UNIVERSITY OF MUMBAI

Bachelor of Engineering

Production Engineering (Second Year – Sem. III & IV)

Revised course (REV- 2012) from Academic Year 2012 -13,

Under

FACULTY OF TECHNOLOGY

(As per Semester Based Credit and Grading System)

Program Structure for B. E. Production Engineering

S. E. (Production) Sem.-III

Course Code	Course Name	Teaching Scheme (Contact Hours)		Credits Assigned		
		Theory	Pract.	Theory	Pract.	Total
PEC301	Applied Mathematics-III[@]	4	--	4	--	4
PEC302	Strength of Materials	4	2	4	1	5
PEC303	Manufacturing Engineering-I	4	--	4	--	4
PEC304	Fluid Mechanics and Fluid Power	4	2	4	1	5
PEL305	Computer Aided Machine Drawing[+]	--	2*+4	--	3	3
PEL306	Data Base Information Retrieval System [#]	--	2*+2	--	2	2
PEL307	Workshop Practice-III	--	4	--	2	2
Total		**16**	**18**	**16**	**9**	**25**

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Pract. /oral	Total
		Internal Assessment			End Sem. Exam.	Exam. Duration (in Hrs)			
		Test1	Test 2	Avg.					
PEC301	Applied Mathematics-III[@]	20	20	20	80	03	--	--	100
PEC302	Strength of Materials	20	20	20	80	03	25	--	125
PEC303	Manufacturing Engineering-I	20	20	20	80	03	--	--	100
PEC304	Fluid Mechanics and Fluid Power	20	20	20	80	03	25	--	125
PEL305	Computer Aided Machine Drawing[+]	--	--	--	--	--	50	50	100
PEL306	Data Base & Information Retrieval System[#]	--	--	--	--	--	50	50	100
PEL307	Workshop Practice-III	--	--	--	--	--	50	--	50
Total		**--**	**--**	**80**	**320**	**--**	**200**	**100**	**700**

* Theory for entire class to be conducted, [@] Course common to Mech/Auto/Prod/Civil,
[+]Course common to Mech/Auto/Prod, [#] Course common to Mech/Auto/Prod/Civil

Course Code	Course/Subject Name	Credits
PEC301	**Applied Mathematics –III[@]**	**4**

Objectives:

1. To provide a sound foundation in the mathematical fundamentals necessary to formulate, solve and analyze engineering problems.
2. To study the basic principles of Laplace Transform, Fourier Series, Complex Variables.

Outcomes: Learner should be able to:-

1. Demonstrate the ability of using Laplace Transform and Fourier Series in solving the Ordinary Differential Equations and Partial Differential Equations.
2. Identify the analytic function, harmonic function, orthogonal trajectories and to apply bilinear transformations and conformal mappings.
3. Identify the applicability of theorems and evaluate the contour integrals.

Module	Details	Hrs
1	**Laplace Transform** 1.1 Function of bounded variation, Laplace Transform of standard functions such as 1, t^n, e^{at}, $\sin at$, $\cos at$, $\sinh at$, $\cosh at$ 1.2 Linearity property of Laplace Transform, First Shifting property, Second Shifting property, Change of Scale property of L.T. (without proof) $L\{t^n f(t)\}, L\left\{\frac{f(t)}{t}\right\}, L\left\{\int_0^t f(u)du\right\}, L\left\{\frac{d^n f(t)}{dt^n}\right\}$ Heaviside Unit step function, Direct Delta function, Periodic functions and their Laplace Transform.	6
2	**Inverse Laplace Transform** 2.1 Linearity property, use of theorems to find inverse Laplace Transform, Partial fractions method and convolution theorem. 2.2 Applications to solve initial and boundary value problems involving ordinary differential equations with one dependent variable.	5
3	**Complex variables:** 1.1 Functions of complex variable, Analytic function, necessary and sufficient conditions for $f(z)$ to be analytic (without proof), Cauchy-Riemann equations in polar coordinates. 1.2 Milne- Thomson method to determine analytic function $f(z)$ when it's real or imaginary or its combination is given. Harmonic function, orthogonal trajectories. 1.3 Mapping: Conformal mapping, linear, bilinear mapping, cross ratio, fixed points and standard transformations such as Rotation and magnification, invertion and reflection, translation.	10
4	**Complex Integral** 4.1 Line integral of a function of a complex variable, Cauchy's theorem for analytic function, Cauchy's Goursat theorem (without proof), properties of line integral,Cauchy's integral formula and deductions. 4.2 Singularities and poles: 4.3 Taylor's and Laurent's series development (without proof) 4.4 Residue at isolated singularity and its evaluation. 4.5 Residue theorem, application to evaluate real integral of type $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$, & $\int_{-\infty}^{\infty} f(x)\, dx$	10

5	**Fourier Series** 5.1 Orthogonal and orthonormal functions, Expressions of a function in a series of orthogonal functions. Dirichlet's conditions. Fourier series of periodic function with period 2π & $2l$. 5.2 Dirichlet's theorem(only statement), even and odd functions, Half range sine and cosine series, Parsvel's identities (without proof) 5.3 Complex form of Fourier series.	10
6	**Partial Differential Equations** 4.1 Numerical Solution of Partial differential equations using Bender-Schmidt Explicit Method, Implicit method(Crank- Nicolson method) Successive over relaxation method. 4.2 Partial differential equations governing transverse vibrations of an elastic string its solution using Fourier series. 4.3 Heat equation, steady-state configuration for heat flow. 4.4 Two and Three dimensional Laplace equations.	10

[@] Course common to Mech/Auto/Prod/Civil

Theory Examination:

1. Question paper will comprise of total 6 questions, each of 20 Marks.
2. Only 4 questions need to be solved.
3. Question 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)

In question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Internal Assessment:

Assessment consists of two tests out of which; one should be a compulsory class test (on minimum 40% of curriculum) and the other is either a class test (on minimum 70% of curriculum) or assignment on live problems or course project.

Reference Books:

1. Elements of Applied mathematics, P N & J N Wartikar, Pune VidyarthiGruhaPrakashan
2. Higher Engineering Mathematics, Dr B. S. Grewal, Khanna Publication
3. Advanced Engineering Mathematics, E Kreyszing, Wiley Eastern Limited
4. Integral Transforms and their Engineering Applications, Dr B. B. Singh, Synergy Knowledgeware, Mumbai
5. Complex Variables: Churchill, Mc-Graw Hill
6. Numerical Methods, Kandasamy, S. Chand & CO.

Course Code	Course/Subject Name	Credits
PEC302	**Strength of Materials**	**4+1**

Objectives:

1. To impart the concept of various types of forces, their modes of action and resulting stresses and strains on various materials under various operating conditions.
2. To impart the knowledge of Bending Moment, Shear force and Moment of Inertia as applied on various structures.

Outcomes: Learner should be able to:-

1. Understand stress-strain behavior of various materials under load.
2. Select various materials for machine parts.
3. Understand the concept of Bending moment, Shear force, Torsion and Moment of inertia in designing of various machine parts and components.

Module	Details	Hrs.
01	**1.1 Direct stress and direct strain:** Types of forces (External forces, Inertia forces, Centrifugal forces, Magnetic forces, Thermal load); Concept of different types of stresses; Stress−strain curves for ductile and brittle material; factor of safety; deformation of uniform/tapering rectangular and circular and circular cross−section bars; deformation of members made of composite materials; shear stress and shear strain; Poisson's ratio; volumetric strain; bulk modulus; relationship between Young's modulus, bulk modulus and modulus of elasticity; temperature stresses in simple and compound bars.	08
02	2.1 **Introduction to Moment of Inertia:** Theorem of parallel and perpendicular axis, Polar Moment of Inertia. 2.2 **Shear Force and Bending Moment:** Axial force, shear force and bending moment diagrams for statically determinate beams excluding beams with internal hinges for different types of loading.	12
03	3.1 **Theory of Bending:** Flexure formula for straight beams; principal axes of inertia; moments of inertia about principal axes; transfer theorem. Simple problems involving application of flexure formula, section modulus and moment of resistance of a section. 3.2 **Shear Stress in Beams:** Distribution of shear stress across plane sections used commonly for structural purposes; shear connectors.	10
04	4.1 **Bending Moment Combined with Axial Loads:** Application to members subjected to eccentrics loads, core of section. 4.2 **Deflection of Beams:** Deflection of cantilevers sample supported and overhanging beams using double integration and Macaulay's method for different types of loadings.	08
05	5.1 **Theory of Torsion:** Torsion of circular shafts−solid and hollow, stresses in shafts transmitting power, shafts in series and parallel. 5.2 **Principal Stresses:** General equations for transformation of stress; principal planes and principal stresses, determination using Mohr's circle maximum shear stress, principal stresses in beams; principal stresses in shafts subjected to torsion, bending and axial thrust; concept of equivalent torsion and bending moments..	08

06	6.1 **Struts:** Struts subjected to axial loads, concept of buckling. Euler's formula for struts with different support conditions. Euler's and Rankin's design formulae. 6.2 **Strain energy:** Strain energy due to axial loads gradually applied transverse loads and under impact load.	06

Term Work:

Term work shall consist of:

1. Assignments: On topics drawn from syllabus [At least 1 assignment per module].
2. Minimum 06 experiments from the list have to be conducted and presented with inferences.

List of Experiments:

1. Tension test on Mild steel bars (Stress strain behavior, Modulus of elasticity determination).
2. Tension test on Tor Steel bar.
3. Shear test on Mild steel, Aluminium and Brass bars.
4. Flexure test on wood (Determination of bending stress of wooden beam).
5. Deflection test (single central point load and two point load).
6. Izod impact Test on Mild steel / Aluminium / Cast iron / Brass.
7. Charpy impact Test on Mild steel / Aluminium / Cast iron / Brass.
8. Torsion test on mild steel bar/ cast iron bar.

The distribution of marks for term work shall be as follows:

Laboratory work (Experiments/Assignments): 20 Marks.
Attendance (practicals &theory): 05 Marks.

Theory Examination:

1. Question paper will comprise of total 6 questions, each of 20 Marks.
2. Only 4 questions need to be solved.
3. Question 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)

In question paper, weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

Internal Assessment:

Assessment consists of two tests out of which; one should be a compulsory class test (on minimum 40% of curriculum) and the other is either a class test (on minimum 70% of curriculum) or assignment on live problems or course project.

Reference Books:

1. *Mechanics of Materials,* Eigth Edition by Gere ,Pretice Hall (1984).
2. *Engineering Mechanics of Solids, 2nd Edition by* E.P. Popov, Prentice Hall (1998).
3. *Strength of Materials,* 4th edition by Singer and Pytel , Harper and Row Publication.
4. *Elements of Strength of Materials*, Timoshenko and Young – Strength of materials, CBS Publication.
5. *Mechanics of Materials,* 4th Edition by Beer and Johnston, McGraw Hill Publication.
6. *Strength of Materials,* S B Junnarkar.
7. *Strength of Materials,* R K Rajput , S. Chand Publication (1996).
8. *Strength of materials*, S S Rattan– Tata McGraw Hill Publication Co. Ltd (2008).
9. *Strength of Materials,* Dr. R. K. Bansal ,Laxmi publication Pvt. Ltd., New Delhi (2010).
10. *Strength of Materials,* 6thEdition by S.Ramamrutham, Dhanpatrai Publication (1981).

Course Code	Course/Subject Name	Credits
PEC303	**Manufacturing Engineering – I**	**4**

Objectives:

1. To study machine tools and basic machining processes like turning, drilling, milling, broaching etc.
2. To know the fundamentals of various metal cutting practices, fundamentals of machine tools and processes.
3. To study manufacturing processes for plastics.

Outcomes: Learner should be able to:-

1. Understand features and applications of lathe, milling, drilling and broaching machines.
2. Understand manufacturing processes for plastics.
3. Understand features and applications of reciprocating machine tools like shaper, planer and slotter.

Module	Details	Hrs.
01*	1.1 **Classification of Manufacturing Processes**: Definition, need and classification of machine tools based on relative motion between tool and work piece. Classification and nomenclature of cutting tools like single point cutting tool, twist drill and milling cutters. 1.2 **Cutting Off Machines**: Power hack−saws, band saw and circular saw, friction saw and abrasive cutting off machines, field of applications and limitations. 1.3 **Turning Machines and Processes:** Lathe as general purpose turning machine, principle of generating surfaces, functions of lathe, principle parts, Gear drive, feed mechanism, lathe accessories and attachments. Lathe operations, taper turning methods, thread cutting. Capstan and turret lathes: difference between capstan and turret lathe, stopper rod mechanism (turret), tool layout for simple components like bolt, nut, pin, shaft etc. Machining time in turning.	12
02*	**Drilling & Boring machines and Processes:** Drilling machine types−sensitive, upright, radial, gang, multiple spindle, work and tool holding devices, Drilling machine operations, Counter boring, Spot facing, Countersinking, types and materials of drills, twist drill nomenclature. Machining time in drilling. Deep hole drilling (only fundamentals to be covered): Gun drills. Boring Machine types- horizontal, vertical, jig, fine and deep hole boring machines.	07
03*	**Reciprocating Machine Tools:** Shaping machines: types of shapers, working of shaping machine, quick return mechanisms, shaper operations, machining time. Planning machines: types of planning machines, planer mechanisms, feed mechanisms, work holding devices, shaper vs. planer. Slotting machines types of slotting machines.	11
04*	**Milling Machines :** Types of milling machines−column and knee type, fixed bed type, planer type and special type, milling processes conventional and climb milling, milling cutters types- peripheral, face and shell milling cutters, geometry & materials of milling cutters attachments, special accessories for milling and universal dividing head. Indexing methods – direct, plain, compound and differential indexing. Calculations of machining time and copy milling machines.	10

05*	**Broaching Machines:** Broaching process, elements of typical internal broach, types of broaches, broaching machines-vertical, horizontal, surface and continuous broaching vs. other processes.	04
06	6.1 **Moulding with plastics:** Basic concepts related to Injection Molding, Compression moulding, Transfer moulding, Blow Molding, Rotational Molding, Thermoforming and Extrusion. (coverage should be limited to outline of moulding equipment, mould/die and moulding cycle). 6.2 **Moulding with ceramics:** Blow moulding and extrusion of glass.	08
*** Machine tool specifications as per IS.**		

Theory Examination:

1. Question paper will comprise of total 6 questions, each question of 20 marks.
2. Only 4 questions need to be solved.
3. Question 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).

In question paper, weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

Internal Assessment:

Assessment consists of two tests out of which; one should be a compulsory class test (on minimum 40% of curriculum) and the other is either a class test (on minimum 70% of curriculum) or assignment on live problems or course project.

Reference Books:

1. *Elements of Workshop Technology: Machine Tools (Volume – 2)*by S. K. HajraChoudhary, A. K. HajraChoudhary, Nirjhar Roy, Media promoters (2010).
2. *A Course in Workshop Technology Vol. II (Machine Tools)* by B. S. Raghuwanshi, DhanpatRai& CO. (2001).
3. *Workshop Technology Part 1, 2 and 3.* By W. A. J. Chapman, Taylor & Francis (1972)
4. *Production Technology – HMT* , Tata McGraw-Hill (1980).
5. *Manufacturing, Engineering and Technology, 4thEdition* bySeropeKalpakjian, Steven R. Schmid, published by Pearson (2005).
6. *A Text Book Of Production Technology Vol. II* by O. P. Khanna, DhanpatRai Publication (2000).
7. *Fundamentals of Modern Manufacturing- Materials, Processes and Systems, 3rd Edition* by Mikell P. Groover, Wiley India (2002).
8. *Manufacturing Processes for Engineering Materials, 4th Edition* bySeropeKalpakjian, Steven R. Schmid, published by Pearson (2007).

Course Code	Course/Subject Name	Credits
PEC304	**Fluid Mechanics and Fluid Power**	**4+1**

Objectives:

1. To impart understanding of fluid mechanics, including mass, energy and momentum balances etc.
2. To set up and solve fluid mechanics problems both analytically and numerically, wherever appropriate.
3. To develop and understand the terms and concepts related to fluid power.
4. To examine related concepts on distributions systems, hydraulic flow in pipes, sources of hydraulic power, rotary & linear actuators and control components in fluid power systems.

Outcomes: Learner should be able to:-

1. Gain the knowledge of concepts of fluid mechanics and its application in practice.
2. Understand the use and accordingly develop the ability to apply hydraulic schematics on fluid power trainer units.
3. Understand the fluid power terms, concepts and calculations.

Module	Details	Hrs.
01	**Fluid Properties and Fluid Statics**: Concept of fluid and flow, continuum concept, properties of fluids, Pascal's law, hydrostatic equation, hydrostatic forces on plane and curved surfaces, Buoyancy and the concept of stability of floating and submerged bodies.(No numerical on Buoyancy and Floatation)	10
02	2.1 **Fluid Kinematics**: Eulerian and Lagrangian description of fluid flow; stream, streak and path lines; types of flows, flow rate and continuity equation.(No numerical on Fluid Kinematics) 2.2 **Fluid dynamics**: Euler's and Bernoulli's equations, Application of Bernoulli's equation; Pitot tube, Venturi meter and Orifice meter (No derivations), mentum equation and its application on force on pipe bend.	08
03	3.1 **Dynamics of Viscous Flow**: Introduction to Laminar and Turbulent flow. Flow regimes and Reynold's number, Introduction to Navier Stokes equation, Fully developed flow through circular Tube/Pipe (Hagen Poisuille flow). 3.2 **Flow Through Pipes**: Major and minor losses in pipes, Darcy Weisbach equation, hydraulic gradient and total energy lines, pipes in series and parallel, branched pipes and equivalent pipe problems	10
04	4.1 **Introduction to Fluid power**: Advantages of fluid power, Application of fluid power system. Types of fluid power systems, Properties of hydraulic fluids General types of fluids, Fluid power symbols. 4.2 **Hydraulic Pumps and Motors**: Introduction, variable capacity and fixed capacity types gear, vane and piston pumps, pump performance. 4.3 **Fluid Power Actuators**: Linear hydraulic actuators – Types of hydraulic cylinders – Single acting, Double acting special cylinders, Rotary actuators – Fluid motors, Gear, Vane and Piston motors	08
05	**Control Components in Hydraulic Systems**: Directional Control Valves, Check valve – Classification, constructional features and symbolic representation. Pressure control valves – Constructional features and symbolic representations (Pressure relief valve, pressure reducing valves, sequence valves, Unloading valve and counter balance valve). Flow control valves – Constructional features and symbolic representations (Needle	08

	valve, Pressure compensated flow control valve and Pressure & temperature compensated flow control valve).	
06	**Hydraulic Circuit**: Control of single and double acting hydraulic cylinders. Meter-in, Meter-out and Bleed-off circuit. Regenerative circuit, counter balance valve circuit, sequencing circuits, Fail and safe circuit and Fast approach and slow transverse circuit	08

Theory Examination:

1. Question paper will comprise of total 6 questions, each of 20 Marks.
2. Only 4 questions need to be solved.
3. Question 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)

In question paper, weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

Internal Assessment:

Assessment consists of two tests out of which; one should be a compulsory class test (on minimum 40% of curriculum) and the other is either a class test (on minimum 70% of curriculum) or assignment on live problems or course project.

Term Work:

Term work shall consist of:

1. Assignments: on topics drawn from syllabus.
2. Minimum six experiments have to be conducted and presented with inferences.

List of Experiments (Any Six)

1. To determine the Cd of Venturi meter.
2. To determine the Cd of Orifice meter.
3. To determine velocity of flow in pipe by using Pitot tube.
4. To determine Metacentric Height of Ship Model.
5. To Verify Bernoulli's Theorem.
6. To determine types of flow by Reynold's Experiment.
7. To determine Major losses in pipes.
8. To determine Minor losses in pipes.

The distribution of marks for term work shall be as follows:

- Laboratory work (assignments/ Practicals): 20 Marks.
- Attendance (practical & theory): 05 Marks.

Reference Books:

1. *Fluid mechanics and hydraulic machines,* R. K. Rajput, S Chand (2008).
2. *Fluid Mechanics & Hydraulic Machines*, 9th Edition by R.K.Bansal, Laxmi Publications (2005).
3. *Fluid Machines and Fluid Power Engg*., 7th Edition by D.S Kumar, S K Kataria publications (2009).
4. *Introduction to Fluid Mechanics*, 4th Edition by R. W. Fox, and A. T. McDonald, John Wiley and Sons, Inc., (1992).
5. *Fluid Mechanics*, 3rd Edition by Frank M. White, McGraw-Hill, Inc., (1994).
6. *Industrial Hydraulics Manual,* Sperry & Vickers Co.
7. *Hydraulic and Pneumatic Power,* H. L. Stewart
8. *Hydraulic and Pneumatic controls,*ShanmugaSundaram.K, Chand& Co. (2006).

Course Code	Course/Subject Name	Credits
PEL305	**Computer Aided Machine Drawing^{+}**	**3**

Objectives:

1. To gain insight of visualizing an object and convert it into a drawing.
2. To gain knowledge of conventional representation of various machining and mechanical details as per IS.
3. To become conversant with 2-D and 3-D drafting.

Outcomes: Learner should be able to:-

1. Visualize and prepare detailed drawing of a given object.
2. Draw details and assembly of mechanical systems.
3. Read and interpret a given drawing.
4. Create 2-D and 3-D models using standard CAD software with manufacturing considerations.

Module	Details	Hrs.	
		Th.	**Pract.**
01	1.1 **Solid Geometry:** Intersection of surfaces and interpenetration of solids- Intersection of prism or cylinder with prism; cylinder or cone, both solids in simple position only. Primary auxiliary views and auxiliary projections of simple machine parts.	08	--
	1.2 **Machine Elements:** Preparation of 2-D drawings of standard machine elements (nuts, bolts, keys, cotter, screws, spring etc.)	--	04
	1.3 Conventional representation of assembly of threaded parts in external and sectional views, Types of threads; thread designation, Conventional representation of machine components and materials, Designation of standard components.	01	--
02	2.1 **Limits fits and tolerances:** Dimensioning with tolerances indicating various types of fits in details and assembly drawings, Types of assembly drawings, part drawings, drawings for catalogues and instruction manuals, patent drawings, drawing standards.	04	--
	2.2 **Details and assembly drawing**: Introduction to the unit assembly drawing, steps involved in preparing assembly drawing from details and vice-versa, Sequence in assembly.	02	--
	2.3 Preparation of details and assembly drawings of *any two*from: Clapper block, Single tool post, Lathe and Milling tail stock.	--	05
	2.4 Cotter, Knuckle joint, Keys and Couplings: keys-sunk, parallel woodruff, saddle, feather etc. Coupling: simple, muff, flanged.	03	--
	2.5 Protected flange coupling, Oldham's coupling, Universal coupling.	--	06
03	3.1 **Preparation of details and assembly drawings of Bearings:** Simple, solid, Bushed bearing. I.S. conventional representation of ball and roller bearing.	01	--
	3.2 Pedestal bearing, footstep bearing	--	04
04	4.1 **Preparation of details and assembly drawings of pulleys, Pipe joints:** Classification of Pulleys, pipe joints	02	--
	4.2 Pulleys: Flat belt, V-belt, rope belt, Fast and loose pulleys.	--	05
	4.3 Pipe joints *(any two)*: Flanged joints, Socket and spigot joint, Gland and stuffing box, expansion joint.	--	06

05	5.1 **Preparation of details and assembly drawings of Valves, I.C. Engine parts:** Types of Valves, introduction to I.C. Engine 5.2 Preparation of details and assembly drawings of*(any three):*Air cock; Blow off cock, Steam stop valve, Gate valve, Globe valve, Non return Valve, I.C. Engine parts: Piston, Connecting rod, Cross head, Crankshaft, Carburetor, Fuel pump, injector, and Spark plug.	02 -- 	-- 08
06	6.1 **Preparation of details and assembly drawings of Jigs and Fixtures:** Introduction to Jigs and fixtures, 6.2 Jigs and Fixtures (*any two from each*) 6.3 Reverse Engineering of a physical model: disassembling of any physical model having not less than five parts, sketch the minimum views required for each component, measure all the required dimensions of each component, convert these sketches into 3-D model and create an assembly drawing with actual dimensions	01 -- --	-- 06 04

[+] Course common with Mech/Auto/Prod

Term work:

A. Minimum two questions from theory part of each module should be solved as a home work in A-3 size sketch book.

B. A-3 size Printouts/plots of the problems solved in practical class from the practical part of each module

Problems from practical parts of each module should be solved using standard CAD packages like IDEAS, PRO-E, CATIA, Solid Works, Inventor etc.

The distribution of marks for Term work shall be as follows:

Home work sketch book	…….	20 marks
Printouts/Plots	…….	20 marks
Attendance (Theory and practicals)	…….	10 marks

Practical/Oral examination:

1. Practical examination duration is three hours, based on Part-B of the Term work, and should contain two sessions as follows:
   Session-I: Preparation of 3-D models of parts, assembling parts and preparing views of assembly from given 2-D detailed drawing.
   Session-II: Preparation of minimum five detailed 3-D part drawings from given 2-D assembly drawing.
   Oral examination should also be conducted to check the knowledge of conventional and CAD drawing.
2. Questions provided for practical examination should contain minimum five and not more than ten parts.
3. The distribution of marks for practical examination shall be as follows:

Session-I	……	20 marks
Session-II	……	20 marks
Oral	……	10 marks

4. Evaluation of practical examination to be done based on the printout of students work
5. Students work along with evaluation report to be preserved till the next examination

Reference Books:

1. *Machine Drawing*,N.D. Bhatt.
2. *A text book of Machine Drawing*, Laxminarayan&M.L.Mathur.(Jain brothers Delhi).
3. *Machine Drawing*, Kamat&Rao.
4. *Machine Drawing*, M.B.Shah
5. *A text book of Machine Drawing*,R.B.Gupta (Satyaprakashan, Tech. Publication)
6. *Machine Drawing*, K.I.Narayana, P.Kannaiah and K.Venkata Reddy.
7. Machine Drawing, Sidheshwar and Kanheya
8. *Autodesk Inventor 2011 for Engineers and Designers*, ShamTickoo, SurinderRaina (dreamtech Press).
9. *Engineering Drawing*, P J Shah
10. *Engineering Drawing*, N D Bhat

Subject Code	Subject Name	Credits
PEL306	**Database & Information Retrieval system#**	**02**

Objective:

1. Learn and practice data modeling using the entity-relationship and developing database designs.
2. Understand the use of Structured Query Language (SQL) and learn SQL syntax.
3. Apply Graphical User Interface techniques for retrieval of information from database.
4. Understand the needs of database processing and learn the techniques for controlling the consequences of concurrent data access.

Outcome: The student should be able to:-

1. To describe data models and schemas in DBMS.
2. To understand the features of database management systems and Relational database.
3. To use SQL- the standard language of relational databases.
4. To understand the functional dependencies and design of the database.
5. To understand the graphical user Interface design.

Module	Detailed content	Hours
1	**Introduction Database Concepts:** What is a database?, Characteristics of databases, Example of database, File system V/s Database system, What is DBMS?, Users of Database system, Advantage of using an enterprise database, Concerns when using an enterprise database, Data Independence, DBMS system architecture, Database Administrator,	02
2	**Entity–Relationship Data Model :** Introduction, Benefits of Data Modeling, Types of Models, Phases of Database Modeling, The Entity-Relationship (ER) Model, Generalization, Specialization and Aggregation, Extended Entity-Relationship (EER) Model.	04
3	**Relational Model and Algebra :** Introduction , Mapping the ER and EER Model to the Relational Model , Data Manipulation , Data Integrity ,Advantages of the Relational Model, Relational Algebra , Relational Algebra Queries, Relational Calculus.	04
4	**Structured Query Language (SQL) :** Overview of SQL , Data Definition Commands, Set operations , aggregate function , null values, , Data Manipulation commands, Data Control commands , Views-Using Virtual Tables in SQL, Nested and complex queries .	04
5	**Introduction to Transactions Management and Concurrency:** Transaction concept, Transaction states, ACID properties, Implementation of atomicity and durability, Concurrent Executions, Serializability, Recoverability, Concurrency Control: Lock-based , Timestamp-based , Validation-based protocols, Deadlock handling, Recovery System: Failure Classification, Storage structure, Recovery & atomicity, Log based recovery, Shadow paging.	04

6	6.1 **Graphical User Interface** : Murphy 's Law of G U I Design, Features of G U I, Icons and graphics, Identifying visual cues, clear communication, color selection, GUI standard, planning GUI Design Work. 6.2 **Visual programming :** ***Sharing Data and Code*:** Working with Projects, Introduction to Basic language, Using inbuilt controls and ActiveX controls, creating and using classes, Introduction to Collections, Using and creating ActiveX Components, dynamic data exchange, object linking and embedding ***Creating visual software entities:*** Working with text, graphics, working with files, file management, serial communication, multimedia control interfaces.	06

* 2hours theory can be taught to entire class followed by 2hours practical in batches
[#] Course common with Mech/Auto/Prod/Civil

Term Work:

Assign minimum two case studies for each student to perform on their case studies following experiments-

1. Problem Definition and draw ER /EER diagram.
2. Design Relational Model.
3. Perform DDL operation.
4. Perform DML and DCL operations
5. Design Forms using Visual programming
6. Retrieve the information through GUI.

Distribution of marks for Term work shall be as follows:

Laboratory work (programs/printouts):	40 marks
Attendance (Theory and practicals):	10 marks

Practical/Oral Examination:

1. Practical examination duration is 2hours and questions to be based on the list of experiments mentioned in Term Work.
2. Evaluation of practical examination to be done by examiner based on the printout of students work
3. Practical examination: 40 marks, oral examination based on practical examination: 10 marks
4. Students work along with evaluation report to be preserved till the next examination

Reference Books:

1. *Database Management Systems*, G K Gupta, McGraw – Hill.
2. *Database System Concepts*, 6th Edition by Korth, Slberchatz,Sudarshan , McGraw – Hill
3. *GUI Design for dummies*,IDG books.
4. *Visual Basic 2005*, How to program (3RD Edition) Deitel&Deitel, Pearson Education.
5. *SQL and PL/SQL for Oracle 10g*, Dr. P.S. Deshpande ,Black Book, Dreamtech Press
6. *Introduction to Database Management*, Mark L. Gillenson, PaulrajPonniah ,Weley
7. *Oracle for Professional*", Sharaman Shah SPD.
8. *Database Management Systems*, Raghu Ramkrishnan and Johannes Gehrke, TMH
9. *Fundamentals of Database Management System*, Mark L Gillenson, Wiley India

Course Code	Course/Subject Name	Credits
PEL307	**Workshop Practice-III**	**2**

Objectives:

1. To practice lathe operations like turning, taper turning, thread cutting etc.
2. To practice machining of flat surfaces on shaping machine.
3. To understand various concepts related to moulding processes of plastic materials.

Outcomes: Learner should be able to:-

1. Perform different types of lathe operations like cylindrical turning, thread cutting etc.
2. Perform Shaping operations for flat surfaces like Keyway cutting and T-slot cutting.
3. Understand difference between metals and plastics, considering their applications.

Term Work:

1. One job on plain and taper turning.
2. One job on precision turning, taper turning and screw cutting.
3. One job on shaping machine to make horizontal and inclined surfaces.
4. One simple exercise on welding – preparing a component comprising of welding joints.
5. Demo of turning operation on plastic rod to know the difference in machining of metals and plastics (Any of the commercial plastics like Nylon-6, Nylon-66, Polyster, PET etc.)

The distribution of marks for term work shall be as follows:

- Laboratory work (experiments): 40 Marks.
- Attendance (practicals): 10 Marks.