

VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

[Autonomous Institute affiliated to University of Mumbai]

SYLLABUS

FOR

S.Y. B. TECH.

(Production Engineering)

VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE,

[V.J.T.I.]

MATUNGA, MUMBAI 400 019.

[YEAR 2010-2011]

**Scheme of Teaching and Evaluation
S Y B Tech (Production Engineering)
(Semester III)**

Theory Courses										
Course Code	Course Name	Hr/Week			Credits	Examination Scheme (Evaluation in % Weightage)				
		L	T	P		TA	IST	ESE	Total	ESE (W) (hrs)
MA0203	Applied Mathematics - III	3	1	-	4	10	30	60	100	3
PE0201	Manufacturing Technology - I	3	-	-	3	10	30	60	100	3
ME0221	Fluid Mechanics and Hydraulics Circuits	3	-	-	3	10	30	60	100	3
SE0221	Strength of Materials	3	1	-	4	10	30	60	100	3
ME0222	Materials Technology	3	1	-	4	10	30	60	100	3
Total		15	3	-	18					

Laboratory Courses										
Course Code	Course Name	Hr/Week			Credits	Examination Scheme (Evaluation in % Weightage)				
		L	T	P		TA	ESE (O / P)	Total	ESE (P)	
PE1201	Manufacturing Technology - I Lab	-	-	3	1.5	50	50	100	-	
ME1221	Fluid Mechanics Lab	-	-	3	1.5	50	50	100	-	
PE 1202	Production and Machine Drawing Lab	-	-	3	1.5	50	50	100	-	
ME1222	Workshop Practice - III	-	-	3	1.5	50	50	100	-	
Total		-	-	12	6					

Co-curricular Activities										
Course Code	Course Name	Hr/Week			Credits					
		L	T	P						
CC4231	Industry-Academia Interaction	-	-	2	A/NA					
CC4232	E-Library/ Internet	-	-	3	-					
Total		-	-	5	-					

Total for Semester	L	T	P	Total Hours	Credits
	15	3	17	35	24

Abbreviations:

L: Lectures, **T:** Tutorial, **P:** Practical, **TA:** Teacher Assessment, **ESE (P):** End Semester Practical Examination, **ESE (O):** End Semester Oral Examination, **IST:** In Semester Test/s, **ESE (W):** End Semester Written Examination, **ESE (W) (hrs):** End Semester Written Examination duration, **ESE (O) (hrs):** End Semester Examination Practical (duration), **A/NA:** Attended/Not Attended

Notes:

TA for Theory and Laboratory courses shall carry 25 marks.

IST: One mid semester test (40 marks of two hour duration) and two surprise Tests/Quizzes (5% weightage of each). ESE (W) shall be of 100 marks of 3 hours, ESE (P) and ESE (O) shall be decided as per course requirement. ESE (O) and ESE (P) shall together carry 25 marks.

Industry - Academia Interaction: Wednesday afternoon slot will be used. Module or broad subject outline will be decided by the course coordinator. Lectures as per module in the defined areas of eminent personalities from industry or academia will be arranged. Assessment will be done on the attendance of the students for the module. (More than 60%: Attended, otherwise: Not Attended).

E- Library/ Internet: Every course must have at least one assignment or case-study which requires exhaustive internet search/support.

**Scheme of Teaching and Evaluation
S Y B Tech (Production Engineering)
(Semester IV)**

Theory Courses										
Course Code	Course Name	Hr/Week			Credits	Examination Scheme (Evaluation in % Weightage)				
		L	T	P		TA	IST	ESE	Total	ESE (W) (hrs)
MA0204	Applied Mathematics - IV	3	1	-	4	10	30	60	100	3
PE 0203	Manufacturing Technology - II	3	-	-	3	10	30	60	100	3
EE0221	Electrical Machines	3	-	-	3	10	30	60	100	3
ME0223	Applied Thermodynamics & Heat Engines	3	1	-	4	10	30	60	100	3
ME0224	Theory of Machines	3	1	-	4	10	30	60	100	3
CE0221	Environmental Studies	3	-	-	3	10	30	60	100	3
Total		18	3	-	21					

Laboratory Courses										
Course Code	Course Name	Hr/Week			Credits	Examination Scheme (Evaluation in % Weightage)				
		L	T	P		TA	ESE (O / P)	Total	ESE (P)	
PE 1203	Manufacturing Technology-II lab	-	-	3	1.5	50	50	100	-	
EE1221	Electrical Machines Lab	-	-	3	1.5	50	50	100	-	
ME1223	Mechanical Engineering Lab	-	-	3	1.5	50	50	100	-	
ME1224	Workshop Practice - IV	-	-	3	1.5	50	50	100	-	
Total		-	-	12	6					

Co-curricular Activities										
Course Code	Course Name	Hr/Week			Credits					
		L	T	P						
CC4241	Industry-Academia Interaction	-	-	2	A/NA					
Total		-	-	2	-					

Total for Semester	L	T	P	Total Hours	Credits
	18	3	14	35	27

Abbreviations:

L: Lectures, **T:** Tutorial, **P:** Practical, **TA:** Teacher Assessment, **ESE (P):** End Semester Practical Examination, **ESE (O):** End Semester Oral Examination, **IST:** In Semester Test/s, **ESE (W):** End Semester Written Examination, **ESE (W) (hrs):** End Semester Written Examination duration, **ESE (O) (hrs):** End Semester Examination Practical (duration), **A/NA:** Attended/Not Attended

Notes:

TA for Theory and Laboratory courses shall carry 25 marks.

IST: One mid semester test (40 marks of two hour duration) and two surprise Tests/Quizzes (5% weightage of each). ESE (W) shall be of 100 marks of 3 hours, ESE (P) and ESE (O) shall be decided as per course requirement. ESE (O) and ESE (P) shall together carry 25 marks.

Industry - Academia Interaction: Wednesday afternoon slot will be used. Module or broad subject outline will be decided by the course coordinator. Lectures as per module in the defined areas of eminent personalities from industry or academia will be arranged. Assessment will be done on the attendance of the students for the module. (More than 60% : Attended, otherwise: Not Attended.)

Programme Name	:	S Y B Tech (Production Engineering)	SEMESTER – III
Course Code	:	MA0203	
Course Title	:	APPLIED MATHEMATICS - III	

Course Contents

Module 1 Laplace Transforms

- 1.1 Functions of bounded variation
- 1.2 Laplace transforms of standard functions such as $1, t^n, e^{at}, \sin at, \cos at, \sinh at, erf \ C$
- 1.3 Linear property of Laplace transforms.
- 1.4 First shifting theorem, Second shifting theorem

$$L\{f(t)\} = F(s), L\{f(t) e^{at}\} = F(s-a), L\left\{ \int_0^t f(u) du \right\} = \frac{F(s)}{s}, L\{t^n f(t)\} = (-1)^n \frac{d^n F(s)}{ds^n}$$
- 1.5 Change of scale property: Unit step functions, Heaviside, Dirac delta functions, Periodic functions and their Laplace transforms.
- 1.6 Inverse Laplace transform using linear property, theorems, partial fractions and convolution theorem.
- 1.7 Application to solve ordinary differential equations with one dependent variable.

Module 2 Matrices

- 2.1 Types of matrices
- 2.2 Adjoint (Adjugate) of a matrix. Inverse of a matrix.
- 2.3 Elementary transformations of matrix, rank of a matrix.
- 2.4 Reduction to a normal form.
- 2.5 Partitioning of matrix, System of homogeneous and non- homogeneous equations, their consistency and solution.
- 2.6 Eigen values Eigen vectors of square matrix.
- 2.7 Cayley Hamilton's theorem and function of square matrix.
- 2.8 Brief revision of vectors over real field, Inner product, Norm, Linear dependence and independence, Orthogonality of matrix.
- 2.9 Characteristic polynomial, values and vectors of square matrix.

Module 3 Fourier Series and Integrals

- 3.1 Orthogonal orthonormal functions, Expression for a function in series of orthogonal functions.
- 3.2 Dirichlet's conditions.
- 3.3 Fourier series of periodic function with period $2\pi, 2l$, Dirichlet's theorem, even and odd functions.
- 3.4 Half range expansions, Parseval's relations.
- 3.5 Complex form of Fourier series. Fourier integral.

Module 4 Numerical Methods

- 4.1 Solutions of systems of linear algebraic equations.
- 4.2 Gauss elimination, Gauss Jordan, Crout's(LU) method
- 4.3 Gauss Seidal and jacobi iteration.
- 4.4 Differential equation, Taylor Series method, Picard method, Rungakutta method, Euler method.

Text Books

1. Advanced Engineering Mathematics, H K Dass, S Chand & Co. Ltd, 3rd Edition, 2006, 2007
2. Higher Engineering Mathematics, Dr B S Grewal, Khanna Publications, 39th Edition, 2005.
3. Theory and Problems in Numerical Methods, T Veer arajan, T Ramachandran, Tata McGraw-Hill, First Edition, 2004.

Reference Books

1. Advanced Engineering Mathematics, Erurin Kreyszig, Wiley Eastern Ltd, 2000

2. Engineering Mathematics for semester III, T Veerrajan, Tata McGraw Hill.,2005
3. Matrices, A R Vasishtha,2005

Programme Name	:	S Y B Tech (Production Engineering)	SEMESTER – III
Course Code	:	PE0201	
Course Title	:	MANUFACTURING TECHNOLOGY - I	

1. Metal Cutting, Machine Tools and Machinability

Definition , need and classification of machine tools:

Brief history and development, typical features, associated with cutting tools and Performance measure of machine tools.

Theory of Metal Cutting

General: Common features of machining processes, geometry of single point tool and tool signature, concept of speed, feed and depth of cut applicable to various machining processes.

Cutting tool materials-types, classification, characteristics and applications .Manufacturing methods of cutting tools including coating of tools CVD, PVD).

Cutting tool geometry and Surface finish :

Height of feed ridges and built up edges as primary factors effecting surface finish; effect of speed, feed, depth of cut, tool material and angles, and material variables on surface finish.

Cutting Fluids, Tool Life and Machinability of Metals:

Functions and types of cutting fluids; effect on cutting force, tool life and surface finish, types of coolants, choice of coolant for various machining processes.

Tool life definition. Flank wear and crater wear. Preliminary failure and ultimate failure, mechanism of tool wear, effect of speed, feed, depth of cut, tool material and geometry on tool life. Cutting force, tool life and surface finish as measures of machine ability.

2. Turning

Lathes -Specifications, description and functions of lathe, principle parts, back gear-all gear.

Drive, feed mechanism, lathe accessories, and attachments—chucks, collets, mandrel, Face plate. Lathe operations, Taper turning methods, thread cutting, cutting tools, and tool geometry.

Capstan and turret lathes: Principle parts of capstan and turret lathes, difference between capstan and turret lathe, work holding devices, tool holding devices, tool dies, chasers, taps, etc.

tool layout for simple components like bolt, nut, pin, shafts. Single point cutting tools: Types, geometry, materials

3. Hole Making

Machine Types:, work and tool holding devices, drilling machine operation, types and materials of drills. Twist drill geometry. Counter-boring-taper of counter bores. Spot facing- types of Spot facers. Countersinking — Types of countersinks. Reaming – types of reamers. Tapping—hand tap and machine tap. Machining time for drilling.

Deep hole drilling (only fundamentals to be covered): Gun drills, deep hole drilling machine

4. Reciprocating Machine Tools And Processes

Shaping machines: types, working of shaper machine, quick return mechanisms, shaper operations, machining time.

Planing machine: types of planing Machines, planer mechanism, feed mechanism, work holding devices, shaper v/s planer.

Slotting machine : types of slotting machines, quick return mechanism

5. Milling

Types of milling machines, milling processes, conventional and climb milling, milling cutters, peripheral, face and shell milling cutters, geometry and materials of milling cutters, attachments

and special accessories, for milling, universal dividing head, indexing method, direct, plane, compound, and differential indexing mechanisms, arbors adaptors, and collets chucks. Calculations of machining time; copy milling machines.

6. Broaching

Broaching machine :

Broaching process, elements of typical internal broach, types of broaches, broaching Machines— vertical, horizontal, surface, and continuous broaching vs. other processes (design of broaches omitted)

7. Cutting Off Machines

Power hacksaws, band saw, and circular saw, friction saw and abrasive cutting off Machines, field of applications and limitations, tools and accessories.

Text Books

1. Manufacturing Technology - Metal Cutting, P N Rao, Second Edition, Tata McGraw Hill
2. Elements of workshop Technology Vol. II, Hajara Chowdhary, Indian Book Distributors, Calcutta

Reference Books

1. Fundamentals of Machining & Machine Tools, Juneja and Sekhon, New Age International 2008
2. Manufacturing Engineering. & Technology, Serope Kalpakjian Pearson Learning
3. Materials and Processes in Manufacturing , E Paul De Garmo, J T Black, PHI.
4. Production Technology – HMT, HMT, Tata McGraw Hill
5. Production Engineering, P.C. Sharma, S.Chand & Co

Programme Name	:	S.Y. B. Tech. Production Engineering	SEMESTER – III
Course Code	:	ME0221	
Course Title	:	FLUID MECHANICS AND HYDRAULIC CIRCUITS	

Course Contents

1. General Properties of fluids and fluid statics

Viscous fluids, Newtonian and non-Newtonian, their stress strain relationship (general description only), pressure at a point in fluid, variation of pressure with depth, fluid application to manometer, transmission of pressure in a fluid, thrust on plane surface, centre of pressure horizontal and vertical plane surfaces, forces on immersed bodies

2. Fluid Dynamics

Various types of flow (general description only), continuity equation, energy equation, momentum equation. Application of energy and continuity equation for fluid flow measurement in closed conduit (No derivations, only applications are to be imparted).

3. Flow in Pipes:

Laminar and turbulent flow in pipes (elementary treatment only), Darcy's equation, and laminar flow between flat parallel stationary plates. Laminar flow between parallel plates one of which is moving, losses in bends, couplings and valves

4. Hydraulic Pumps and Motors

Hydraulic pumps and motors

Introduction, variable capacity and fixed capacity types-gear, vane and piston pumps, ram units and rotary actuators, performance curves for variable speed drives, combination of pump and motor units

5. Valves

Introduction, types of valves viz. check valve, relief valve, speed control valves, pressure compensating valves, pressure compensated flow control valves, unloading valves, direction control valves, sequence valves and counter balance valves

6. Hydraulic Circuits

Oil hydraulic circuits:

Introduction, basic circuit, general classification of valves in circuit, meter-in circuit, meter-out circuit

Text Books

1. Fluid Mechanics and Hydraulic: - R.K.Bansal, Ninth Edition, 2005, Laxmi Publications (P) Ltd
2. Fluid Mechanics - Victor Streeter & Wiley, McGraw Hill, Publishing

Reference Books

1. Introduction to Fluid Mechanics - Robert :Fox and McDonald, Wiley Publications, 2003.
2. Fluid Mechanics and Hydraulic Machines - Ramamurtham. Dhanpatrai Publishing Pvt Ltd
3. Fluid Mechanics and Hydraulic Machines. - Modi & Seth, Standard Book House 2010.

Programme Name	:	S.Y. B. Tech. Production Engineering	SEMESTER – III
Course Code	:	SE 0221	
Course Title	:	STRENGTH OF MATERIALS	

Course Contents

1. Simple Stress Strain Analysis

Simple stress and strain, Testing of round and flat specimen as per IS specifications. True stress- strain vs. Engineering stress-strain diagrams for important engineering metals and alloys. Venant's Principle, Stress-strain diagram, Deformation of rectangular and circular, uniform and tapering bars, deformation due to self weight, shear stress and shear strain, Poisson's ratio, Volumetric strain, Bulk modulus, relationship between Young's modulus and Modulus of elasticity, Factor of Safety

2. Shear Force And Bending Moment

Axial force, shear force and bending moment diagrams for statically determinate beams including beams with internal hinges for different types of loading, relationships between rates of loading, shear force and bending moment

3. Simple Theory Of Bending

Flexure formula for straight beams, principal axes of inertia, moments of inertia about principle axes, transfer theorem, simple problems involving application of Flexure formula, section modulus, moment of modulus of a section, flinched beams

4. Shear Stress In Beams

Distribution of shear stress across plane sections used commonly for structural purposes, shear connectors.

5. Simple Theory of Torsion

Torsion of circular shafts-solid and hollow, stresses is shaft when transmitting power, closed-coiled helical spring under axial load.

6. Bending Moment Combined With Axial Loads

Application to members subjected to eccentric load, core of a section.

7. Principal Stresses

General equations for transformation of stress, principal planes and principal stresses, maximum shear stress, determination using Mohr's circle, principle stresses in beams, principal stresses in shafts subjected to torsion, bending and axial thrust, concept of equivalent torsional and bending moments.

8. Deflection Of Beams

Deflection of cantilevers simply supported and overhanging beams using double integration and Macaulay's methods for different types of loadings.

9. Column And Struts

Struts subjected to axial loads, concept of buckling, Euler's formula for struts with different support conditions, Euler's and Rankine's design formulae.

10 Strain Energy

Strain energy due to axial force and bending moment, stresses in axial members and simple beams due to impact loading.

Text Books

1. Mechanics of Material - Beer & Johnston,. Tata McGraw Hill 2008
2. Strength Of Materials - S. Ramamrutham, Dhanpatrai Publications (P) Ltd

Reference Books

1. Strength Of Materials : - Nash Schum Series
2. Mechanics of Materials - E. P. Popov, Prentice Hall of India Pvt. Ltd.
3. Handbook -Mechanical - ASM
Testing Vol.5

Programme Name	:	S.Y. B. Tech. Production Engineering	SEMESTER – III
Course Code	:	ME 0222	
Course Title	:	MATERIALS TECHNOLOGY	

Course Contents

NOTE: Analytical and application oriented approach required to be adopted in teaching and evaluation rather than descriptive approach. All written examinations are expected to set question papers having numerical problems with at least 50%marks. Question paper is not expected to contain lengthy descriptive questions.

1. Solidification And Structure Of Metals

Formation of solids from liquids of pure metals and alloys, ingot defects and their remedies, Single crystal and polycrystalline structure, Classification and crystal structure, unit cell, co-ordination number, atomic packing, crystallographic notations

2. Crystal imperfection: Deformation and Strain hardening

Elastic & plastic deformations and their significance. Deformation in single and polycrystalline materials. Mechanism of deformation, critical resolved stress. Deformability of FCC, BCC, HCP metals, slip system

Strain hardening ::Significance., dislocation theory of strain hardening. Re-crystallization annealing and its stages, factors affecting recrystallization. Hot and cold working,

4 Alloys And Theory Of Alloying

Definition and importance. Classification and characteristics of different types of alloys. Phase diagram and its importance, different types of phase diagrams and their interpretation. Eutectic, Eutectoid, Peritectic alloys, conditions of their formation and importance. Solid solutions, conditions and importance of their formation. Intermediate alloys. Types and conditions of formation with importance. Important alloys of aluminium, copper, nickel, tin and zinc, their specifications, universal identification numbers and applications

5. Principles And Technology Of Heat Treatment.

Equilibrium transformations in iron-iron carbide systems. Non-equilibrium transformations. Time Temperature Transformations of austenite. Mechanisms of Pearlite, Bainite & Martensite Transformations. Principles of heat treatment of steels from T.T.T. diagram.

Technology of heat treatment: Significance of austensization, homogenization and controlled decomposition of Austenite. Heat treatment furnaces, salt baths and cooling media, heat treatment in controlled atmosphere.

6. Heat Treatment Processes

Annealing, different annealing processes. Normalizing, Hardening, Hardening media, hardenability, its method of determination, factors affecting hardenability. Tempering, transformations in tempering, temper embrittlement, temper colors. Austempering, Martempering.

Case Hardening.-Carburizing, Nitriding, Cyaniding, Carbonitriding. Induction hardening, Flame hardening

7. Powder Metallurgy

Powder making methods. Powder compaction, Sintering, sintering mechanism. Applications of power metallurgy

Text Books

1. Material Science & Metallurgy: - V.D. Kodgire., Everest Publication House, Pune.

Reference Books

1. Mechanical Metallurgy - G.E. Dieter, Third Edition, McGraw Hill International
2. Applied Metallurgy For Engineers. - E.C. Rollason, ELBS
3. Engineering Materials Part I & II : - R.A. Higgins, ELBS Publishing
4. Physical Metallurgy - V.Raghvan Prentice Hall India

Programme Name	:	S.Y. B. Tech. Production Engineering	SEMESTER – III
Course Code	:	PE1201	
Course Title	:	MANUFACTURING TECHNOLOGY - I LAB	

Title of the Experiment /Assignment

- 1 Study of single point tool geometry.
- 2 Study of designation of cutting tools –ASA(American Standard Association (ASA) system and Orthogonal Rake System (ORS)
- 3 Study of multi-point tool point tool geometry-milling cutter, drill, broach
- 4 Assignment based on cutting tool materials and industry catalogues.
- 5 Assignment based on speed feed and depth of cut for various metal cutting operations of lathe, milling, drilling and other machining operations.
- 6 Study of gear box, feed mechanisms and thread cutting mechanism
- 7 Assignment on broach design
- 8 Study of important accessories of machine tools.
- 9 Study of cutting fluids

Reference Books

- 1 Manufacturing Technology -Metal Cutting : P.N. Rao Second Edition TMH
- 2 Elements of workshop Technology Vol. II Hajara Chowdhary, Indian Book Distributor, Calcutta
- 3 Fundamentals of Machining & Machine Tools , Juneja & Sekhon, New Age International
- 4 Production Engineering: P.C.Sharma S. Chand & Company

Programme Name	:	S.Y. B. Tech. Production Engineering	SEMESTER – III
Course Code	:	ME1221	
Course Title	:	FLUID MECHANICS LAB	

Title of the Experiment /Assignment

- 1 Calibration of pressure gauge/ vacuum gauge
- 2 Center of pressure
- 3 Bernoulli's theorem
- 4 Venturimeter/ orifice meter
- 5 Pipe friction
- 6 Impact of jets
- 7 Valve characteristics
- 8 Gear pump characteristics
- 9 Hydraulic Circuit-Basic hydraulic circuit, Regenerative Circuit, Sequencing circuit
- 10 Counter balance circuit, Flow Control circuits

References Books

- 1 Fluid Mechanics- Victor Streeter,
- 2 Industrial Hydraulics Manual- ETN

Programme Name	:	S.Y. B. Tech. Production Engineering	SEMESTER – III
Course Code	:	PE1202	
Course Title	:	PRODUCTION AND MACHINE DRAWING LAB	

Course Contents

1. Fundamentals of Production Drawing

Principles of Dimensioning, Specification of Materials, Standard Mechanical Components Specifications, Limit, , Surface Roughness, Production Drawings and Process Sheets
Production Drawings of Mating Parts, Production Drawing of Assemblies
Tool Drawings, Jigs and Fixtures Drawings, Inspection and Gauging Tool Drawings

2. Production Machine Elements

Screwed fasteners: Thread nomenclature, forms of screw threads, V threads, Square thread, ACME, Buttress, and Whitworth. Representation of threads, Hexagonal headed bolts and nuts, square headed bolts & nuts, locking devices for nuts.

Keys, cotters and pin joints : Keys such as saddle keys, sunk keys, round keys, Cotter joints such as Socket and Spigot joint, Gib and Cotter joint, Cotter and Sleeve Joint. Pin joint (Knuckle joint).

Couplings: Rigid couplings, Split, Muff, and Flanged protected type, Flexible bush pin type.

3. Assembly & Details Drawings

Machine tools parts: Machine swivel vice, pipe vice, screw jack, tailstock, tool head of shaper, Simple drill jig & milling fixture, simple press tool assembly.

Bearings: Plummer block, foot step bearing, bracket with pedestal bearing.

IC Engine parts: I.C. Engine connecting rod, stuffing box, and eccentric.

Valves : Feed checks valve, Non Return valve, stop valve, Relief valve

4 Tolerances and Fits

Tolerances and Fits: Limits, fits, allowances and tolerances: Selection of tolerances, methods of placing limit dimensions, fits .Calculation of tolerances, limits, allowances and fit.

5. CAD

Computer Aided Design and Draughting: Auto-CAD commands, Editing commands, Basic Dimensioning, Creating 2-D and 3-D objects of simple machine parts

Title of the Experiment /Assignment

- 1 Two sheets based on topic one.
- 2 One sheet comprising of at least 4 problems from chapter No. 2
- 3 One sheet of "Free hand sketches" drawn on A2 size paper comprising of at least 6 problems from chapter No. 3.
- 4 2 sheets of Assembly & 2 sheets of part or detail drawing from chapter No. 4 comprising of at least 2 problems in assembly and 2 problems in part drawing.
- 5 2 sheets comprising of at least 4 problems from chapter No.4 using Auto CAD.

Reference Books

- 1 Production Drawing: K L Narayana, P Kannaiah, K Venketa Reddy, New Age International
- 2 Machine Drawing: Siddheshwara Sastry. TMH
- 3 Engineering Drawing with AUTO CAD2000: Jeyapoovan., Vikas Publications.
- 4 Machine Drawing: M.B.Shah and B.C.Rana, Charaotar Publishing

Programme Name	:	S.Y. B. Tech. Production Engineering	SEMESTER – III
Course Code	:	ME1222	
Course Title	:	WORKSHOP PRACTICE - III	

Title of the Experiment /Assignment

NOTE: Detail survey and study of machine tools and their important parts and sub-assemblies, accessories, tools used Three assignments based on the descriptive as well as numerical calculations required in the machine tools. (This part of work shop practice will supplement the understanding required in Manufacturing Engineering-I)

1. Machine Shop

- 1 One job on plain and taper turning.
- 2 One job on turning, taper turning and screw cutting.
- 3 One job on shaping machine with horizontal and inclined surfaces
- 4 One job on milling machine
- 5 One job on cylindrical grinding or surface grinding machine

2. Moulding Shop

- 1 Sufficient practice (about 3 to 4 moulds) of preparing different sand moulds

Reference Books

- 1 All About Machine Tools:Gerling, TMH
- 2 Manufacturing Technology -Metal Cutting : P.N. Rao Second Edition ,Tata McGraw Hill Publishing
- 3 Elements of workshop Technology Vol. II Hajara Chowdhary,Indian Book Distribution,Kolkata

Programme Name	:	S.Y. B. Tech. (Production)	SEMESTER – IV
Course Code	:	MA0204	
Course Title	:	APPLIED MATHEMATICS - IV	

Course Contents

Module 1: Statistics

- 1.1 Review of measures of central tendency, measures of variation and probability.
- 1.2 Discrete and continuous Random variable.
- 1.3 Binomial, Poisson and Normal distribution.
- 1.4 Random sampling, sampling distribution, standard error, Central limit theorem.
- 1.5 Estimation of parameters, point estimation, interval Estimation, confidence interval.
- 1.6 Testing of Hypothesis, large sample and small sample, tests 't' test and 'F' test, Chi-square test.
- 1.7 Correlation and regression.
- 1.8 Coefficient of correlation and Rank correlation
- 1.9 Regression analysis, curve fitting, method of least square
- 1.10 Statistical quality control and control charts.
- 1.11 Analysis of variance (One way & Two way).

Module 2: Vector Calculus

- 1.1 Scalar and vector point functions.
- 1.2 Directional derivative Curl and Divergence.
- 1.3 Consecervative, Irrotational and Solenoidal field.
- 1.4 Line integral and its properties.
- 1.5 Green's theorem, Stoke's theorem, divergence theorem and its applications.

Text Books

1. Mathematical Statistics, Kapur and Saxena, S Chand & Co. Ltd, 2009
2. Engineering Statistics, T Veerarajan, Tata McGraw-Hill Publishing Company 2nd Edition.2005
3. Advance Engineering Mathematics , H K Dass, S Chand & Co., 3rd Edition, 2007.

Reference Books

1. Computational Mathematics for Semester-IV by G V Kumbhojkar, C Jamnadas & Co.- 2005, 5th Edition.
2. Engineering Mathematics by S.S. Sastri- Prentice Hall of India, 2005, 4th Edition.

Programme Name	:	S.Y. B. Tech. Production Engineering	SEMESTER – IV
Course Code	:	PE0203	
Course Title	:	MANUFACTURING TECHNOLOGY - II	

Course Contents

NOTE: Analytical and application oriented approach required to be adopted in teaching and evaluation rather than descriptive approach. All written examinations are expected to set question papers with numerical problems with at least 50%marks. Question paper is not expected to contain lengthy descriptive questions.

1. Thread Cutting

Thread production process, thread chasing, thread milling, thread whirling, die threading and tapping, thread rolling, thread grinding, self opening die heads, chasers-radial, and tangential (tool geometry omitted.)

2. Gear Teeth Cutting

Gear Milling, Gear Hobbing- Principles of Hobbing (Kinematics omitted) , hobbing techniques, hob size, material (tool Geometry omitted), gear shaper cutter (tool geometry omitted). Gear finishing processes-gear shaving, gear lapping, gear grinding, gear burnishing

3. Grinding

Grinding Process, grinding machines- cylindrical, center type, universal, plain, plunge center type, chucking type, centre- less grinding machines-through feed, in feed, end feed, internal grinding machines- horizontal, vertical spindle-rotary/reciprocating types, tool and cutter grinders, special grinding machines.

Grinding wheels. Types of abrasives-natural, artificial, grain size, types of bonds, grade, structure, shape and sizes, IS for marking system of grinding wheel, selection of grinding wheels, grinding fluids, balancing of grinding wheels, truing and dressing, mounting of grinding wheels, safety

4. Superfinishing

Superfinishing Processes- Honing, lapping, polishing, buffing and other unconventional finishing processes

5. Automats

Major classification, horizontal and vertical, single spindle and multi-spindle, bar type and chuck type, screw type and Swiss type, tool and tool holders, typical tooling set-up for simple work pieces, special attachments, threading attachments, high speed drilling attachments, chutes, magazines, and hoppers for feeding

NC and CNC lathes. CNC turning centers, Programming, working principles and fundamentals of programming Machining centers, special purpose machines

6. Unconventional Machining Processes

(only basic principles, machines and application)

Electrical Discharge Machines (EDM)

Electrochemical Machining (ECM)

Chemical Machining (CHM)

Ultrasonic Machining (USM)

Abrasive Jet Machining (AJM)

Laser Beam Machining (LBM)

Electron Beam Machining (EBM)

Plasma Arc Machining (PAM)

7. Micromachining

Fundamentals of micro fabrication. Tool material interaction during micromachining
Mechanical Micromachining; Micro-drilling, micro-milling, micro-turning processes. Thermal
Micromachining processes; micro-EDM, micro wire EDM, micro-ECM, LASER based
micromachining, LIGA. Micro-electro-mechanical Systems (MEMS). Measurement techniques
in micro engineering

Recommended Books

1. Manufacturing Technology-
Metal Cutting P.N.Rao, Second Edition, Tata McGraw Hill Publishing Co
2. Fundamentals of Machining &
Machine Tools Juneja & Sekhon, New Age International 2008

Reference Books

1. Workshop Technology-Vol II Hajara Chowdhary Indian Book Distribution, Kolkata
2. Manufacturing Science Amitabh Ghosh & Asok Mullick, EWP Calcutta
3. Production Technology HMT Tata McGraw Hill Publishing Co.
4. Material and Manufacturing
Processes De Garmo, Prentice Hall India Publications
5. Production Technology R.K. Jain, 2009 Khanna Publications, New Delhi

Programme Name	:	S.Y. B. Tech. Production Engineering	SEMESTER – IV
Course Code	:	EE0221	
Course Title	:	ELECTRICAL MACHINES	

1) Transformer

- 1.1 Construction, principle of operation properties of ideal transformer.
- 1.2 Equivalent circuit & phasor diagram of practical transformer.
- 1.3 Different losses efficiency & regulation.
- 1.4 O.C & S.C test and its calculation
- 1.5 Distribution & power Transformer, current & potential transformer.

2) Three phase induction motor

- 2.1 Construction, principle operation, equivalent circuit, torque equation, torque - slip characteristics, different losses and calculation of efficiency
- 2.2 No load test and blocked rotor test
- 2.3 Load test on 3 phase I. M.
- 2.4 Different methods of Speed control of 3 phase I. M.
- 2.5 Starter use for 3 phases I. M. Applications of 3 phase I.M.

3) Single Phase I. M.

- 3.1 Double field revolving theory, analysis of motor equivalent circuit
- 3.2 Split phase, capacitor start and capacitor start run I. M, testing of single phase I. M. Applications of different single phase I.M.

4) Synchronous Machine

- 4.1 Alternator : Construction, emf equation, winding factor, armature reaction, synchronous impedance, load characteristics voltage regulation. Use of alternators in power plants.
- 4.2 Synchronous Motors : Principle operation, method of starting, V and inverted V curves, applications of Synchronous motors.

List of Experiments

1. O.C. / S.C. test on single-phase transformer.
2. Load test on transformer.
3. Load test on 3 phase I.M.
4. O.C. / S.C. test on 3 Phase I.M.
5. Load test on single phase I.M.
6. Regulation of 3 phases Alternator.
7. Synchronization of alternator with bus bar.
8. Speed control of 3 phase I.M..

Text book

1. Electrical machine” by J.B.Gupta.
2. Bimbhra P.S. “Electrical Machinery” Khanna Publisher
3. Nagrath I.J. & Kothari D.P., “Electrical Machines”, TMH Publications.

Reference books

1. Electrical machine” by M.G. Say.
2. “Electrical machine” by Broson, Haydon.

Programme Name	:	S.Y. B. Tech. Production Engineering	SEMESTER – IV
Course Code	:	ME0223	
Course Title	:	APPLIED THERMODYNAMICS AND HEAT ENGINES	

Course Contents

1. Revision of Thermodynamics Concept

System, Surrounding, state, Path Property, Reversible and irreversible process, thermodynamic work, heat. Temperature, thermal equilibrium. Ideal and real gases. Properties of steam. Zeroth law of thermodynamics, first and second laws of thermodynamics

2. Compressors

Uses of compressed air, classification, single stage reciprocating compressor with and without clearance, work and power calculations, two stage air compressor with perfect inter cooling, FAD and volumetric efficiency

3. Heat Transfer

One dimensional, steady state, heat transfer by conduction through plane wall, radial heat transfer by conducting through hollow cylinder and hollow sphere. Conduction through a composite plane and cylindrical wall.

Heat flow by convection. Free and forced convection. Nusselt, Reynolds and Prandtl number; heat transfer between two fluids separated by composite plane and cylindrical wall. Over all heat transfer coefficient. Heat exchangers. Types of heat exchangers. Log Mean Temperature Difference. Radiation heat transfer, Absorptivity, reflectivity and transmittivity Monochromatic emissive power. Wien's law, Stefan Boltzman's and Kirchoff's Laws

4. Analysis of I.C. Engines

Otto, Diesel and dual combustion cycles, air standard efficiency and mean effective pressure. Study of constructional details of I.C. engines. Four and two stroke cycle I.C. engines. S.I. and C.I. engines. Systems requirements of I.C. engines. Ignition system of S.I. engines. Governing of I.C. engines. Valve timing diagrams. Calculation of I.P, F.P. and B.P., determination of indicated and brake thermal efficiency and specific fuel consumption. Testing of I.C. engines. Heat balance sheet

5. Introduction Refrigeration and Air Conditioning

Applications of refrigeration, Bell Coleman cycle, C.O.P. and power calculations. Vapour compression refrigeration system. Representation on T-S and P-H diagram, vapour absorption system

6. Miscellaneous Topics for Production Engineers

Text Books

1. Thermodynamics and Heat Engines: Vol I and II R.Yadav,Cental Publishing House,Allahabad
2. Elements of Heat Engines. (Vol. I, II & III). Patel & Karmachandani, Acharya Book Depot

Reference Books

1. Thermal Engineering Mahesh Rathore, Tata McGraw Hill Publication 2010
2. Thermal Engineering R.K.Rajput,Dhanpat Rai Publications
3. Power Plant Engineering Domkundwar , Dhanpatrai Publications

Programme Name	:	S.Y. B. Tech. Production Engineering	SEMESTER – IV
Course Code	:	ME0224	
Course Title	:	THEORY OF MACHINES	

Course Contents

1. Basic Concepts

Links, kinematics pairs, kinematics pairs giving one, two and three degrees of freedom
 Kinematics chains, degree of freedom and move ability criterion. Constrained kinematics
 Chains as mechanism. Inversions of single and double slider crank chains and their
 Applications. Introduction, pantograph, straight line motion mechanism, engine indicators Viz.,
 Simplex, Crosby, Thomson and Dobbie Mckines indicators, automobile steering Gears.

2. Motion Characteristics Of Mechanisms

Velocity and acceleration analysis of mechanisms with single degree of freedom system Using
 graphical method. Instantaneous centre, Kenneth's theorem; analysis of velocities of
 mechanism using instantaneous centre method. Analytical technique applied to only Slides
 crank mechanism, Bennett's construction and Ritterhau's construction.

3. Static And Dynamic Force Analysis

Four linkage mechanism as applied to only slider crank chain and four bar chains with lower
 pairs

4. Cams

Introduction, types of cams, types of followers. Follower motion, viz. simple harmonic motions,
 constant velocity, uniform and constant acceleration & retardation and cycloidal motion, layout
 of cam profile for specified displacement characteristics. Cams with oscillating follower system.

5. Clutches Brakes and Dynamometers

Study and analysis of single plate clutch, multiple plate clutches and cone clutches.
 Introduction, types of brakes, viz.. block and shoe brakes , band brakes, band and block
 Brakes, braking of vehicles. Types of dynamometers, viz. Prony brake, Rope brake, belt
 transmission dynamometers

6. Gear

Introduction, condition of constant velocity ratio-conjugate profiles -- profiles used in Gears,
 interference of involutes teeth, methods of preventing interference, under cutting, Length of
 path of contact, arc of contact and contact ratio

7. Turning Moment

Turning moment diagram and flywheel

8. Balancing

Introduction, Rotary masses—serial masses in same plane, several masses in different Planes,
 balancing of reciprocating masses, primary balance and secondary balance. Balancing of
 locomotives -- hammer blow and variation of tractive efforts. Static and Dynamic balancing of
 machines

9. Vibrations

Introduction, free vibration, longitudinal, transverse and tensional vibrations, Dunkerley's
 Empirical equation, critical or whirling speed of shaft. Torsional vibrations of two rotor system
 and three rotor system – torsional equivalent shaft – free tensional vibrations of a geared

system. (Damped and forced vibrations are excluded).

10. Gyroscope

Introduction-- Gyroscopic couple and precision stabilization of ships and air crafts only.

Governors: Introduction, types of governors, centrifugal governors—gravity controlled and spring controlled governors. (Mathematical derivations, and analytical problems are not to be covered in governors)

Text Books

1. Theory of Machines S.S. Rattan, Second Edition, Tata Mcgraw Hill Publications
2. Theory of Machines R.S. Khurmi & Gupta, S. Chand & Co, 2010

Reference Books

1. Theory of Machines Thomas Bevan, Third Edition,
2. Theory of Machines Amitabh Ghosh and Ahsok Mullick, EWP Calcutta

Programme Name	:	S.Y. B. Tech. Production Engineering	SEMESTER – IV
Course Code	:	CE0221	
Course Title	:	ENVIORNMENTAL STUDIES	

Course Contents

Unit 1: The Multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness.

Unit 2: Natural Resources

Renewable and non renewable resources:

- a) Natural resources and associated problems
 - Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people.
 - Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.
 - Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
 - Food Resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers- pesticides problems, water logging, salinity, case studies.
 - Energy Resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies
 - Land Resources: Land as a resource, land degradation, man induces land slides, soil erosion, and desertification.
- b) Role of individual in conservation of natural resources.
- c) Equitable use of resources for sustainable life styles.

Unit 3: Eco Systems

- Concept of an eco system
- Structure and function of an eco system.
- Producers, consumers, decomposers.
- Energy flow in the eco systems.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following eco systems:-

- Forest ecosystem
- Grass land ecosystem
- Desert ecosystem.
- Aquatic eco systems(ponds, streams, lakes, rivers, oceans, estuaries)

UNIT 4: Biodiversity and it's Conservation

- Introduction-Definition: genetics, species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, national and local level.
- India as a mega diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity: habitats loss, poaching of wild life, man wildlife conflicts.
- Endangered and endemic spaces of India.
- Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT 5: Environmental Pollution

Definition Causes, effects and control measures of:-

- a. Air pollution
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

Solid waste Management: Causes, effects and control measures of urban and industrial wastes

Role of an individual in prevention of pollution

Pollution case studies

Disaster management: Floods, earth quake, cyclone and land slides

Unit 6: Social issues and the Environment

- Form unsustainable to sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, water shed management
- Resettlement and rehabilitation of people; its problems and concerns, case studies

- Environmental ethics: issues and possible solutions
- Climate change, global warming, acid rain , ozone layer depletion, nuclear accidents and holocaust, case studies.
- Wasteland reclamation
- Consumerism and waste products
- Environment protection Act
- Air(prevention and control of pollution)Act
- Water((prevention and control of pollution)Act
- Wildlife protection act
- Forest conservation act
- Issues involved in enforcement of environmental legislations
- Public awareness

Unit 7: Human population and the environment

- Population growth and variation among nations
- Population explosion- family welfare programme
- Environment and human health
- Human rights
- Value education
- HIV/AIDS
- Women and child welfare
- Role of information technology in environment and human health
- Case studies

Unit 8: Field work

Visit to a local area to document environment assets river/ forest/ grassland/ hill/mountain. Visit to a local polluted site-urban/rural/industrial/agricultural. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hills lopes, etc(field work equal to 5 lecture works)

Text Books

1. Textbook of Environmental studies, Erach Bharucha, UGC 2005
2. Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd 2010

Programme Name	:	S.Y. B. Tech. Production Engineering	SEMESTER – III
Course Code	:	PE1203	
Course Title	:	MANUFACTURING TECHNOLOGY - II LAB.	

Title of the Experiment /Assignment

- 1 Study of grinding wheel and process parameters for grinding various materials.
- 2 Tool layout for single spindle Automat with process sheet.
- 3 Study of NC code and application of the same for producing a component.
- 4 Mathematical modeling of at least three unconventional machining methods.
- 5 Seminar preparation and presentation on unconventional machining methods.
- 6 Factory visit report for gear cutting and Superfinishing.
- 7 Demonstration on micromachining.

Reference Books

- 1 Fundamentals of Machining & Machine Tools, Juneja & Sekhon, New Age International Publications
- 2 Manufacturing Technology-Metal Cutting :P.N.Rao,Second Edition, Tata McGraw Hill Publications
- 3 Manufacturing Science: Amitabh Ghosh & Mullick. East West,Affiliate,New Delhi
- 4 Production Technology : HMT, Tata McGraw Hill Publications
- 5 All About Machine Tools: Gerling, Tata McGraw Hill Publications

Programme Name	:	S.Y. B. Tech. Production Engineering	SEMESTER – IV
Course Code	:	EE1221	
Course Title	:	ELECTRICAL MACHINES LAB	

Title of the Experiment /Assignment

- 1 Characteristics of three phase induction motor
- 2 DC Motor Characteristics
- 3 Speed control of DC motors
- 4 Starting methods of DC motors
- 5 Study of logic gates
- 6 OP- AMP applications
- 7 Study of counters
- 8 Kelvin Double Bridge
- 9 Application of timers
- 10 SCR application in AC & DC motors
- 11 Microprocessor programming (simple programs without any interfacing circuits)
- 12 Study of PLC

Reference Books

- 1 Electronic Devices & Circuit Theory : Boylestad & Nashelsky, PHI Publishing
- 2 Electric Machines and Transformers :Anderson Leonard D. & Jack McNeil
- 3 OP- Amplifier : Gayakwad, Pearson Publications Edition, 2009
- 4 Microprocessor : Gaonkar, Fifth Edition, Penram International Publishing
- 5 Digital Principle and Applications: Malvino & Leach, Fifth Edition, Medium Publishing

Programme Name	:	S.Y. B. Tech. Production Engineering	SEMESTER – IV
Course Code	:	ME1222	
Course Title	:	MECHANICAL ENGINEERING LAB	

Title of the Experiment /Assignment

- 1 Load Test on compressor
- 2 To find the thermal conductivity of a metal rod
- 3 Trial on Parallel flow Heat exchanger
- 4 Trial on Counter flow Heat exchanger
- 5 Study of domestic refrigerators
- 6 Load test on a Diesel Engine
- 7 Study of a Gas Turbine Plant
- 8 Assignments based on the topics covered in the theory course 'Thermodynamics' : I and II law of thermodynamics. Air Compressors, Heat Transfer, I.C.Engines etc.

Reference Books

- 1 Heat Transfer :J.P.Hollman,McGraw Hill International Publications
- 2 Heat Engines Vol.III-Patel & Karmachandani, Acharaya Publications
- 3 Internal Combustion Engines: Ganeshan, Tata McGraw Hill Publications
- 4 Refrigeratation and Air-Conditioning : C.P.Arora, Tata McGraw Hill Publications

Programme Name	:	S.Y. B. Tech. Production Engineering	SEMESTER – IV
Course Code	:	ME1224	
Course Title	:	WORKSHOP PRACTICE - IV	

Title of the Experiment /Assignment

NOTE: Detail survey and study of machine tools and their important parts and sub-assemblies, accessories, tools used Three assignments based on the descriptive as well as numerical calculations required in the machine tools. (This part of work shop practice will supplement the understanding required in Manufacturing Engineering-I)

Machine Shop

One composite job consisting minimum four parts employing operations on lathe, viz., precision

- 1 turning, screw cutting, boring etc; and involving use of shaping, milling, drilling, grinding operations.
- 2 Assembly and disassembly some of machining fixture, drill jig etc.
- 3 Assembly and disassembly of machine tool sub assembly

Reference Books

- 1 All About Machine Tools : Gerling, Tata McGraw Hill Publications
- 2 Manufacturing Technology -Metal Cutting : P.N. Rao Second Edition, Tata McGraw Hill Publications
- 3 Elements of workshop Technology Vol. II Hajara Chowdhary. Indian Book Distribution, Kolkata