Jabalpur Engineering College, Jabalpur

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

Scheme of Examination

Bachelor of Engineering B.E. (Mechanical 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	**CH3001**	Energy, Environment, Ecology & Society	70	20	10	-	-	100	3	1	-	4	
2	**ME3002**	Strength of Materials	70	20	10	30	20	150	3	1	2	6	
3	**ME3003**	Theory of Machines & Mechanisms	70	20	10	30	20	150	3	1	2	6	
4	**ME3004**	Manufacturing Process	70	20	10	30	20	150	3	1	2	6	
5	**ME3005**	Thermodynamics	70	20	10	-	-	100	3	1	-	4	
6	**CS3106**	Programming-I	-	-	-	30	20	50	-	-	2	2	
7	**ME3007**	1.Rural Outreach/Social service Activities under digital India or clean India 2.Evaluation of Industrial training (Internal Assessment)	-	-	-	-	50	50	-	-	2	2	
8	**ME3008**	NSS/NCC/Professional society activities (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**

B.E.CBGS III SEMESTER
ENERGY ECOLOGY ENVIRONMENT & SOCIETY

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Energy Ecology Environment & Society	CH3001	Min. "D"	Min. "D"	5.0

Unit -I : Energy Sources and Energy Storing Devices :

World and Indian energy scenario, types of energy sources – renewable and non-renewable energy sources. Solar energy storage, application & maintenance of solar cell panel, introduction & applications of hydro, wind, biomass, ocean, tidal, wave and geothermal. Synergy between energy and environment. Global environment issues, greenhouse gas emission, global warming, green energy solution. Batteries – Primary and Secondary batteries- Alkaline battery – Lead (Pb) acid storage battery , Ni-cadmium battery ,Lithium battery, Fuel cell , Hydrogen Oxygen fuel cell ,Photo galvanic cell.

Unit -II : Ecosystem :

Structure & scope of ecology, Natural cycles of the environment, Hydrogen cycle, Oxygen Cycle, Carbon cycle, Nitrogen cycle, Phosphate cycle, Sulphur cycle, Biodiversity.

Society:-

Environmental problems and impact of P.A.T(Population, Affluence and Technology). Environmentally beneficial and harmful technologies, environment impact assessment policies (EIA).Ethics and regulatory act of environment.

Soil Pollution :

Sources & control measures. MSW, HWM.

Unit -III : Air Pollution:

Chemical composition of atmosphere, -primary, secondary, pollutants, Chemical and photochemical reaction, effects of CO, SOx, NOx, HC and particulates. Causes & effects of acid rain, ozone depletion: Monitoring and control of air pollutants.

Noise Pollution:

introduction, physiological effect, measurement and control of noise pollutants.

Unit -IV : Water Pollution:

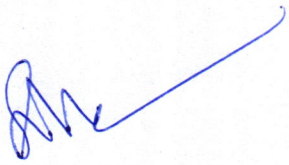
Sources causes of water pollution , types and nature of water pollutants. Pollution load determination i.e. particulates ,suspended matter, total dissolved solids ,dissolved gases DO, BOD & COD. EL NINO phenomenon. Waste water treatment Domestic – Aerobic & anaerobic treatment. Industrial waste water treatment (ETP plant.) Electro dialysis membrane technique and filtration by activated charcoal and synthetic resins.

Unite -V : Corrosion & its Prevention:

Theories of Corrosion and Mechanism – Dry (Direct Chemical attack), Wet (Electro Chemical Theory) Atmospheric corrosion, Galvanic Series, Galvanic & Concentration Cell Corrosion, Corrosion by sea water. Factors Influencing & control of Corrosion – Proper Design, Use of pure metal and metal alloys, passivity, cathodes protection – Sacrificial anode and Impressed Current. Modifying the environment, Use of inhibitors.

Books References :

1. J.C. Kuriakose and J. Raja ram, "Chemistry in Engineering and Technology", Vol.1 & 2, Tata Mcgraw Hill Publishing
2. Company (P) Ltd., New Delhi
3. Mars G. Fontana, "Corrosion Engineering", Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi.
4. F.Chau, Y. Liang, J. Gao and X. Shao, "Chemometrics", Wiley Inter Science.
5. A text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company, New Delhi
6. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd.
7. A text book of Environmental Chemistry and Pollution control by S.S. Dara & Dr. D. D. Mishra, S. Chand & Co, New Delhi
8. Energy, Environment Ecology and Society by Dr.Pushpendra,Vayu Education of India New Delhi .
9. Energy, Environment Ethics and Society, by Dr.S.Deswal & Dr.A.Deswal Dhanpat Rai Publishing Company, New Delhi.



B.E.CBGS III SEMESTER
STRENGTH OF MATERIALS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Strength of Materials	ME3002	Min. "D"	Min. "D"	5.0

Course Objective:

At the completion of course the students will be able:

1. To calculate the stresses and strain of different members of machines.
2. To draw shear force and bending moment diagram for various types of beams with different loadings.
3. To find the deflection of various types of beams with different loadings.
4. To study torsion of shafts and stresses in thin cylinders and spheres.

Course Contents:

Unit-I: Stress and Strain:

Stresses in members of a structure, Axial loading, normal stress, shear stress,analysis of simple structures, stepped rods, members in series and parallel: stress strain diagram,Hooke's law, stress due to temperature, Poisson's ratio, Bulk modulus, shear strain, relation Among elastic constants, residual stress, fiber reinforced composite materials, strain energy underaxial loads and stresses due to impact of falling weights. Transformation of stress and strain,principal stresses, normal and shear stress, Mohr's circle and its application to two dimensional analysis.

Unit-II : Shear Force and Bending Moment:

Pure bending, Bending equation, Flexure formula, Section modulus Bending of symmetric member, Bending of composite sections, Shear force and Bending Moment diagram for cantilevers , beam supported at ends, beams with overhangs. Point of contraflexure, Relationship among load, shear stresses in beams, strain energy in bending.

Unit-III: Deflection of Beams:

Slope, Deflection and Radius of curvature, Cantilevers subjected to various types of load, Macaulay's method and Area moment method for deflection of Cantilever beam, Simply supported beam and Over hanging beam subjected to various types of loads, Relation between maximum bending and maximum deflection.

Unit-IV: Torsion of Shafts:

Theory of pure torsion, Polar modulus, Torsional Rigidity, angle of twist, Torsional stresses in a shafts, Power transmitted by a shaft, Stepped shafts, Composite shafts, Torsional resilience, shafts in series and shafts in parallel, Torsion of a tapering rod.

Unit –V: Columns and Struts:

stability of structures, Crushing load, Crippling load, Euler's formula for columns with different end conditions, Rankine's formula, Limitation of Euler's formula.

Thin Cylinders and Spheres: Circumferential and Longitudinal stresses, Wire bound pipes, Thin spherical shells.

Evaluation:

Evaluation will be continuous an integral part of the class followed by the final examination as well as through external assessment

Books References :

1. Beer FP, Johnson Mechanics of Materials, Sixth Edition; Mc Graw Hills.
2. Debabrata Nag &Abhijet Chanda: Strength of Materials: Wiley.
3. Rattan; Strength of materials;Second Edition , Mc Graw Hills.
4. Nash William; Schaum's Outline Series; fourth Edition Strength of Materials;McGraw Hills.
5. Singh Arbind K; Mechanics of Solids; PHI.
6. Sadhu Singh; Strength of Materials; Khanna Pub.
7. R Subramannian, Strength of materials OXFORD University Press, Third Edition.
8. S Ramamurthum, Strength of materials, Dhanpat Rai.
9. Stephen Timoshenko;Strength of materials; part 1 &2; CBS Pub.

STRENGTH OF MATERIALS

List of Experiments:

1. Standard tensile test on MS and CI test specimen with the help of UTM.
2. Direct/ cross Shear test on MS and CI specimen.
3. Transverse bending test on wooden beams to obtain modulus of rupture.
4. Fatigue test.
5. Brinell hardness tests.
6. Vicker hardness test.
7. Izod/Charpy test.
8. Rockwell Hardness test.

B.E.CBGS III SEMESTER
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.	Theory of Machines & Mechanisms	ME3003	Min. "D"	Min. "D"	5.0

Course Objective:
At the completion of course the students will be able:

1. To describe the working of different mechanism used in machines.
2. To find velocity and acceleration of links of different mechanism.
3. To know the working of different types of gears, gear trains and cams.
4. To know the applications of gyroscopic principle.
5. To know the working principles of belt, rope and chain drive.

Course Contents:

Unit-I: Mechanisms and Machines:

Links, Pairs, Chains, Structure, Mechanism, Machine, Equivalent linkage, Degrees of freedom, Gruebler's & Kutzback's criterion, Inversions of four bar chain,Mechanism with lower pairs Pantograph, Straight line motion mechanisms, Davis and Ackermann's steering mechanisms, Hooke's joint, Numerical problems based on above topics.

Unit-II: Motion:

Plane motion, Absolute & Relative motion, Displacement, Velocity and Acceleration of a point, Velocity and Acceleration Analysis by Graphical & Analytical methods, Velocity of rubbing, Kennedy's Theorem, Acceleration polygon, Coriolis acceleration component, Klein's construction, Numerical problems based on above topics.

Unit – III: Gears:

Classification of gears, Helical, Spiral, Bevel and Spur Gear, Spur GearTerminology, Law of gearing, Tooth profiles, velocity of sliding, Path of contact, Arc ofcontact, Contact Ratio, Interference and Undercutting, , Conjugate action, Numerical problems based on above topics.

Gear Trains: Simple, compound, reverted and epi cyclic gear trains. Velocity ratio and torque calculation in gear trains.

Unit-IV: Cams:

Classification of Cams and Followers, Radial Cam Terminology, Analysis of Followermotion (uniform, modified uniform, simple harmonic, parabolic, cycloidal), Pressure Angle,Radius of Curvature, Cam Profile for radial and offset followers Synthesis of Cam Profile byGraphical Approach, Cams with Specified Contours.

Gyroscope: 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.

Unit-V: Belt Rope & Chain Drive:

Types of Belts, Velocity ratio of a belt drive, Slip in belts, Length ofopen belt and crossed belt, Limiting ratio of belt-Tensions, Power transmitted by a belt,Centrifugal tension, Maximum tension in a

belt, Condition for maximum power transmitted,Initial tension in a belt, Creep in belt, Applications of V-Belt, Rope and Chain drives.

Evaluation:

Evaluation will be continuous an integral part of the class followed by the final examination as well as through external assessment.

Books References:

1. Thomas Bevan; Theory of Machines; Pearson Education.
2. Rattan SS; Theory of machines; MC Graw Hills.
3. Ambekar AG; Mechanism and Machine Theory; PHI. Eastern Economy Edition 2015.
4. Uicker&Shigley, Theory of machines & Mechanism Second Edition Oxford University Press.
5. Rao J S and Dukkipati; Mechanism and Machine Theory; New Age Delhi.
6. Abdulla Shariff, Theory of Machines.
7. Theory of machines by R.K.Bansal.

THEORY OF MACHINES & MECHANISMS

List of Experiments:

1. To verify principal of gyroscopic couple.
2. To Find out velocity & acceleration of slider crank mechanism by Klein"s Construction.
3. To find out velocity ratio of different gear trains.
4. To study various types of belt drives & find out the velocity ratio of the drive.
5. To draw the cam profile of different types of follower having different motion
6. Study of working models of various popular mechanisms like quick return mechanism etc.
7. To draw Involute profile of a gear by generating method.

B.E.CBGS III SEMESTER
MANUFACTURING PROCESS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Manufacturing Process	ME3004	Min. "D"	Min. "D"	5.0

Course Objective:

To make the students aware of different manufacturing processes like casting, metal forming, metal cutting and gear manufacturing.

Course Contents:

Unit-I: Pattern Making:

Types of pattern, Pattern and pattern making, pattern allowances; pattern design considerations, coreand core boxes.

Casting: Types of casting process. Molding and Foundry core sands and their properties,gating, runners, risers, solidification, defects and elimination, molding machines, centrifugal casting, dye casting, shell molding; Lost wax molding; continuous casting; cupola description and operation.

Unit –II: Welding:

Types of welding ,Gas welding method, flames, gas cutting, Electric arc welding, ACand DC welding machines and their characteristics, flux, electrodes, submerged arc welding, TIG& MIG welding; pressure welding; electric resistance welding spot, seam and butt welding;Thermit chemical welding; brazing and soldering, welding defects & remedies. Safety precautions.

Unit –III: Forging:

Types of forging operations. Theory and application of forging processes, description of drop and horizontal forging machines.

Unit-Press working:

Description and operation of processes, process of shearing, punching, piercing, blanking, trimming, perfecting, notching, lancing, embossing, coining, bending, forging and drawing; press, tool dies, auxiliary equipment, safety devices, stock feeders, scrap cutters, forces,pressure and power requirements .

Unit–V: Rolling:

Types of Rolling operations, General description of machines and process; rolling of structural section plates and sheets; hot and cold rolling techniques.

Evaluation:

Evaluation will be continuous an integral part of the class followed by the final examination as well as through external assessment .

Books References:

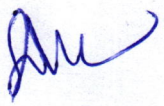
1. Anderson and Tetro; Shop Theory; Mc Graw Hills.
2. Kaushish JP; Manufacturing Processes; PHI Learning.
3. KalpakjianProducting Engineering, PEARSON Education.
4. Chapman; Workshop Technology.

5. Philip F Ostwald; Manufacturing Process &systems: John Wiley.
6. Raghuvanshi; Workshop Technology; Dhanpat Rai.
7. HajraChoudhary; Workshop Technology: Vol I.
8. Bhupendra Gupta, Manufacturing Process; Dhanpat Rai Publishing Co., New Delhi.

MANUFACTURING PROCESS

List of Experiments:

1. Study of Molding and Casting process.
2. To perform welding joints using arch/gas welding.
3. Study of forging operations and tools.
4. To understand press working process like; shearing, punching, piercing, blanking, trimming, etc.
5. Study of rolling process and evaluation of power requirements.
6. Study of Lathe machine; parts and operations.
7. Study of Milling machine; parts and operations.
8. Study of Shaper machine; parts and operations.
9. Study of Grinding and Drilling machines.



B.E.CBGS III SEMESTER
THERMODYNAMICS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Thermodynamics	ME3005	Min. "D"	Min. "D"	5.0

Course Objective:

To develop ability and gain insight into the process of problem-solving, with emphasis on thermodynamics .Specially in following manner:

1. Apply conservation principles (mass and energy) to evaluate the performance of simple engineering systems and cycles,
2. Evaluate thermodynamic properties of simple homogeneous substances,
3. Analyze processes and cycles using the second law of thermodynamics to determine efficiency and performance,
4. Discuss the physical relevance of the numerical values for the solutions to specific engineering problems and the physical relevance of the problems in general,
5. Critically evaluate the validity of the numerical solutions for specific engineering problems.

Course Contents:

Unit-I: Basic Concepts& First Law of Thermodynamics:

Basic concepts: Property, Equilibrium, State, Process, Cycle, Zeroth law of thermodynamics, Heat and work transfer. First law of Thermodynamics- first law applied to various systems steady flow process, limitations of first law of thermodynamics.

Unit-II: Second Law of Thermodynamics:

Second law of thermodynamics, heat engine, heat reservoir, Refrigerator, heat pump, Carnot's cycle, statements of Second law Reversible and irreversible processes, consequence of Second law, Clausious Inequality , Entropy, T-S diagrams, Available & Unavailable energy Availability Concept .

Unit-III: Properties of Steam:

Pure Substance, Phase, Phase-transformations, formation of steam, properties of steam, PVT surface, HS,TS,PV,PH,TV diagram, processes of vapor, measurement of dryness fraction, Use of Steam tables and Mollier chart.

Unit -IV:. Air Standard Cycles:

Carnot, Otto, Diesel, Dual cycles and their comparison, Brayton cycle.

Non-reactive gas mixture:PVT relationship, mixture of ideal gases, properties of mixture of ideal gases, internal energy, Enthalpy and specific heat of gas mixtures.

Unit –V: Fuels & Combustion:

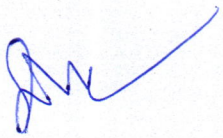
Actual & theoretical Combustion processes, Enthalpy of formation & enthalpy of reaction, first law analysis of reacting systems, adiabatic flame temperature, Basic concept of Third Law of thermodynamics.

Evaluation:

Evaluation will be continuous an integral part of the class followed by the final examination.

Books References:

1. P.K.Nag; Engineering Thermodynamics; Mc Graw Hills Fifth Edition.
2. Cengel Y; Thermodynamics; MC Graw Hills, Eight Edition.
3. Kross& Potter Thermodynamics for Engineers CENGAGE Learning.
4. Moran, Shapiro, Boettner Principles of Engineering Thermodynamics Wiley student edition.
5. P Chattopadhya, Engineering Thermodynamics Second Edition,OXFORD University Press.
6. Zemansky Heat & Thermodynamics, Eight Edition, Mc Graw Hills India Education.
7. R Yadav Applied Thermodynamics, Central Publishing house Allahabad.
8. Van Wylin&Sontak, Thermodynamics by, Wiley, Eastern.



B.E.CBGS III SEMESTER
PROGRAMMING – I (PROGRAMMING IN C++)

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Programming – I (Programming in C++)	CS3106	Min. "D"	Min. "D"	5.0

Unit I: Fundamental Concepts of Object-Oriented Programming (OOP):

Object, Class, message passing, abstraction and data hiding, encapsulation, modularity, inheritance, and polymorphism. Difference between Procedure Oriented Programming and Object Oriented Programming.

Unit II: Beginning With C++:

What is C++, Difference between C and C++, Classes and Objects in C++, defining classes, access specifier (i.e. Private, public, protected), defining member functions, creating objects of a class, access to member variables from objects etc. Friend functions and inline functions. Different types of function calls: call by value, call by address and call by Reference.

Unit III: Static Data Members, Constructor and Destructor in C++:

Default constructor, parameterized constructors and copy constructs.

Unit IV: Inheritance in C++:

Introduction, types of inheritance: single inheritance, multiple inheritance, multilevel inheritance, hierarchical inheritance and hybrid inheritance. Abstract class and Virtual base class.

Unit V: Polymorphism in C++:

Types of polymorphism, function overloading, operator overloading. Function overriding:- introduction to pointers, pointers to objects, this pointer, pointers to derived class, virtual functions, pure virtual function.

Books Reference:

1. Object Oriented Programming with C++ by E Balagurusamy, TMH.
2. Object Oriented Programming in C++ by Robert Lafore, Sams publishing.
3. Object Oriented Programming with C++, A. K. Sharma, Pearson.

PROGRAMMING – I (PROGRAMMING IN C++)

List of Experiments:

1. Write a C++ program to find the largest of three numbers using inline function.
2. Write a C++ program to sort an array of integer in ascending order using a function called exchange( ) which accepts two integer arguments by reference.
3. Create a class 'COMPLEX' to hold a complex number. Write a friend function to add two complex numbers. Write a main function to add two COMPLEX objects.
4. Write a C++ program to illustrate multiple inheritance.
5. Write a C++ program to illustrate 'this' pointer and pointers to derived classes.
6. Create a base class called 'SHAPE' having two data members of type double, member function

compute and display the area of the geometrical object. Derive two specific classes 'TRIANGLE' and 'RECTANGLE' from the base class .Using these three classes design a program that will accept dimension of a triangle / rectangle interactively and display the area

7. Write a C++ program that uses function using overloaded functions
   a) To swap two integers,
   b) To swap two characters ,
   c) To swap two real numbers.
8. Write a C++ program to illustrate the use of overloaded constructor.
9. Write a C++ program to overload unary and binary operator, using a simple example.
10. Write a C++ program to calculate marks of postgraduate and graduate students using virtual function.
11. Write a C++ program to illustrate the use of static member function.