream tubes; continuity equation for one and three dimensional flow, rotational & irrotational flow, circulation, stagnation   point, separation of flow, sources & sinks, velocity potential, stream function, flow nets their utility & method of drawing flow nets.

Unit-III:

Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow, momentum correction factor. The moment of momentum equation, forces on fixed and moving vanes and other applications. Flow Measurements: Velocity measurement (Pitot tube, Prandtl tube, current meters etc.), flow measurement (orifices, nozzles, mouth pieces, orifice meter, nozzle meter, venture- meter, weirs and notches).

Unit-IV:

Dimensional Analysis and Dynamic Similitude: Dimensional analysis, dimensional homogeneity, use of Buckingham-pi theorem, calculation of dimensionless numbers, similarity laws, specific model investigations (submerged bodies, partially submerged bodies, weirs, spillways, rotodynamic machines etc.)

Unit-V:

Laminar Flow: Introduction to laminar & turbulent flow, Reynolds experiment & Reynolds number, relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel plates, laminar flow through porous media, Stokes law, lubrication principles.

Books References:
1. Modi & Seth; Fluid Mechanics; Standard Book House, Delhi
2. Som and Biswas; Fluid Mechnics and machinery; TMH
3. Cengal; Fluid Mechanics; TMH
4. White ; Fluid Mechanics ; TMH
5. JNIK DAKE; Essential of Engg Hyd; Afrikan Network & Sc Instt. (ANSTI)
6. Franiss JRD; A Text Book of fluid Mech. for Engg. Student
7. R Mohanty; Fluid Mechanics; PHI.
8. Gupta; Fluid Mechanics; Pearson.

FLUID MECHANICS-1 LAB

List of Experiment (Expandable):
1. To determine the local point pressure with the help of pitot tube.
2. To find out the terminal velocity of a spherical body in water.
3. Calibration of Orifice meter and Venturi meter
4. Determination of Cc, Cv, Cd of Orifices
5. Calibration of Nozzle meter and Mouth Piece
6. Reynolds experiment for demonstration of stream lines & turbulent flow
7. Determination of meta-centric height
8. Determination of Friction Factor of a pipe
9. To study the characteristics of a centrifugal pump.
10. Verification of Impulse momentum principle.

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Fluid Mechanics-I

B.E. (CBGS) IV SEMESTER
INDUSTRIAL AND PRODUCTION ENGINERRING
MACHINE DRAWING & CAD

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	Machine Drawing & CAD	IP4004	Min. "D"	Min. "D"	5.0

Unit-I:

Drawing conventions, drawing and dimensioning IS codes, sectional views and sectioning, surface finish and tolerances, representation of machine parts such as external and internal threads, slotted heads, square ends, and flat radial ribs, slotted shaft, splined shafts, bearings, springs, gears. Rivet heads and riveted joints, types of welded joints and representation.

Unit II:

Assembly Machine Drawing: Basic concept, plotting technique, assembly and blow up of parts, bill of materials, product data. Cotter and knuckle joints, pedestal and footstep bearings, crosshead, stuffing box, IC engines parts- piston and connecting rods, lath machine parts.

Unit III:

CAD software for 2D and 3D modeling, basic design concepts, design process, stages/phases in design, flowchart, problem formulation, design considerations (strength, manufacturing, maintenance, energy, environment, economics and safety), design for recycle and reuse, design and safety factors for steady and variable loads, impact and fatigue considerations, reliability and optimization, standardization in design.

Unit-IV:

Design of components subject to static loads: Riveted joints, welded joints, threaded joints, pin, knuckle, and cotter joints.

Books References:

1. Bhat, ND; Machine Drawing; Charotar
2. Singh A; Machine Drawing; TMH
3. Narayana and Reddy; Machine Drawing; New age, Delhi.
4. Agarwal and agrawal; Engineering Drawing; TMH
5. Shigley JE et al; Mechanical Engineering Design, TMH
6. Kulkarni SG; Machine Design; TMH
7. Mubeen and Mubeen; Machine Design.
8. Luzzader WJ, Duff JM; Fundamental of Engg Drawing and Interactive Graphics; PHI.

Note: Weightage of Individual Unit as follows.

Unit -I	Unit -II	Unit -III	Unit -IV
20%	40%	20%	20%

MACHINE DRAWING& CAD

List of Experiments:

1. Introduction to Compute Aided Drafting software for 2D and 3D Modeling
2. Computer Aided Drafting of simple machine parts
3. D Modeling of simple solid shapes
4. Design and drawing of parts contained in the syllabus

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B.E. (CBGS) IV SEMESTER
INDUSTRIAL AND PRODUCTION ENGINERRING
MACHINE DESIGN

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	Machine Design	IP4005	Min. "D"	Min. "D"	5.0

Unit-I:

Stress concentration and fatigue: Causes of stress concentration, stress concentration in tension, bending and torsion, reduction of stress concentration, theoretical stress concentration factor, notch sensitivity, fatigue stress concentration factor, cyclic loading, endurance limit, S-N Curve, loading factor, size factor, surface factor. Design consideration for fatigue, Goodman and modified Goodman's diagram, soderberg equation, Gerber parabola, design for finite life, cumulative fatigue damage factor.

Unit-II:

Shafts: Design of shaft under combined bending, twisting and axial loading, shock and fatigue factors, design for rigidity, design of shaft subjected to dynamic load, design of keys and shaft couplings.

Unit-III:

Design of Bearings: Sliding Bearing, hydrodynamics lubrication, mechanical aspects of bearing design, lubricants, journal bearing design, rolling element bearings.

Unit-IV:

Brakes & Clutches: Materials for friction surface, uniform pressure and uniform wear theories. Design of friction clutches: Disk, plate clutches, cone & centrifugal clutches. Design of brakes: Rope, band & block brake, Internal expending brakes, Disk brakes.

Unit-V:

Design of Power screws types, screw drives, efficiency, stresses in power screws, design procedure and calculation.

Books References:

1. Shigley J.E; Machine Design; TMH
2. Sharma and Purohit; Design of Machine elements; PHI
3. Wentzell Timothy H; Machine Design; Cengage learning
4. Mubeen; Machine Design; Khanna Publisher
5. Ganesh Babu K and Srithar k; Design of Machine Elements; TMH
6. Sharma & Agrawal; Machine Design; Kataria & sons
7. Maleev; Machnine Design;

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B.E. (CBGS) IV SEMESTER
INDUSTRIAL AND PRODUCTION ENGINERRING
MACHINE DESIGN LAB

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E. (CBGS)	Machine Design Lab	IP4006	Min. "D"	Min. "D"	5.0

List of Experiment (Expandable):

Designing and sketching of components contained in the syllabus (Suggested List)

1. To Study S-N Curve for various Elements.
2. Design of Machine Elements for cyclic Loading.
3. Design of Bearings.
4. Design of Friction Clutch.
5. Design of a Shaft Subjected to Combined Loadings.
6. Design of Simple Band Brake.

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