Choice Based Credit System (CBCS)
Scheme of Examination w.e.f.
Bachelor of Engineering (Industrial Production Engineering)

SEMESTER IV

S.No.	Subject Category	Subject Code	Subject Name	Maximum Marks Allotted									Hours/Week			Total Credits
				Theory						Practical						
				End Sem	Minor I	Minor II	Quiz	Assignments	Tutorials/Problem Solving	End Sem	Lab Work	Viva Voce/ Assignment	L	T	P	
IP-242	1.	DC	IP-225	Fluid Mechanics	60	10	10	5	5	10	10	20	20	3	0	2	4
IP-243	2.	DC	IP-226	Machine Drawing & CAD	60	10	10	5	5	10	10	20	20	3	-	2	4
IP-244	3.	DC	IP-227	Energy Conversion	60	10	10	5	5	10	10	20	20	2	1	2	4
IP-245	4.	DC	IP-228	Machine Design-I	60	10	10	5	5	10	-	-	-	3	1	-	4
IP-246	5.	EAS	IP-229	Computer Programming	-	-	-	-	-	-	10	20	20	-	-	4	2*
MA-241	6.	DE	MA-220	Mathematics-III	60	10	10	5	5	10	-	-	-	3	1	-	4
IP-247	7.	EAS	ES-221	System Engineering	60	10	10	5	5	10	-	-	-	3	1	-	4
HU-248	8.	HU	HU-223	NSS/NCC	-	-	-	-	-	-	-	-	-	-	-	-	Qualifier*
				Total	360	60	60	30	30	60	40	80	80	17	4	10	26

L: Lecture T: Tutorial P: Practical

Note:

For 'Computer Programming' there will be no examination and credits will be awarded only on the basis of internal assessment.

NSS/NCC is just a qualifier subject which means student has to compulsorily qualify this is a mandatory requirement for the award of degree before completing the course.

Mathematics- III will be a departmental elective subject with content customized to the requirements of parent discipline.

(Prof. Jyoti Bhalavi) (Prof. Sanjay Soni) 07.03.17 (Prof. U.K. Joshi) 07/03/17 (Dr. L.K. Patel) 07-03-17

JABALPUR ENGINEERING COLLEGE, JABALPUR

Choice Based Credit System

Industrial Production Engineering , IV-Semester

(2)

Fluid Mechanics

IP-242

Objectives :

To be familiar with all the basic concepts of fluids and fluid flow phenomenon, conservation equations and their applications to fluid flow problems.

Outcomes : : At the completion of this course, students should be able to

. understand the properties of the fluid.

. understand and solve the fluid flow problems.

understand the mathematical techniques of practical flow problems.

. understand the energy exchange process in fluid machines.

Fluid Static's : Review of Basic concepts &properties of the fluid . Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces ; buoyant force, Stability of floating and submerged bodies, Relative equilibrium.

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 net & its applications , method of drawing flow nets.

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. Fluid Measurements: Velocity measurement (Pitot tube, current meters etc.); flow measurement (orifices, nozzles, mouth pieces, orifice meter, nozzle meter, venturi-meter, weirs and notches).

Dimensional Analysis : Dimensional analysis, dimensional homogeneity, use of Buckingham-pi theorem, calculation of dimensionless numbers

Introduction to boundary layer, Boundary layer development on a flat plate and its characteristics - Boundary layer thickness, displacement thickness, momentum thickness, energy thickness. Momentum equation for boundary layer by Von karman, drag on flat plate, boundary layer separation and its control. Aerofoil theory, lift and drag coefficients, streamlined and bluff bodies.

Flow through Pipes : Reynolds experiment & Reynolds number, laminar & turbulent flow, Introduction to Navier Stokes' Equation, relation between shear & pressure gradient, laminar flow through circular pipes, friction factor, laminar flow between parallel plates, hydrodynamic lubrication.

EVALUATION

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

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Industrial Production Engineering , IV-Semester

Machine Drawing & CAD

IP-243

Objectives :

To enable the students to prepare a detailed assembly drawing for machine components.

Outcomes :

1. Understand Indian standards for machine drawing.
2. Understand Fits and Tolerances in technical drawing.
3. Prepare assembly drawing of joints, couplings and machine elements.
4. Design and prepare Jigs and fixtures for given components.

Drawing conventions; 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, Welded joints, Drawing of Threaded fasteners .

Assembly Drawing : Assembly Machine Drawing ,Basic concept of assembly drawing ,bill of materials, Assembly drawing of Cotter and Knuckle joints, pedestal and footstep bearings, Engine parts- crosshead and stuffing box, IC engines parts - piston and connecting rods; lathe machine parts-Tool post and Tail Stock.

CAD : software and hardware required to produce CAD drawings Software: operating systems; CAD software packages e g AutoCAD, AutoCAD/Inventor, Micro station, Catia, Pro/ENGINEER, Solid works; minimum system requirements. Preparing & interpreting CAD drawing, orthographic projections; Commands: absolute/relative/polar coordinates; features eg line types, grids, snaps, circle, text, hatching, dimensioning, layers/levels, colour; viewing e g zoom, pan; inserting other drawings e g symbols, blocks; modifying e g copy, rotate, move, erase, scale, chamfer, fillet Interpret: determine properties of drawn objects e g list, distance, area, volume use CAD software to produce 2D & 3D assembly drawings and views

3D environment: 3D views e g top, front, side, isometric 3D models: 3D techniques e g addition and subtraction of material, extrude, revolve, sweep, 3D coordinate entry (x, y, z), wire frame drawing, 2D to 3D (thickness, extrusion); surface models; solid

EVALUATION

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

References:

1.Bhatt, ND; Machine Drawing; Charotar Publication
2. K C John ,Machine Drawing , PHI
3. Singh A; Machine Drawing; TMH publication
4. Narayana and Reddy; Machine Drawing; New age, Delhi.
5. Shigley JE et al; Mechanical Engineering Design, TMH

List of Experiments:

Assembly Drawing and design problem as per given syllabus

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Industrial Production Engineering , IV-Semester

Energy Conversion

IP-244

Objectives :

On completion of this course, the students are expected to understand the fundamental principle, operation, performance of IC Engines, auxiliary systems, combustion of SI & CI engines, various fuels used and engine emissions.

Outcomes :

Acquire the knowledge of engine components and fuel air cycles
Understand the working of engine auxiliary systems.
Understand the combustion aspects of SI Engines
Understand the combustion aspects of CI Engines.

Internal Combustion Engine: S.I. and C.I. engines of two and four stroke cycles, real cycle analysis of SI and CI engines, determination of engine dimensions, speed, fuel consumption, output, mean effective pressure, efficiency, factors effecting volumetric efficiency, heat balance, performance characteristics of SI and CI engines, cylinder arrangement, firing order, power balance for multi-cylinder engines .

Combustion in SI engines: Flame development and propagation ,Pressure-Crank Angle diagram , Stages of Combustion ignition lag, effect of air density, temperature, engine speed, turbulence and ignition timings, physical and chemical aspects , abnormal Combustion , effect of engine and fuel variables on abnormal combustion , pre-ignition, its causes and remedy, salient features of various type combustion chambers.

Combustion in C.I. Engines: Times base indicator diagrams and their study, various stages of combustion, delay period, diesel knock, knock inhibitors, salient features of various types of combustion chambers .

I.C. Engine System: Fuels, ignition systems, cooling, exhaust/scavenging and lubrication system. Fuel metering in SI engine: Fuel injection in SI engine (MPFI, TBI,CRDI), Theory of carburetion, Solex Carburetor, simple problems on carburetion. Fuel metering in CI engines: Fuel injection in CI engine ,Working Principle of fuel pump & fuel injectors , types of nozzles , simple numerical problems . Cooling & lubrication of SI & CI Engines

Supercharging & Turbo charging : Methods of supercharging,& turbo charging Effects of super charging and turbo charging . Engine Modifications for supercharging, supercharging of two stroke engines. micro processor controlled supercharging .

EVALUATION

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

References:

1. J.B. Heywood. Internal combustion Engines , Wiley
2. Ganeshan V; Internal Combusion engines; TMH
3. Mathur M L & Sharma RP; A. Course in IC engines; DhanpatRai
4. R Yadav , Internal Combustion Engines
5 Halderman JD and Mitchell CD; Automotive Engines theory and servicing; Pearson

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Choice Based Credit System

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Industrial Production Engineering , IV-Semester

Machine Design - I

IP-245

)jectives :

study the basic design principles and apply the principles to the design of various elements countered in Mechanical machines and structures.

ıtcomes :

- determine the strength of the components
- determine the failure conditions and apply them to real life Problems
- design simple joints, fasteners, levers and springs.

echanical Engineering design - Design considerations, Design Procedure Material selection des of failure - Theories of failure , causes of stress concentration; stress concentration in nsion, bending and torsion; reduction of stress concentration, theoretical stress concentration ct notch sensitivity, fatigue stress concentration factor, cyclic loading, endurance limit, S-N urve, loading factor, size factor, surface factor. Design consideration for fatigue, Goodman and odified Goodman's diagram, Soderberg equation, Gerber parabola, design for finite life, mulative fatigue damage

esign of Fasteners : Design of cotter and knuckle joints.. Fasteners and keys , Design of elded joints , Fillet and butt welds , Design of riveted joints. Design of bolted joints . Power crews .

election & Design of bearings : Reynold's equation, stable and unstable operation, heat issipation and thermal equilibrium, boundary lubrication, dimensionless numbers, Design of ournal bearings, Rolling-element Bearings: Types of rolling contact bearing, bearing friction nd power loss, bearing life; Radial, thrust & axial loads; Static & dynamic load capacities; election of ball and roller bearings; lubrication and sealing.

esign of Springs : Design of helical compression & tension spring , design of leaf spring & orsion springs , fatigue loading of springs ,surge in springs ,spiral springs .

EVALUATION

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

References :

1 Robert C Juvinal, Kurt M Marshek Machine Component design Wiley Student edition
2 C S Sharma & Kamlesh Purohit , Design of machine elements PHI
3 Sharma & Agarwal Machine design .
4 Pandya & Shah , Charottar .
5 J E Shingley Machine design Mc Graw Hills
7 Gope P C , Machine Design , PHI Learning .
2015 8 P Kannaiah , Machine Design , SCITECH .
9 Nortan RL , Machine Design , Pearson , Fifth Edition .

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Choice Based Credit System

Industrial Production Engineering , IV-Semester

System Engineering

IP-247

COURSE OBJECTIVE

This course in systems engineering examines the principles and process of creating effective systems to meet application demands. The course is organized as a progression through the systems engineering processes of analysis, design, implementation, and deployment with consideration of verification and validation throughout.

COURSE CONTENT

What is System Engineering, Origin, Examples of Systems requiring systems engineering,Systems Engineer Career Development Model, Perspectives of Systems Engineering, Systems Domains, Systems Engineering Fields, SystemEngineering Approaches.
Structure of Complex Systems, System Building Blocks and Interfaces, Hierarchy of Complex Systems, System Building Blocks, The System Environment, Interfaces and Interactions, Complexity in Modern Systems.
Concept Development and Exploration, Originating a New System, Operations Analysis, Functional Analysis, Feasibility, System Operational Requirements, Implementation of Concept Exploration.
Engineering Development, Reducing Program Risks, Requirements Analysis, Functional Analysis and Design, Prototype Development as a Risk Mitigation Technique, Development Testing, Risk Reduction.
Integration and Evaluation, Integrating, Testing, And Evaluating The Total System, Test Planning And Preparation, System Integration, Developmental System Testing, Operational Test And Evaluation, Engineering For Production, Transition From Development To Production, Production Operations.

COURSE OUTCOME

After successful completion of the course, students would be able to Plan and manage the systems engineering process and examine systems from many perspectives (such as software, hardware, product, etc.) Students can distinguish critical functions, diagnose problems, and apply descoping strategies and judge the complexity of production and deployment issues.

EVALUATION

Evaluation will be a continuous and integral process comprising classroom and external assessment.

REFERENCES:

1. Alexander Kossiakoff, William N Sweet, "System Engineering Principles and Practice, Wiley India
2. Blanchard Fabrycky, Systems engineering and analysis, Pearson

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