Jabalpur Engineering College, Jabalpur

Semester III 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	**CH3001**	Energy, Environment, Ecology & Society	70	20	10	-	-	100	3	1	-	4	
2	**IP3002**	Mechanics of Materials	70	20	10	30	20	150	3	1	2	6	
3	**IP3003**	Production Process	70	20	10	30	20	150	3	1	2	6	
4	**IP3004**	Thermodynamics	70	20	10	30	20	150	3	1	2	6	
5	**IP3005**	Material Science & Metallurgy	70	20	10	-	-	100	3	1	-	4	
6	**CS3106**	Programming-I	-	-	-	30	20	50	-	-	2	2	
7	**IP3007**	1.Rural Outreach/Social service Activities under digital India or clean India 2.Evaluation of Industrial training (Internal Assessment)	-	-	-	-	50	50	-	-	2	2	
8	**IP3008**	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, ENVIRONMENT, ECOLOGY & SOCIETY

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Energy, Environment, Ecology & 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
MECHANICS OF MATERIALS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Mechanics of Materials	IP3002	Min. "D"	Min. "D"	5.0

Unit-I:

Mechanical Properties of Materials: Ductility, malleability, hardness, toughness, fatigue, creep, behavior of materials under tension, compression, bending, shear, ductile and brittle materials, failure of MS and CI in tension and torsion, ductile and brittle failures.

Stress and strain: stresses in members of a structure, axial loading, normal stress, shear stress, bearing stress, analysis of simple structures, stress on oblique plane under axial loading, stepped rods, members in series and parallel, stress strain diagram, Hooke's law, modulus of elasticity, elastic and plastic behavior of materials, deformation under axial loading, statically indeterminate problems, stress due to temperature, Poisson's ratio, Bulk modulus, shear strain, relation among elastic constants, residual stress, fiber reinforced composite materials.

Unit-II:

Transformation of stress and strain, principal stresses, normal and shear stress, Mohr's circle and its application to two dimensional analysis, Shear force and BM diagram for various types of loading, stresses in thin walled pressure vessel.

Unit-III: Bending:

pure bending, symmetric member, deformation and stress, bending of composite sections, eccentric axial loading, beams of unsymmetrical sections, shear stresses in beams, distribution of shear stresses. Deflection of beams, moment area method.

Unit-IV:

Torsion in shafts: stresses in a shaft, deformation in circular shaft, angle of twist, stepped hollow, thin walled-hollow transmission shafts, transmission shaft under combined bending and torsion; Leaf springs; helical springs, open and closed coil, stress in spring wire, deflection of helical spring, springs in series and parallel.

Unit-V:

Theories of failures: maximum normal stress & shear stress theory; maximum normal and shear strain energy theory; maximum distortion energy theory; application of theories to different materials and loading conditions Columns: stability of structures, Euler's formula for columns with different end conditions, Rankin's formula.

Books References:

1. Beer FP, Johnson ER, Dewolf JT : Mechanics of Materials; TMH
2. Rattan; Strength of materials; TMH
3. Nash William; Schaum's Outline of Strength of Materials; TMH.
4. Negi ; strength of materials; TMH
5. Singh Arbind K; Mechanics of Solids; PHI
6. Strength of Materials, Sadhu Singh,
7. Kamal K and Ghai RC; Advanced Mechanics of Materials; Khanna Pub.

MECHANICS OF MATERIALS

List of Experiments :

1. Standard tensile test on MS and CI test specimen
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 impact tests.

B.E.CBGS III SEMESTER
PRODUCTION PROCESS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Production Process	IP3003	Min. "D"	Min. "D"	5.0

Unit –I:

Melting Practices, Cupola, capacity of a cupola, cupola operation, zones of cupola, cupola Efficiency, melting furnaces for non-ferrous metals, classification of crucible furnaces, gating system, pouring basin, sprue, runner, gates, types of gates, riser, gating design, numerical simulation, main consideration in design and position of risers, types of risers, feeder location and shapes use of exothermic materials, use of chills.

Unit –II:

Solidification and Special casting process: Solidification of casting, permanent mould Casting, slush casting, die casting, centrifugal casting, investment casting, continuous casting, casting defects and their remedies, cleaning of castings, repair of casting, inspection of casting. Solid modeling of castings.

Unit –III:

Metal Forming: Nature of plastic deformation, stress-strain relation in elastic and plastic deformation, concept of flow stress, deformation mechanism, hot and cold working, rolling principal, rolling stand arrangement, roll passes, breakdown passes, roll pass sequence, analysis of rolling.

Unit–IV:

Abrasive processes: Grinding wheel, specification, characteristics, abrasive types, grinding. operations, cylindrical grinding, surface grinding, centre less grinding, form grinding, internal cylindrical grinding, wheel balancing, dressing and truing, honing, Lapping, super finishing Polishing buffing.

Unit –V:

Forging, Extrusion and other Processes: Forging operations, forging design, drop forging die design, die inserts. Extrusion- principle, forward and backward extrusion, extrusion analysis, impact extrusion, hydrostatic Extrusion, extruding tubes. Wire drawing- Rod and tube drawing, tube making, swaging, drawing analysis.

Books References:

1. Rao P.N; Manufacturing Technology-foundry, formin; TMH Publishing House
2. Ravi B; Metal casting- CAD and Analysis; PHI Publishing House
3. Jain P.L; principles of foundry technology; TMH Publishing House
4. Hennie & Roshanthall; Metal casting; Mcgraw Hill New York
5. Chambell J.S. Manufacturing Science Mcgraw Hill New York

PRODUCTION PROCESS

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 system (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 process. (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 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	IP3004	Min. "D"	Min. "D"	5.0

Unit-I:

Basic concepts: Concept of an ideal gas, gas laws, Avogadro's hypothesis, heat and work transfer. First law of thermodynamics- Statement of first law of thermodynamics, first law applied to closed system, first law applied to a closed system undergoing a cycle, processes analysis of closed system, flow process, flow energy, steady flow process, relations for flow processes, and limitations of first law of thermodynamics.

Unit-II:

Second law of thermodynamics, heat engine, heat reservoir, refrigerator, heat pump, COP, EPR, available energy, Carnot's theorem, Carnot's cycle, efficiency of Carnot's cycle, statement of second law reversible and irreversible processes, consequence of second law, entropy, entropy change for ideal gas, T-S diagrams, availability and irreversibility. Gibbs and Helmholtz functions.

Unit-III:

Real gas, deviation with ideal gas, Vander-wall's equation, evaluation of its constants, limitations of the equation. The law of corresponding states compressibility factor, generalized compressibility chart, P-V-T surface of a Real gas, thermodynamics relations, Maxwell relations and their applications.

Unit-IV:

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 table and Mollier chart.

Unit-V:

Air standard cycles, Carnot, Otto, Diesel, Dual cycles and their comparison, two stroke and four stroke engines, 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, enthalpy of gas-mixtures.

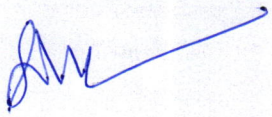
Books References:

1. P.K.Nag; Engineering Thermodynamics; TMH
2. Van GJ; Thermodynamics; John Wylen
3. Cengel Y; Thermodynamics; TMH
4. Arora CP; Thermodynamics; TMH
5. Engineering Thermodynamics by Omkar Singh New Age International.
6. Engineering Thermodynamics by Ratha Krishanan PHI India Pvt. Ltd.
7. Engineering Thermodynamics by M. Achuthan, PHI India.

THERMODYNAMICS

List of Experiments:

1. To find mechanical equivalent of heat using Joules apparatus
2. To study working of impulse and reaction steam turbine by models.\
3. To study working of Gas turbines by models and to identify various processes of Brayton Cycle.
4. To calculate COP of vapor compression refrigeration system and to plot on T-s, p-H diagrams.
5. To plot specific fuel consumption versus rpm diagrams for diesel and petrol engin



B.E.CBGS III SEMESTER
MATERIAL SCIENCE & METALLURGY

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Material Science & Metallurgy	IP3005	Min. "D"	Min. "D"	5.0

Unit-I:

Crystal Atoms of Solid: Structure of atom bonding in solids metallic, Vander walls, ionic and covalent, Space lattice and crystal system arrangement of atoms in BCC, FCC and HCP crystal. Manufacture of refractory and ferrous metals, properties uses and selection of acid, basic and natural refractory, metallurgical coke, properties, types, uses and brief description of the manufacturing processes for iron and steel making.

Unit-II:

Plastic Deformation of Metals: Point and line defects in crystals, their relation to mechanical properties, deformation of metal by slip and twinning stress strain curves of poly crystalline materials viz. mild steel cast iron and brass yield point phenomenon. Cold and hot working of metals and their effect on mechanical properties, annealing of cold worked metals, principles of re-crystallization and grain growth phenomenon, fracture in metal and alloys, ductile and brittle fracture, fatigue failure

Unit-III :

Alloy Formation and Binary Diagram: Phase in metal system solution and inter-metallic compounds. Hume-Rottery's rules, solidification of pure metals and alloy equilibrium diagrams of isomorphous, eutectic peritectic and eutectoid system, non-equilibrium cooling and coring iron, iron carbon equilibrium diagram.

Unit-IV:

Heat Treatment of Alloys Principles of Heat Treatment of Steel: TTT curves heat treating processes, normalizing, annealing spheroidizing, hardening, tempering, case hardening, austempering, mar-tempering, precipitation hardening process with reference to Al, Cu alloys

Unit-V:

Properties of Material: Creep Fatigue etc., Introduction to cast iron and steel, Non Ferrous metals base alloys, Bronze, Brasses, Duralumin, and Bearing Metals. Plastics, Composites and ceramics: Various types of plastics, their properties and selection. Plastic molding technology, FRP, GRP resins adhesive, elastomers and their application. Powder Metallurgy: Property and Applications of Powder Metallurgy, Various process and methods of making products by powder Metallurgy techniques.

Books References:

1. Narula GK, KS and GuptaVK; Material science; TMH
2. Raghavan V; Material Science and Engineering, PHI Publication.
3. Raghavan V; Physical Metallurgy Principles and Practice; PHI
4. Rajendran V and Marikani; Material science; TMH
5. Sriniwasan R; Engineering materials and Metallurgy; TMH
6. Navneet Gupta, Material Science & Engineering, Dhanpat Rai.
7. B. K. Agrawal, Introduction to Engineering Materials, TMH.

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 get-data( ) to initialize base class data members – pure virtual member function display – area( ) to 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.