VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017-2018

B.E.: Industrial Engineering and Management

III SEMESTER

Sl. No.	Course Code	Title	Teaching Department	Teaching Hours /Week		Examination				Credits
				Theory	Practical/ Drawing	Duration (in Hrs)	SEE Marks	CIE Marks	Total Marks	
1	17MAT31	Engineering Mathematics-III *	Mathematics	04	-	03	60	40	100	4
2	17IM/IP32	Fluid Mechanics	IEM/IPE	04	-	03	60	40	100	4
3	17IM/IP33	Basic Thermodynamics	IEM/IPE	04	-	03	60	40	100	4
4	17IM/IP34	Mechanical Measurements	IEM/IPE	04	-	03	60	40	100	4
5	17IM/IP35	Mechanics of Materials	IEM/IPE	04	-	03	60	40	100	4
6	17IM/IP36	Manufacturing Process-I	IEM/IPE	03	-	03	60	40	100	3
7	17IML/IPL 37A/37B	Foundry and Forging Lab/ Machine Shop	IEM/IPE	-	1Hr-Instruction 2Hr-Practical	03	60	40	100	2
8	17IML/IPL 38A/38B	Metallography and Material Testing Lab/ Metrology and Measurements Lab	IEM/IPE	-	1Hr-Instruction 2Hr-Practical	03	60	40	100	2
9	17KL / CPH39/49	Kannada / Constitution of India, Professional Ethics and Human Rights	Humanities	01		01	30	20	50	1
TOTAL				**24**	**6**	**25**	**510**	**340**	**850**	**28**

1. Kannada/Constitution of India, Professional Ethics and Human Rights: 50 % of the programs of the Institution have to teach Kannada/Constitution of India, Professional Ethics and Human Rights in cycle based concept during III and IV semesters.

2. Audit Course:

(i) *All lateral entry students (except B.Sc. candidates) have to register for Additional Mathematics – I, which is 03 contact hours per week.

1	17MATDIP31	Additional Mathematics –I	Mathematics	03	--	03	60	--	60	--

(ii) Language English (Audit Course) be compulsorily studied by all lateral entry students (except B.Sc. candidates)

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017-2018

B.E.: Industrial Engineering and Management

IV SEMESTER

Sl. No	Subject Code	Title	Teaching Department	Teaching Hours /Week		Examination				Credits
				Theory	Practical/ Drawing	Duration (in Hrs)	SEE Marks	CIE Marks	Total Marks	
1	17MAT41	Engineering Mathematics-IV*	Mathematics	04	-	03	60	40	100	4
2	17IM/IP42	Computer Aided Machine Drawing	IEM/IPE	02	04	03	60	40	100	4
3	17IM/IP43	Kinematics of Machines	IEM/IPE	04	-	03	60	40	100	4
4	17IM/IP44	Manufacturing Process -II	IEM/IPE	04	-	03	60	40	100	4
5	17IM/IP45	Material Science and Metallurgy	IEM/IPE	04	-	03	60	40	100	4
6	17IM/IP46	CAD/CAM	IEM/IPE	03	-	03	60	40	100	3
7	17IML/IPL 47A/47B	Foundry and Forging Lab/ Machine Shop	IEM/IPE	-	1Hr-Instruction 2Hr-Practical	03	60	40	100	2
8	17IML/IPL 48A/48B	Metallography and Material Testing Lab/ Metrology and Measurements Lab		-	1Hr-Instruction 2Hr-Practical	03	60	40	100	2
9	17KL / CPH39/49	Kannada / Constitution of India, Professional Ethics and Human Rights	Humanities	01		01	30	20	50	1
TOTAL				**22**	**10**	**25**	**510**	**340**	**850**	**28**

1. Kannada/Constitution of India, Professional Ethics and Human Rights: 50 % of the programs of the Institution have to teach Kannada/Constitution of India, Professional Ethics and Human Rights in cycle based concept during III and IV semesters.

2. Audit Course:
(i) *All lateral entry students (except B.Sc. candidates) have to register for Additional Mathematics – I, which is 03 contact hours per week.

1	17MATDIP41	Additional Mathematics –II	Mathematics	03	--	03	60	--	60	--

(ii) Language English (Audit Course) be compulsorily studied by all lateral entry students (except B.Sc. candidates)

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017-2018

B.E.: Industrial Engineering and Management

V SEMESTER

Sl. No	Subject Code	Title	Teaching Department	Teaching Hours /Week		Examination				Credits
				Theory	Practical/ Drawing	Duration (in Hrs)	SEE Marks	CIE Marks	Total Marks	
1	17IM51	Management and Entrepreneurship	IEM	04	-	03	60	40	100	4
2	17IM52	Work Study and Ergonomics	IEM	04	-	03	60	40	100	4
3	17IM53	Design of Machine Elements	IEM	04	-	03	60	40	100	4
4	17IM54	Statistics for Engineers	IEM	04	-	03	60	40	100	4
5	17IM55X	Professional Elective-I	IEM	03	-	03	60	40	100	3
6	17IM56X	Open Elective-I	IEM	03	-	03	60	40	100	3
7	17IML57	Mechanical Lab	IEM	-	1Hr-Instruction 2Hr-Practical	03	60	40	100	2
8	17IML58	Work Study and Ergonomics lab	IEM	-	1Hr-Instruction 2Hr-Practical	03	60	40	100	2
TOTAL				**22**	**06**	**24**	**480**	**320**	**800**	**26**

Professional Elective-I		**Open Elective-I**	
17IM 551	Engineering Economy	17IM 561	Professional Communication and Report Writing
17IM 552	Theory of Metal Forming	17IM 562	Concurrent Engineering
17IM 553	Finite Elements Method	17IM 563	Technology Management
17IM 554	Hydraulics and Pneumatics	17IM 564	Human Resource Management

*******Students can select any one of the open electives offered by any Department (Please refer to consolidated list of VTU for open electives).
Selection of an open elective is not allowed, if:

· The candidate has no pre – requisite knowledge.

· The candidate has studied similar content course during previous semesters.

· The syllabus content of the selected open elective is similar to that of Departmental core course(s) or to be studied Professional elective(s). Registration to open electives shall be documented under the guidance of Programme Coordinator and Adviser.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017-2018

B.E.: Industrial Engineering and Management

VI SEMESTER

Sl. No	Subject Code	Title	Teaching Department	Teaching Hours /Week		Examination				Credits
				Theory	Practical/ Drawing	Duration (in Hrs)	SEE Marks	CIE Marks	Total Marks	
1	17IM61	Quality Assurance and Reliability	IEM	04	-	03	60	40	100	4
2	17IM62	Operations Research	IEM	04	-	03	60	40	100	4
3	17IM63	Simulation Modelling and Analysis	IEM	04	-	03	60	40	100	4
4	17IM64	Materials Management	IEM	04	-	03	60	40	100	4
5	17IM65X	Professional Elective-II	IEM	03	-	03	60	40	100	3
6	17IM66X	Open Elective-II	IEM	03	-	03	60	40	100	3
7	17IML67	CAD/CAM Lab	IEM	-	1Hr-Instruction 2Hr-Practical	03	60	40	100	2
8	17IML68	Simulation Lab	IEM	-	1Hr-Instruction 2Hr-Practical	03	60	40	100	2
TOTAL				**22**	**6**	**24**	**480**	**320**	**800**	**26**

Professional Elective-II		**Open Elective-II**	
17IM651	Financial Management	17IM661	Management Information Systems
17IM652	Industrial Automation	17IM662	Advanced Machining Processes
17IM653	Software Engineering and Management	17IM663	Value Engineering
17IM654	Composite Materials	17IM664	Development of Enterprises

*******Students can select any one of the open electives offered by any Department (Please refer to consolidated list of VTU for open electives).
Selection of an open elective is not allowed, if:

· The candidate has no pre – requisite knowledge.

· The candidate has studied similar content course during previous semesters.

· The syllabus content of the selected open elective is similar to that of Departmental core course(s) or to be studied Professional elective(s). Registration to open electives shall be documented under the guidance of Programme Coordinator and Adviser.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017-2018

B.E.: Industrial Engineering and Management

VII SEMESTER

Sl. No	Subject Code	Title	Teaching Department	Teaching Hours /Week		Examination				Credits
				Theory	Practical/ Drawing	Duration (in Hrs)	SEE Marks	CIE Marks	Total Marks	
1	17IM71	Facility Planning and Design	IEM	04	-	03	60	40	100	4
2	17IM72	Operations Management	IEM	04	-	03	60	40	100	4
3	17IM73	Project Management	IEM	04	-	03	60	40	100	4
4	17IM74X	Professional Elective-III	IEM	03	-	03	60	40	100	3
5	17IM75X	Open Elective-III	IEM	03	-	03	60	40	100	3
6	17IML76	Enterprise Resource Planning Lab	IEM	-	1Hr-Instruction 2Hr-Practical	03	60	40	100	2
7	17IML77	Quality Engineering Lab	IEM	-	1Hr-Instruction 2Hr-Practical	03	60	40	100	2
8	17IMP78	Project Work Phase-I + Project Seminar	IEM	-	03	--	--	100	100	2
TOTAL				**18**	**9**	**21**	**420**	**380**	**800**	**24**

Professional Elective-III		**Open Elective-III**	
17IM741	Marketing Management	17IM751	Financial Management
17IM742	Enterprise Resource Planning	17IM752	World Class Manufacturing
17IM743	Strategic Management	17IM753	Product Design and Manufacturing
17IM744	Maintenance and Safety Engineering	17IM754	Organizational Behaviour

- **Project Phase – I and Project Seminar:** Comprises of Literature Survey, Problem identification, Objectives and Methodology. CIE marks shall be based on the report covering Literature Survey, Problem identification, Objectives and Methodology and Seminar presentation skill.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017-2018

B.E.: Industrial Engineering and Management

VIII SEMESTER

Sl. No	Subject Code	Title	Teaching Department	Teaching Hours /Week		Examination				Credit
				Theory	Practical/ Drawing	Duration (in Hrs)	SEE Marks	CIE Marks	Total Marks	
1	17IM81	Supply Chain Management	IEM	4	-	3	60	40	100	4
2	17IM82	Total Quality Management	IEM	4	-	3	60	40	100	4
3	17IM83X	Professional Elective-IV	IEM	3	-	3	60	40	100	3
4	17IM84	Internship / Professional Practice	IEM	Industry Oriented		3	50	50	100	2
5	17IMP85	Project Work Phase-II	IEM	-	6	3	100	100	200	6
6	17IMS86	Seminar	IEM	-	4	-	-	100	100	1
TOTAL				**11**	**10**	**15**	**330**	**370**	**700**	**20**

Professional Elective-IV

17IM831 Just In Time Manufacturing
17IM832 Automation in Manufacturing
17IM833 Lean Manufacturing
17IM834 Automobile Engineering

- **Internship / Professional Practice:** The 4 Weeks internship to be completed between the VI and VII semester vacation, and/or VII and VIII semester vacation period.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

Scheme of Teaching and Examination 2017-2018

Choice Based Credit System (CBCS)

FLUID MECHANICS

INDUSTRIAL ENGG & MANAGEMENT

B.E., III Semester,

[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17IM/IP32**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10Hours per Module)**	**Exam Hours**	**03**

Credits – 04

Course Objectives:

- To provide the students with
- The fundamentals of fluid mechanics, fluids and its properties.
- An understanding of fluid statistics and hence the usage of manometers, forces on submerged bodies.
- Study of Buoyancy, metacenter, continuity equation and different functions
- Application of Bernoulli's equation to measure energy levels
- Using different fluid equipment's to calculate fluid flow and using dimensional analysis to
- solve flow problems.
- Understanding the phenomenon of losses during flow in pipes.

- Study of Laminar flow and the viscous effects.
- Evaluating the various parameters connected to flow around immersed bodies.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examination 2017-2018

Choice Based Credit System (CBCS)

Module-1

Properties of Fluids: Introduction, Properties of fluids, viscosity, thermodynamic properties, surface tension, capillarity, vapour pressure and cavitation Fluid Statics : Fluid pressure at a point, Pascal's law, pressure variation in a static fluid, absolute, gauge, atmospheric and vacuum pressures, simple manometers and differential manometers. Total pressure and center of pressure on submerged plane surfaces; horizontal, vertical and inclined plane surfaces, curved surface submerged in liquid.

Module-2

Buoyancy and Fluid Kinematics: Buoyancy, center of buoyancy, metacentre and metacentric height, conditions of equilibrium of floating and submerged bodies, determination of Metacentric height theoretically. Kinematics: Types of fluid flow, continuity equation in 2D and 3D (Cartesian Co-ordinates only), velocity and acceleration

Module-3.. .

Fluid Dynamics: Introduction equation of motion, Euler's equation of motion, Bernoulli's equation from first principles and also from Euler's equation, limitations of Bernoulli's equation. Fluid Flow Measurements :Venturimeter, orificemeter, pitot-tube, vertical orifice, V-Notch and rectangular notches.

Module-4

Flow through pipes : Minor losses through pipes. Darey's and Chezy's equation for loss of head due to friction in pipes. HGL andTEL(no problems). Flow past immersed bodies : Drag, Lift, expression for lift and drag, boundary layer concept, displacement, momentum and energy thickness.

Module-5

Dimensional Analysis : Introduction, derived quantities, dimensions of physical quantities, dimensional homogeneity, Rayleigh's method, Buckingham π theorem, dimensionless numbers, similitude(theory and no problems) Introduction to compressible flow : Velocity of sound in a fluid, Mach number, Mach cone, propagation of pressure waves in a compressible fluid on plates.

1. After the completion of the course, a student will
2. 1. examine the fundamental of fluid mechanics and fluids and apply the basic equations to find the force on submerged surfaces.
3. 2. Calculate using known formula to calculate the center of buoyancy and find the velocity and acceleration.
4. 3. Calculate various flow parameters using fluid flow meters and using dimension analysis to predict flow phenomena.
5. 4. Use Euler's and Bernoulli's equations and the co nservation of mass to determine velocities & pressures. Calculate frictional losses through pipes and to calculate the drag and lift, displacement, momentum and energy thickness…

Text Books:

1. Fluid Mechanics and Fluid Power Engineering, Kumar.D.S, Kataria and Sons., 2004.
2. Fluid Mechancis by Dr. Bansal, R.K.Lakshmi Publications, 2004.

Reference Books:

1. Fluid Mechanics and hydraulics, Dr.Jagadishlal: Metropolitan Book Co-Ltd., 1997.
2. Fluid Mechanics (SI Units), Yunus A. Cingel John M.Oimbala. Tata MaGrawHill, 2006.
3. Fluid Mechanics by John F.Douglas, Janul and M.Gasiosek and john A.Swaffield, Pearson Education Asia, 5th ed., 2006

BASIC THERMODYNAMICS
INDUSTRIAL ENGG & MANAGEMENT
B.E., III Semester,
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17IM/IP33**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10Hours per Module)**	**Exam Hours**	**03**

Credits – 04

Module-1

Fundamental Concepts & Definitions: Thermodynamics definition and scope, Microscopic and Macroscopic approaches. Some practical applications of engineering thermodynamic Systems, Characteristics of system boundary and control surface, examples. Thermodynamic properties; definition and units, intensive and extensive properties. Thermodynamic state, state point, state diagram, path and process, quasi-static process, cyclic and non-cyclic ;Processes; Thermodynamic equilibrium; definition, mechanical equilibrium; diathermic wall, thermal equilibrium, chemical equilibrium, Zeroth law of thermodynamics, Temperature; concepts, scales, fixed points and measurements. Work and Heat: Definition of work and its limitations.Thermodynamic definition of work; examples, sign convention.

Module-2

Displacementwork; as a part of a system boundary, as a whole of a system boundary,expressions for displacement work in various processes through p-v diagrams. First Law of Thermodynamics: Joules experiments, equivalence of heat andwork. Statement of the First law of thermodynamics, extension of the First law tonon - cyclic processes, energy, energy as a property, modes of energy, puresubstance; definition, two-property rule, Specific heat at constant volume,enthalpy, specific heat at constant pressure.

Module-3

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APPLICATION OF FIRST LAW OF THERMODYNAMICS:Extension of the First law to controlvolume; steady state-steady flow energy equation, important applications,analysis of

unsteady processes such as film and evacuation of vessels with andwithout heat transfer. SECOND LAW OF THERMODYNAMICS –Qualitative differenc e between heat & work; Cyclic heat engine; Energy Reservoirs; Kelvin-Planck statement of the Second law of Thermodynamics; Clausius's statement of Second law of Thermodynamics; (Equivalence of two statements not included)

Module-4

Gas power cycle: Air Standard cycles: Carnot, Otto, Diesel, Dual and Stirling cycles, P-V and T-S diagrams, description, efficiencies and mean effective pressures, Comparison of Otto, Diesel and dual cycles. Introduction To Gas Turbine And Its Classification.

Module-5

.C. Engine: Testing of two stroke and four stroke SI and CI engines for performance Related numerical problems, heat balance, Motoring Method, Willian's line method, swinging field dynamometer, Morse test. Real Gases: Introduction. Van-der Waal's Equation of state, Van-derWaal's constants in terms of critical properties, Law of corresponding states,compressiblity factor; compressibility chart.

Text Books:

1. Basic Engineering Thermodynamics, A.Venkatesh, Universities Press, 2008

2.Basic and Applied Thermodynamics, P.K.Nag, 2nd Ed., Tata McGraw Hill Pub. 2002

3. Thermal Engineering,R.K, Rajput, Laxmi Publication

Reference Books:

- Thermodynamics, An Engineering Approach, YunusA.Cenegal and Michael A.Boles, Tata McGraw Hill publications, 2002
- Engineering Thermodynamics, J.B.Jones and G.A.Hawkins, John Wiley and Sons..
- Fundamentals of Classical Thermodynamics, G.J.VanWylen and R.E.Sonntag, Wiley Eastern.

- An Introduction to Thermodynamcis, Y.V.C.Rao, Wiley Eastern, 1993,
- B.K Venkanna, Swati B. Wadavadagi "Basic Thermod ynamics, PHI, New Delhi, 201

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

Scheme of Teaching and Examination 2017-2018

Choice Based Credit System (CBCS)

MECHANICAL MEAUREMENTS

INDUSTRIAL ENGG & MANAGEMENT

B.E., III Semester,

[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17IM/IP34**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10Hours per Module)**	**Exam Hours**	**03**

Credits – 04

Course Objectives:

1. …
2. …

Module-1

Standards of measurement:

Definition and Objectives of metrology, Standards of lengthInternational prototype meter, Imperial standard yard, Wave length standard, subdivision of standards, line and end standard, calibration of end bars (Numerical), Slip gauges, Wringing phenomena, Indian Standards (M-81, M-12), Numerical problems on building of slip gauges.

Module-2

System of Limits, Fits, Tolerance and Gauging:

Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly limits of size, Indian standards, concept of limits of size and tolerances, compound tolerances, accumulation of tolerances, definition of fits, types of fits and their designation (IS919-1963), geometrical tolerance, positional-tolerances, hole basis system, shaft basis system, classification of gauges, brief concept of design of gauges (Taylor's principles), Wear allowance on gauges, Types of gauges-plain plug gauge, ring gauge, snap gauge, limit gauge and gauge materials

Comparators and Angular measurement:

Introduction to comparators, characteristics, classification of comparators, mechanical comparators-Johnson Mikrokator, sigma comparators, dial indicator, optical comparators-principles, Zeiss ultra optimeter, electric and electronic comparatorsprinciples, LVDT, pneumatic comparators, back pressure gauges, solex comparators. Angular measurements, bevel protractor, sine principle and use of sine bars, sine centre, use of angle gauges (numericals on building of angles), clinometers.

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.Module-3

Interferometer and screw thread, gear measurement:

Interferometer, interferemetry, autocollimator. Optical flats. Terminology of screw threads, measurementof major diameter, minor diameter, pitch, angle and effective diameter of screw threadsby 2-wire and 3-wire methods, best size wire. Tool maker's microscope, gear.to.,terminology, use of gear tooth vernier caliper and micrometer.

Measurements and measurement systems:

Definition, significance of measurement, generalized measurement system, definitions and concept of accuracy, precision, calibration, threshold, sensitivity, hysterisis, repeatability, linearity, loading effect, system response-times delay. Errors in measurement, classification of errors.Transducers, transfer efficiency, primary and secondary transducers, electrical, mechanical, electronic transducers, advantages of each type transducers.

Module-4

Intermediate modifying and terminating devices:

Mechanical systems, inherent problems, electrical intermediate modifying devices, input circuitry, ballast circuit, electronic amplifiers and telemetry. Terminating devices, mechanical, cathode ray oscilloscope, oscillographs, X-Y plotters.

Module-5

Measurement of force, torque and pressure:

Principle, analytical balance,platform balance, proving ring. Torque measurement, Prony brake, hydraulicdynamometer. Pressure measurements, principle, use of elastic merijbers, Bridgemangauge, Mcloed gauge, Pirani gauge.

Temperature and strain measurement:

Resistance thermometers, thermocouple, law of thermo couple, materials used for construction, pyrometer, optical pyrometer. Strain measurements, strain gauge, preparation and mounting of strain gauges, gauge factor, methods of strain measurement.

Course outcomes:

1. ..
2. ..

Text Books:

· Mechanical Measurements, Beckwith Marangoni and Lienhard, Pearson Education, 6th Ed., 2006.

· Engineering Metrology, R.K. Jain, Khanna Publishers, 1994.

Reference Books:

· Engineering Metrology, I.C. Gupta, DhapatRaiPublications,Delhi.
· Mechanical Measurements, R.K. Jain
· Industrial Instrumentation, Alsutko, Jerry. D. Faulk, Thompson Asia Pvt. Ltd.2002.
· Measurement Systems Applications and Design, Ernest O. Doblin, McGraw Hill Book Co.

MECHANICS OF MATERIALS

INDUSTRIAL ENGG & MANAGEMENT

B.E., III Semester,
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17IM/IP35**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10Hours per Module)**	**Exam Hours**	**03**

Credits – 04

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Module-1

Simple Stress and Strain:

Introduction, Stress and types, Strain, Tensile test on a mild steel bar, Hooke's Law and Poisson's ratio, Stress-Strain relation for cast iron and non-ferrous materials, Extension / Shortening of bars – uniform cross section, with cr oss sections varying in steps, with continuously varying cross sections (circular and rectangular), Principle of superposition, Elongation due to self weight. Volumetric strain, expressions for volumetric strain for bars with uniform circular and rectangular cross sections, Simple shear stress and shear strain, Elastic constants (No derivation for relationship between elastic constants), Temperature stresses (excluding compound bars). Simple numerical problems on tensile test and determining change in dimensions.

Module-2

Principal stresses:

Stresses in a tensile member, Stresses due to pure or simple shearing, mutually perpendicular direct stresses, Principal planes and stresses, Two-dimensional stress system, Graphical method (Mohr's circle) for plane stresses.

Thick and Thin Cylinder:

Stresses in thin cylinders, change in dimensions of cylinder (diameter, length and volume). Thick cylinders - Lame's equations for radial and hoop stresses (compound cylinders and spherical shells not included).

Torsion of Circular Shafts:

Introduction, Torsion equation – assumptions and de rivation, Torsional rigidity / Stiffness of shafts. Power transmitted by solid and hollow circular shafts, Simple numerical problems.

Columns:

Introduction, End conditions, Assumptions in deriving Euler's equations, Sign conventions for bending moments, Euler's formulas (no derivation) for axially loaded elastic long columns, Limitations of Euler's theory, Rankine's formula.

Module-3

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Bending Moment and Shear Force in Beams:

Introduction - types of beams, loads and reactions, Shear force and bending moment, Sign conventions, Relationship between load intensity, shear force and bending moment; Shear force and Bending moment diagrams for different beams subjected to concentrated loads, uniformly distributed load, (UDL) uniformly varying load (UVL) and couple for different types of beams.

Module-4

Bending Stresses in Beams:

Moment of inertia and section modulus for different sections (I, T, rectangular, and circular – only formulas) Introduction to theory of simple bending, assumptions in simple bending theory, Bending stress equation - relationship between bending stress and radius of curvature, relationship between bending moment and radius of curvature; Moment carrying capacity of a section. Simple problems on rectangular, symmetrical I (about NA) and T sections. (composite / notched beams not included).

Module-5

Deflection of Beams:

Introduction, Differential equation for deflection (flexure), Sign conventions and assumptions, Equations for deflection and slope - Double integration method and Macaulay's method for cantilever and simply supported beams for point load, uniformly distributed load, uniformly varying load, and couple.

Course outcomes:

1. At the end of this course students will be able to:
2. Explain the fundamental concepts of stress and strain and the relationship between both through the strain -stress equations in order to solve problems for simple elastic solids.
3. Determine different stresses induced in cylinders carrying fluids at a pressure.
4. Explain the phenomena of torsion in circular shafts and determine the power transmitted by solid and hollow circular shafts.
5. Explain the concept of buckling in columns and be able to compute buckling load using Euler's and Rankine's equations.
6. Explain the concept of bending in beams and determine the shear force and bending moment in beams subjected to different types of loads.
7. Explain the theory behind deflection of beams and determine the deflection amount caused by different loads…

Text Books:

1. Fundamentals of Strength of Materials – P N Chan dramouli; PHI Learning Pvt. Ltd., 2013
Strength of Materials – R K Rajput; S. Chand an d Company Pvt. Ltd. 2014

Reference Books:

1. Mechanics of Materials – R C Hibbeler; Pearson, Latest edition
2. Mechanics of Materials - James M Gere; Thomson Learning, Latest edition
3. Mechanics of Materials - Ferdinand Beer, Russell Johston, John Dewolf, David Mazurek; McGraw Hill Education (India) Pvt. Ltd., Latest edition

MANUFACTURING PRACTICE I
INDUSTRIAL ENGG & MANAGEMENT
B.E., III Semester,
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17IM/IP36**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (08 Hours per Module)**	**Exam Hours**	**03**

Credits –03

Module-1

CASTING PROCESS

Introduction: Concept of Manufacturing process, its importance.Classification of Manufacturing processes. Introduction to Casting process &steps involved. Varieties of components produced by casting process.Advantages& Limitations of casting process.**Patterns:**

Definition, functions, Materials used for pattern, various patternallowances and their importance.Classification of patterns.**Sand Moulding :**
Types of base sand, requirement of base sand.Moulding sand mixture ingredients for different sand mixtures. Method used for sand moulding, such as Green sand, dry sand and skin dried moulds. **Binder:**
Definition, Types of binder used in moulding sand. Additives: Need, Types of additives used and their properties

Module-2

Cores:

Definition, Need, Types. Method of making cores, Binders used,core sand moulding. **Concept of Gating & Risers**.
Principle and types. Fettling and cleaning of castings.Basic steps, Casting defects, Causes,features and remedies.
MouldingMachines :

Jolt type, Squeeze type, Jolt & Squeeze type and Sandslinger.

Special moulding Process:

Study of important moulding processes, No bakemoulds, Flasklessmoulds, Sweep mould, CO2 mould, Shell mould,Investmentmould.

Module-3

Metal moulds:

Gravity die-casting, Pressure die casting, Centrifugal casting,Squeeze Casting, Slush casting, Thixo-casting and Continuous CastingProcesses.

Melting Furnaces:

Classification of furnaces. Constructional features &working principle of coke fired, oil fired and Gas fired pit furnace, Resistancefurnace, Coreless Induction furnace, Electric Arc Furnace, Cupola furnace

Module-4

WELDING

Welding process:

Definition, Principles, Classification, Application,Advantages& limitations of welding.

Arc Welding:

Principle, Metal Arc welding (MAW), Flux Shielded MetalArc Welding (FSMAW), Inert Gas Welding (TIG & MIG) Submerged ArcWelding (SAW) and Atomic Hydrogen Welding processes. (AHW)

Gas Welding:

Principle, Oxy – Acetylene welding, Chemical Reacti on inGas welding, Flame characteristics. Gas torch construction &working.Forward and backward welding

Module-5

Special types of welding:

Resistance welding - principles, Seam welding,Butt welding, Spot welding and projection welding.Friction welding, Explosive welding, Thermit welding, Laser welding and Electron beam welding**.**

Inspection Methods –

Methods used for Inspection of casting and welding.Visual, Magnetic particle, Fluorescent particle, Ultrasonic, Radiography,Eddy current, Holography methods of Inspection

Course outcomes:

1 To understand various processes carried out in Foundry.

2 To understand about ingredient of sand and types of Sand. • To understand various specialized casting process.

3 To understand the principles, advantage, application and limitation of various type of joining process.

4 Able to make a Comparative study of all the joining processes such as welding, Soldering and Brazing along with metallurgical aspects and changes…

Text Books:

2. “Manufacturing Process-I”, Dr.K.Radhakrishna, Sa pna Book House,5th Revised Edition 2009.
3. “Manufacturing & Technology: Foundry Forming and Welding”,P.N.Rao, 3rd Ed., Tata McGraw Hill, 2003.

Reference Books:

1. “Process and Materials of Manufacturing”, Roy A Lindberg, 4th Ed. Pearson Edu. 2006.
“Manufacturing Technology”, SeropeKalpakjian, S teuen. R. Sechmid, Pearson Education Asia, 5th Ed. 2006.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examination 2017-2018
Choice Based Credit System (CBCS)

FOUNDRY & FORGING LAB/ MACHINE SHOP
INDUSTRIAL ENGG & MANAGEMENT
B.E., III Semester
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17IML/IPL37A/37B**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03=(1 Hour Instruction + 2 Hours Laboratory)**	**SEE Marks**	**60**
RBT Levels	**L1, L2, L3**	**Exam Hours**	**03**

Credits – 02

Course Objectives:

1. …
2. …

Experiments:

PART – A

1. Testing of Moulding sand and Core sand

Preparation of sand specimens and conduction of the following tests:
1 Compression, Shear and Tensile tests on Universal Sand Testing Machine.
2 Permeability test
3 Core hardness &Mould hardness tests.
4 Sieve Analysis to find Grain Fineness number of Base Sand
5 Clay content determination in Base Sand

PART – B

2. Foundry Practice

Use of foundry tools and other equipments.

Preparation of moulds using two moulding boxes using patterns or without patterns. (Split pattern, Match plate pattern and Core boxes).

Preparation of one casting (Aluminum or cast iron-Demonstration only)

PART – C

3. Forging Operations :

Calculation of length of the raw material required to do the model.

Preparing minimum three forged models involving upsetting, drawing and bending operations.

Out of these three models, at least one model is to be prepared by using Power Hammer.

Scheme of Examination:

One question is to be set from Part-A: 10 marks

One question is to be set from either

Part-B or Part-C: 30 marks

Calculation part in case of forging is made compulsory

Calculation + Foundry = 05 +25 = 30 Marks

(Forging) Model

Calculation + Forging = 05 +25 = 30 Marks

(Forging) Model

METALLOGRAPHY AND MATERIAL TESTING LAB
INDUSTRIAL ENGG & MANAGEMENT
B.E., III Semester
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17IML/IPL38A/38B**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03=(1 Hour Instruction + 2 Hours Laboratory)**	**SEE Marks**	**60**
RBT Levels	**L1, L2, L3**	**Exam Hours**	**03**
Credits – 02			
Course Objectives:			

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

Scheme of Teaching and Examination 2017-2018

Choice Based Credit System (CBCS)

1. …

2. …

PART – A

· **Preparation of specimen for Metallograpic examination of different engineering materials.Identification of microstructures of plain carbon steel, tool steel, gray C.I, SG iron, Brass, Bronze & composites.**

· **Heat treatment: Annealing, normalizing, hardening and tempering of steel. Hardness studies of heattreated samples.**

· **To study the wear characteristics of ferrous, non-ferrous and composite materials for different parameters.**

· **Non-destructive test experiments like, (a). Ultrasonic flaw detection (b).Magnetic crack detection (c). Dye penetration testing. To study the defects of Cast and Welded specimens**

PART – B

Tensile, shear and compression tests of metallic and non metallic specimens using Universal Testing Machine

1. **Torsion Test**
2. **Bending Test on metallic and nonmetallic specimens.**
3. **Izod and Charpy Tests on M.S,C.I Specimen.**
4. **Brinell, Rockwell and Vickers's Hardness test.**
5. **Fatigue Test.**

COMPUTER AIDED MACHINE DRAWING
INDUSTRIAL ENGG & MANAGEMENT
B.E., IV Semester,
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17IM/IP42**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of	**50 (10 Hours per Module)**	**Exam Hours**	**03**

Lecture Hours			

Credits – 04

Course Objectives:

- …
- …

Module-1

Review of graphic interface of the software. Review of basic sketching commands and navigational commands. Starting a new drawing sheet. Sheet sizes. Naming a drawing, Drawing units, grid and snap.Sections of Solids: Sections of Pyramids, Prisms, Cubes, Tetrahedrons, Cones and Cylinders resting only on their bases (No problems on, axis inclinations, spheres and hollow solids).True shape of sections.Orthographic Views: Conversion of pictorial views into orthographic projections.ofsimple machine parts with or without section. (Bureau of Indian Standards conventions are to be followed for the drawings) Hidden line conventions.Precedence of lines.

Module-2

…

Thread Forms: Thread terminology, sectional views of threads. ISO Metric (Internal & External) BSW (Internal & External) square and Acme. Sellers thread, American Standard thread. Fasteners: Hexagonal headed bolt and nut with washer (assembly), square headed bolt and nut with washer (assembly) simple assembly using stud bolts with nut and lock nut. Flanged nut, slotted nut, taper and split pin for locking, counter sunk head screw, grub screw, Allen screw.

Module-3

Keys &Joints : Parallel key, Taper key, Feather key, Gibhead key and Woodruff key Riveted Joints: Single and double riveted lap joints, butt joints with single/double cover straps (Chain and Zigzag, using snap head rivets).cotter joint (socket and spigot), knuckle joint (pin joint) for two rods

Module-4

Couplings: Split Muff coupling, Protected type flanged coupling, pin (bush) type flexible coupling, Oldham's coupling and universal coupling (Hooks' Joint)

Module-5

…   (Part drawings should be given)
1. Plummer block (Pedestal Bearing) 2. Screw jack (Bottle type) 3. Machine vice
Course outcomes: 1. ..
2. ..

Text Books:

1. 'A Primer on Computer Aided Machine Drawing-2007', Published by VTU, Belgaum.
2. 'Machine Drawing', N.D.Bhat&V.M.Panchal

Reference Books:

1. 'A Text Book of Computer Aided Machine Drawing',S. Trymbaka Murthy, CBS Publishers, New Delhi, 2007

2. 'Machine Drawing', K.R. Gopala Krishna, Subhash Publication.

3. 'Machine Drawing with Auto CAD', GoutamPohit&GouthamGhosh, 1st Indian print Pearson Education, 2005

4. 'Auto CAD 2006, for engineers and designers', Sham Tickoo. Dream tech 2005

5. 'Machine Drawing', N. Siddeshwar, P. Kanniah, VV..S. Sastri, published by Tata Mc GrawHill,2006

KINEMATICS OF MACHINES

INDUSTRIAL ENGG & MANAGEMENT

B.E., IV Semester

[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17IM/IP43**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of	**50 (10Hours per Module)**	**Exam Hours**	**03**

Lecture Hours

Credits – 04

Course Objectives:

Module-1

Introduction: Definitions Link or element, kinematic pairs, Degrees of freedom, Grubler's criterion (without derivation), Kinematic chain, Mechanism, Structure, Mobility of Mechanism, Inversion, Machine. Kinematic Chains and Inversions: Inversions of Four bar chain; Single slider crank chain and Double slider crank chain.

Module-2

…

Mechanisms: Quick return motion mechanisms-Drag link mechanism, Whitworth mechanism and Crank and slotted lever Mechanism. Straight line motion mechanisms Peaucellier's mechanism and Robert's mechanism. Intermittent Motion mechanisms -Geneva wheel mechanism and Ratchet and Pawl mechanism. Toggle mechanism,

Module-3

.. .

Velocity and Acceleration Analysis of Mechanisms (Graphical Methods) Velocity and acceleration analysis of Four Bar mechanism, slider crank mechanism and Simple Mechanisms by vector polygons: Relative velocity and acceleration of particles .in a common link, relative velocity and accelerations of coincident Particles on separate links- Coriolis component of acceleration.Angular velocity and angular acceleration of links, velocity of rubbing.

Module-4

…

Spur Gears: Gear terminology, law of gearing, Characteristics of involute action, Path of contact.Arc of contact, Contact ratio of spur, helical, bevel and worm gears, Interference in involute gears. Methods of avoiding interference, Back lash. Comparison of involute and cycloidal teeth. Profile Modification. Gear Trains: Simple gear trains, Compound gear trains for large speed.reduction, Epicyclic gear trains, Algebraic and tabular methods of finding velocity ratio of epicyclic gear trains. Tooth load and torque calculations in epicyclic gear trains.

Module-5

...

Cams: Types of cams, Types of followers. Displacement, Velocity and, Acceleration time curves for cam profiles. Disc cam with reciprocating follower having knife-edge, roller and flat-face follower, Disc cam with oscillating roller follower. Follower motions including SHM, Uniform velocity, uniform acceleration and retardation and Cycloidal motion.

Course outcomes:

2 ..

2 ..

Text Books:

1. "Theory of Machines", Rattan S.S, Tata McGraw-Hi ll Publishing Company Ltd., New Delhi, and 3rd edition -2009.

2. "Theory of Machines", Sadhu Singh, Pearson Educa tion (Singapore) Pvt. Ltd, Indian Branch New Delhi, 2nd Edi. 2006

Reference Books:

1. "Theory of Machines & Mechanisms", J.J. Uicker, , G.R. Pennock, J.E. Shigley. OXFORD 3rd Ed. 2009.

2. Mechanism and Machine theory, Ambakar, PHI

Graphical Solutions may be obtained either on the Graph Sheets or on the Answer Book itself.

MANUFACTURING PROCESS II

INDUSTRIAL ENGG & MANAGEMENT

B.E., IV Semester
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17IM/IP44**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10Hours per Module)**	**Exam Hours**	**03**
Credits – 04			

Course Objectives:

The objective of this course are to make student to study the fundamentals of single point cutting tool and basic machining processes in shaping, drilling, milling, grinding machine. To know the need and properties of cutting fluids and to familiarize with Non conventional manufacturing process.

Module-1

Classification of metal removal process and machines: Concept of orthogonal and oblique cuttingGeometry of single point cutting tool and tool angles, tool nomenclature.Mechanism of Chip Formation: Type of chips. Mechanics of metal cutting,Merchants circle diagram andanalysis, Ernst Merchant's solution, shear angle relationship,Tool Wear and Tool failure, tool life. Effects of cuttingparameters on tool life.Tool Failure Criteria, Taylor's Tool Life equation

Module-2

…

Desired properties and types of cutting toolmaterials – HSS, carbides coated carbides, ceramics. Cutting fluids.Desiredproperties, types and selection.Heat generation in metal cutting, factorsaffecting heat generation.Heat distribution in tool and work piece and chip.

Turning (Lathe), Shaping Machines: Classification,constructional features of Turret and Capstan Lathe. Tool Layout, shapingMachine, Different operations on lathe, shaping machine

Module-3

.. .

Drilling machines: drilling & related operations, Classification of drilling machine, constructional features and working principle of Radial, multi spindle, Gang, Deep hole and automatic drilling machine, Types of drill & drill bit nomenclature.

Milling machines: Classification, constructional features, milling cutters nomenclature, milling operations, up milling and down milling concepts.Various milling operations.

Indexing: Simple, compound, differential and angular indexing calculations.Simple problems on simple and compound indexing

Module-4

…

Grinding machines: Types of abrasives, Grain size, bonding process, gradeand structure of grinding wheels, grinding wheel types.Classification,constructional features of grinding

machines (Centerless, cylindrical andsurface grinding). **Broaching process** - Principle of broaching.Details of a broach.Typesofbroachingmachinesconstructionaldetails.Applications.AdvantagesandLimitations

Module-5

…

Finishing and other Processes Lapping and Honing operations Principles, arrangement of set up and application. Super finishing process,polishing, buffing operation and application**. Non-traditional machining processes**: Need for non traditionalmachining,Principle, equipment

1. operation of Laser Beam, Plasma Arc Machining,Electro Chemical Machining, Ultrasonic Machining, Abrasive Jet Machining,Water Jet Machining, Electron Beam Machining, Electron DischargeMachining and Plasma Arc Machining

Course outcomes:

α. .Course Outcomes

β. To understand Tool Nomenclature, different types of machine tools , types, applications and operations

χ. Ability to understand failure criteria, heat generation and selection ofcutting fluids.

δ. To understand the tool life of different cutting tool materialsandIndexing in milling machine.

ε. To understand the working of shaping and grinding.

ϕ. To understand the principles, advantages, application and limitations of Nonconventional Machining.

Text Books:

1. Elements of Workshop Technology: Machine Tools (Volume – 2) by S. K. HajraChoudhary, A. K. HajraChoudhary, Nirjhar Roy, Media promoters (2010).

2. Manufacturing Processes for Engineering Materials, 4th Edition bySeropeKalpakjian, Steven R. Schmid, published by Pearson (2007).

3. Fundamentals of Metal Machining and Machine Tools by G. Boothroyd, McGraw Hill, 2000.

Reference Books:

1. LalG.K.,Introduction to Machining Science, New Age international Publishers.

2. Ghosh, A., &Mallik, A. K. , Manufacturing Science, East West Press Private Limited.

3. Pandey& Singh, Production Engineering Science, Standard Publishers Distributer, Delhi.

4. Karl H.Heller, All About Machine Tools, Wiley Eastern Ltd., New Delhi

5. Sen, G. C., & Bhattacharyya, A. Principles of Machine Tools: New Central Book Agency

6. Bhattacharyya A, Theory & Practice of Metal Cutting, New Central Book Agency

7. Trent, E. M. Metal cutting: Butterworth Heinemann

8. Stephenson, D. A., &Agapiou, J. S. Metal cutting theory and practice: CRC Taylor & Francis.

9. Milton C. Shaw, Metal Cutting Principles, CBS Publishers.

MATERIAL SCIENCE& METALLURGY

INDUSTRIAL ENGG & MANAGEMENT

B.E., IV Semester Engineering

[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17IM/IP45**	**CIE Marks**	**40**
Number of Lecture	**04**	**SEE Marks**	**60**

Hours/Week			
Total Number of Lecture Hours	**50 (10Hours per Module)**	**Exam Hours**	**03**

Credits – 04

Course Objectives:

4. To make students understand how and when such imperfections are formed and what could be the effects of such imperfections on the properties of the material
5. To distinguish between steady and non-steady types of diffusions
6. To appreciate the significance and construction of phase diagrams
7. To construct the iron carbon equilibrium diagram and identify different phases
8. To understand the properties of different metals resulting from different heat treatments

Module-1

Crystal Structure

-Unit Cells, Crystal systems, BCC, FCC, and HCP structures, Coordination number and atomic

packing factors Crystal Imperfection-Point, line and surface imperfections
Atomic Diffusion
-Fick's laws of diffusion, Factors affecting Diffusion, Steady and non-steady state diffusions **Module-2** **…** **Dislocation**
Characteristics of dislocations slip systems, slip in single crystals, Plastic deformation of polycrystalline materials, Deformation by twinning **Fracture**
Types of fracture, ductile and brittle fracture, Ductile to brittle transition temperature
Fatigue and creep Cyclic stresses, SN curves, crack initiation and propagation, Factors affecting fatigue life, Creep behavior Stress and temperature effects, Data extrapolation methods **Module-3**
.. .
Phase Diagrams

Solid solutions, Hume Rothary rules-substitutional, and interstitial solid solutions, Intermediate phases, Gibbs phase rule, Construction of equilibrium diagrams, lever rule Iron carbon equilibrium diagram Description of phases, Solidification of steels and cast irons, Invariant reactions, TTT curves, Continuous cooling curves

Module-4

...

Heat Treatment of Metals

Annealing and its types, normalizing, Hardening, tempering, Martempering, Austempering, Hardenability, surface hardening methods like carburizing, cyaniding, Nitriding, Flame hardening and induction hardening. Age hardening of Aluminium –Copper alloys Recovery,

Recrystallization and Grain Growth

Recrystallization temperature, Annealing temperature v/s cold-worked and recovered grains, Direction of grain boundary motion, time v/s grain diameter

Module-5

...

Steels and cast irons

Ferrous alloys, steels – low medium and high carbon , AISI designation steels, Cast irons – types and properties Composites and ceramics

Composite materials:

definition, classification, Types of matrix materials & reinforcements, Application of composites, Ceramics: Glasses, Glass – ceramics, cl ay products, Refractories, abrasives and cements.

Course outcomes:

4. .Estimate the impact of imperfection on the property of the material Analyze steady and non-steady types of diffusion and solve related problems Construct the iron carbon diagram and TTT curves Estimate the hardness and other properties of metals obtained from different heat treatment processes Select the right iron-carbon alloy for any given application.
5. ..

Text Books:

o William D Callister, "An Introduction -Material' s Science and Engineering", John Wiley and Sons India Pvt Ltd., 6th Edition, 2006 New Delhi.

p Smith -Foundation of Material Science and Engineering, 3rd Edition, McGraw Hill, 1997.

q Donald R Askland, Pradeep.p.phule -Essentials of Materials for Science and Engineering, Thomson Engineering, 4th edition 2003.

Reference Books:

· V Raghavan -Physical Metallurgy, Principles and Practices, PHI, 2nd Edition 2006, New Delhi.

· H. Van Black and Addison -Elements of Material Science and Engineering, Wesley Edition,1998.

· James F Shackelford -Introduction to Material Science for Engineering, 6th edition 4. Pearson Prentice hall, New Jersey,2006.

CAD/CAM

INDUSTRIAL ENGG & MANAGEMENT

B.E., IV Semester

[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17IM/IP46**	**CIE Marks**	**40**

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

Scheme of Teaching and Examination 2017-2018

Choice Based Credit System (CBCS)

Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (08 Hours per Module)**	**Exam Hours**	**03**

Credits 03

Course Objectives:

To provide the student to

1. know the fundamentals of CAD

4. information regarding various CAD hardware
5. understand the fundamentals of CAM
6. programming concepts in CNC
7. robotics and their applications

Module-1

INTRODUCTION: Role of computers in design and manufacturing. Influence of computers in manufacturing environment. Product cycle in conventional and computerized manufacturing environment.Introduction to CAD, Introduction to CAM.Advantages and disadvantages of CAD and CAM.

HARDWARE IN CAD: Basic Hardware structure, working principles, usage and types of hardware for CAD - input and output Devices, memory, CPU, hardcopy and Storage devices.

Module-2

...

COMPUTER GRAPHICS: Software configuration of a graphic system, function of a Graphics package, construction of geometry, wire frame and solid modelling, CAD/CAM integration. Describe modelling facilities. Introduction to exchange of modeling data – Basic features of IGES, STEP, DXF, DMIS.

NC, CNC, DNCTECHNOLOGY : NC, CNC, DNC< modes, NC elements, advantages and limitationsof NC, CNC. Functions of computer in DNC.

Module-3

.. .

CNC TOOLING: Turning tools geometry, milling tooling systems, tool presetting, ATC work holding.

CAM PROGRAMMING: Overview of different CNC machining centers, CNC turning centers, high

speed machine tools, MCE.
Module-4
…
CNC PROGRAMMING: Part program fundamentals – steps involved in dev elopment of a part program.Manual part programming, milling, turning center programming.
Module-5 **…** **INTRODUCTION TO ROBOTICS :** Introduction, Robot Configuration, Robot Motions, Programming the Robots, Robot- Programming Languages, End effectors, Work Cell, Control and Interlock, Robot Sensor, Robot Applications.
Course outcomes: A student will be able to
10 understand the concepts of CAD and the required hardware 10 understand CAM and CNC machines 11 program CNC machines 12 Understand and program the robot

Text Books:

1. CAD / CAM Principles and Applications by P.N.Rao, TMH, New Delhi, 2002

2. CAD/CAM, Mikell P-groover, Emory W. ZimrnersJr Pearson Education inc, 2003

Reference Books:

1. Introduction to the Design and Analysis of Algorithms -S.E. Goodman, S.T.Headetmiemi, McGraw Hill Book Company -1988

2. Principles of Interactive Computer Graphics by Newman and Sproull, Tata McGraw Hill, 1995

3. NC Machine programming & software Design -Chno-Hwachang, Michel.A.Melkanoff, Prentice Hall, 1989.

4. Numerical control and CAM, Pressman RS and Williams JE, John Wiley.
5. Computer Graphics by Steven Harrington, McGraw Hill Book Co.
6. CAD-CAM by Chris McMahon &Jimrnie Browne -Pearson education Asia 2001
7. CAD/CAM -IbrahimZeid, Tat McGraw Hill, 1999
8. Computer Aided Manufacturing by P.N.Rao, N.K.Tewari and T.K. Kundra Tata McGraw Hill 1999.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

Scheme of Teaching and Examination 2017-2018

Choice Based Credit System (CBCS)

MACHINE SHOP

INDUSTRIAL ENGG & MANAGEMENT

B.E., III Semester

[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17IML/IPL47A47B**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03=(1 Hour Instruction + 2 Hours Laboratory)**	**SEE Marks**	**60**
RBT Levels	**L1, L2, L3**	**Exam Hours**	**03**
Credits – 02			

Course Objectives:

- …
- …

Experiments:

PART – A

Preparation of three models on lathe involving Plain turning, Taper turning, Step turning, Thread cutting, Facing, Knurling, Drilling, Boring, Internal Thread cutting and Eccentric turning.

PART – B

Cutting of V Groove/ dovetail / Rectangular groove using a shaper.

Cutting of Gear Teeth using Milling Machine.

Course outcomes:

- ..
- ..

MEAUREMENTS AND METROLOGY LAB

INDUSTRIAL ENGG & MANAGEMENT

B.E., III Semester

[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17IML/IPL48A/48B**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03=(1 Hour Instruction + 2 Hours Laboratory)**	**SEE Marks**	**60**
RBT Levels	**L1, L2, L3**	**Exam Hours**	**03**

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

Scheme of Teaching and Examination 2017-2018

Choice Based Credit System (CBCS)

Credits – 02

Course Objectives:

1. …
2. …

Experiments:

PART-A: MECHANICAL MEASUREMENTS

1. Calibration of Pressure Gauge
2. Calibration of Thermocouple
3. Calibration of LVDT
4. Calibration of Load cell
5. Determination of modulus of elasticity of a mild steel specimen using strain gauges.

PART-B: METROLOGY

1. Measurements using Optical Projector / Toolmaker Microscope.
2. Measurement of angle using SineCenter / Sine bar / bevel protractor
3. Measurement of alignment using Autocollimator / Roller set
4. Measurement of cutting tool forces using

Lathe tool Dynamometer
Drill tool Dynamometer.

5. Measurement of Screw thread Parameters using Two wire or Three-wire method.
6. Measurements of Surface roughness, Using Tally Surf/Mechanical Comparator
7. Measurement of gear tooth profile using gear tooth vernier /Gear tooth micrometer
8. Calibration of Micrometer using slip gauges
9. Measurement using Optical Flats

Course outcomes:

4 ..

5 ..

MANAGEMENT AND ENTREPRENEURSHIP

SEMESTER – V

Subject Code	**17IM/IP51**	IA Marks	40
NumberofLecture Hours/Week	04	Exam Hours	03
Total Number of Lecture Hours	50	Exam Marks	60

CREDITS – 04

Course Objectives:

This course will enable students to

1. Understand the basic concepts of management, planning, organizing and staffing.
2. Acquire the knowledge to become entrepreneur.
3. Comprehend the requirements towards the small-scale industries and project preparation.

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module -1 **MANAGEMENT:** Introduction- Meaning- nature and characteristics of Management, Scope and Functional areas of management -Management as	**10 Hours**	**L1, L2, L3**

a Science, art of profession -Management &Administration -Roles of Management, Levels of Management, Development of Management Thought- Early management approaches- Modern management approaches. **PLANNING:**Nature,importanceandpurposeofplanningprocessObjectives-Types Of plans (Meaning Only) - Decision making Importance of planning - Steps in planning & planning premises-Hierarchy of plans		
Module -2 **ORGANIZING ANDSTAFFING:** Nature and purpose of organization Principles of organization-Types of organization-Departmentation Committees- Centralization Vs Decentralization of authority and responsibility-Span of control- MBO and MBE (Meaning Only) Nature and importance of staffing— :Process Of Selection& Recruitment. **DIRECTING& CONTROLLING:** Meaning and nature of directing Leadership styles, Motivation Theories, Communication- Meaning and importance- coordination, meaning And importance and Techniques of Co	**10 Hours**	**L1, L2,L3**

Ordination. Meaningand steps in controlling- Essentials of a sound control system- Methods of establishing control.		
Module -3 **ENTREPRENEUR:** Meaning of Entrepreneur; Evolution of .the Concept; Functions of an Entrepreneur, Types of Entrepreneur, Entrepreneur-an emerging. Class. Concept of Entrepreneurship-Evolution of Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of Entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship-its Barriers.	**10 Hours**	**L2, L3, L4**
Module -4 **SMALL SCALE INDUSTRIES:** Definition; Characteristics; Need and rationale;Objectives;Scope;roleofSSIinEconomicDevelopment.Advantages ofSSIStepstostartandSSI-GovernmentpolicytowardsSSI;DifferentPolicies ofSSI;GovernmentSupportforSSIduring5yearplans.ImpactofLiberalization, Privatization, Globalization on SSI Effect of WTO/GATT Supporting Agencies Of Government for SSI, Meaning, Nature of support; Objectives; Functions; Types of Help; Ancillary Industry and Tiny Industry.	**10 Hours**	**L3,L4,L5**
Module -5	**10 Hours**	**L2, L3**

INSTITUTIONALSUPPORT: Different Schemes; TECKSOK;KIADB;

KSSIDC;KSIMC; DIC Single Window Agency; SISI;NSIC;SIDBI;KSFC**.**

PREPARATION OF PROJECT: Meaning of Project; Project Identification;

Project Selection; Project Report; Need and Significance of Report; Contents;

Formulation;GuidelinesbyPlanningCommissionforProjectreport;Network

Analysis;ErrorsofProjectReport;ProjectAppraisal.Identificationofbusiness

opportunities:MarketFeasibilityStudy;TechnicalFeasibilityStudy;Financial

Feasibility Study & Social Feasibility Study.

Course Outcomes :

After studying this course, students will be able to:

1. Explain about the management and planning.
2. Apply the knowledge on planning, organizing, staffing, directing and controlling.
3. Describe the requirements towards the small-scale industries and project preparation.

Graduate Attributes :

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6. Engineering Knowledge. o Problem Analysis.

- Design / development of solutions

- Modern Tool Usage and Interpretation of data

Question paper pattern:

3. The question paper will have ten questions.
4. Each full question consists of 16 marks.
5. There will be 2full questions (with a maximum of four sub questions) from each module.
6. Each full question will have sub questions covering all the topics under a module.
7. The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

4. PrinciplesofManagement–P.C.Tripathi,P.N.R eddy–TataMcGraw H ill,
5. DynamicsofEntrepreneurialDevelopment&ManagementVasantDesai-HimalayaPublishingHouse
6. EntrepreneurshipDevelopment–Poornima.M.Charantimath Small BusinessEnterprises-PearsonEducation-4006(2&4).

Reference Books:

1. ManagementFundamentals- Concepts,Application, Skill Development-RobersLusier-Thomson
2. EntrepreneurshipDevelopment-S.S.Khanka-S.Chand&Co.
3. Management-StephenRobbins-PearsonEducation/PHI-17th Edition,4003.

WORK STUDY AND ERGONOMICS

Subject Code	: 17IM/IP52	No. of Credits	: 4 -0-0
No. of Lecture Hours / Week	: 04	Exam Hours	: 3
Total No. of Lecture Hours	: 50	Exam Marks	: 60 IA : 40

COURSE OBJECTIVES

1. To develop concepts related to principles of productivity & work study as a tool for increasing the efficiency and effectiveness in organizational systems.
2. To study the existing method, compare and propose a new method.
3. To provide the usage of the various tools and techniques used in work measurement.
4. To develop basic ideas of ergonomics and its design.
5. To develop concepts related Man-Machine Interfaces and Design of Displays and controls.

COURSE CONTENT

UNIT – 1 Productivity and Work Study: Definition of productivity, task of management, productivity of materials, land, building, machine and power, factors affecting the productivity, work content, basic work content, excess work content, how manufacturing job is made up, work content due to excess product and process, ineffective time due to short comings on part of the management.

Definition, Objective and scope of Work Study: Work study and management, work study and worker

08 Hours

UNIT – 2.

Method Study: Definition, objective and scope of method study, activity recording and tools, **Recording tools:** Out Line Process Chart, Flow Process Chart, Flow diagram, String Diagram, Travel Chart, Multiple Activity Chart, Two- Handed process chart.

Principles of Motion Economy: Introduction, Classification of movements. Two- hand process chart, Micromotion study, Therbligs, SIMO Chart. Special

Charts: Cyclegraph and Chronocycle graph - development, definition and installation of the improved method.

Work Measurement: Definition, objectives, work measurement techniques.**Work sampling** – Need, confidence levels, and sample size determination, onducting study with problems

12 Hours

UNIT – 3 Time study - Definition, time study equipment, selection of job, steps in time study. Breaking jobs into elements, recording information.

Rating: Systems of rating, standard rating, standard performance, scales of rating.

Allowances: Standard time determination, predetermined motion time study (PMTS), factors affecting rate of working, problems on allowances.

08Hrs

UNIT – 4 Introduction to Ergonomics: Human factors and ergonomics, psychology, engineering, bio mechanics, industrial design, graphics design, statistics, operation research and anthropometry Morphology of design and its relationship with cognitive abilities of human being.

Physical Ergonomics : human anatomy, and some of the anthropometric, physiological and bio mechanical characteristics as they relate to physical actvity.Cognitive: mental processes, such as perception, memory, reasoning, and motor response, mental workload, and decision-making. Organizationalergonomics: optimization of socio-technical systems, including their organizational structures, policies, processes. Communication, work design, design of working times, teamwork, cooperative work, and new work programs. Environmental ergonomics**:** human interaction with the environment- characterized by climate, temperature, pressure, vibration, light.

12 Hours

UNIT – 5 Man-Machine Interaction; Man-Machine interaction cycle, Man-machine interfaces, Displays : factors that control choice of display, visual displays- qualitative displays; moving pointer displays, moving scale displays, digital displays Indicators, auditory displays, tactile displays. Factors affecting effectiveness of displays. Quantitative displays, check- reading displays, representational displays. Types of controls and their integration with displays.

Design guidelines for displays and controls: viewing distance, Illumination, angle of view, reach etc., general design checklist for displays and controls.Standards for ergonomics in engineering and design, displays and controls.

08 Hours

COURSE OUTCOMES:

Upon completion of this course, students should be able to:

1. Recollect the basic concepts of productivity, work content and work study and definethe objective and scope of Work Study.
2. Define the various charts and to construct the charts on the basis of present method and develop a new / proposed method and identify the unnecessary movements.
3. Explain the basic work measurement techniques and to gain knowledge of measurement of work, rating and imbibe the concept of allowance in estimating Standard Time
4. Determine the basic concepts of Ergonomics and demonstrate a sound knowledge of Ergonomics in engineering applications.
5. Demonstrate a sound knowledge of Man-Machine Interfaces and design of displays and controls in engineering systems

TEXT BOOKS

\endash **Introduction to Work Study** – ILO, 4 th edition 1992

\endash **Mark. S. Sanders and Ernest. J McCornick**. "Human Factor in Engineering and Design", McGraw- Hill Book Co., Inc., New York, 1993

REFERENCE BOOKS

3. S. Dalela and Sourabh, " **Work Study and Ergonomics**". Standard publishers 4013
4. **Wesley Woodson, Peggy Tillman and Barry Tillman**, "Human Factors Design Handbook", McGraw-Hill; 2nd edition, 1992
5. Ralph M. Barnes, "Motion and Time Study", Wiley Int ernational, 7th Edition.
6. Mark S. Sanders and Ernest J. McCormick , "Human Fa ctors in Engineering Design" 4 th edition, 4013.
7. B. Niebel and Freivalds, Niebel's Methods Standards and Work Design, McGraw-Hill, 12th Edition, 4009,

DESIGN OF MACHINE ELEMENTS
Semester - V

Subject Code: **17IM/IP53**			IA Marks	40
Number of Lecture Hours/Week	04		Exam Marks	60
Total Number of Lecture Hours:	50		Exam Hours	03
CRIDITS – 04				

Module 1

DESIGN FOR STATIC STRENGTH: Design considerations; Codes and Standards, static loads and factor of safety. Theories of failure: Maximum Normal Stress Theory, Maximum Shear Stress Theory, Distortion energy theory. Failure of Brittle and Ductile materials. Stress concentration. Determination of stress concentration factor. 8 **Hours**

Module 2

DESIGN FOR FATIGUE STRENGTH: S – N Diagram, low cycle and High cycle fatigue. Endurance limit. Modifying factors: Load, Size and Surface finish effects. Fatigue stress concentration factor. Fluctuating stresses. Goodman and Soderberg Relationship. Stresses due combined loading, Cumulative fatigue damage. 8 **Hours**

Module 3

DESIGN OF SHAFTS: Design of shafts subjected to torsion, bending moment and combined torsion moment and axial loading. ASME and BIS Codes for design of transmission shafting. Design for strength and rigidity. Shafts under fluctuating loads and combined loads.

12 **Hours**

Module 4

DESIGN OF GEARS: Introduction to Spur, Helical and Bevel Gears. Design of Spur gear, Lewis equation, form factor, stresses in gear tooth, Dynamic load and wear load.

12 Hours

Module 5

RIVETED JOINTS AND WELDED JOINTS: Types of riveted joints, failures of riveted joints, Boiler joint, Efficiency. Types of welded joints, Strength of butt and fillet welds, eccentrically loaded welds. **5 Hours**

DESIGN OF SPRINGS: Types of springs, Stresses in Coil springs of circular and non-circular cross-sections. Tension and compression springs. Stresses in Leaf springs.**5 Hours**

TEXT BOOKS

1. **Mechanical Engineering Design** - Joseph Edward Shigley – Tata McGraw Hill, New Delhi - 1986.
2. **Machine Design** - VL. Maleev and Hartman **–** CBS Publishers and Distributors, Delhi - 1983.
3. **Design of Machine Elements** - V. B. Bahandari**–** Tata McGraw Hill, New Delhi - 4000.

REFERENCE BOOKS:

3. Machine Design - Robert. L. Norton – Pearson Educat ion Asia, New Delhi - 4001.
4. Theory and Problems of Machine Design - Hall, Holowinko, LaughlinSchaums - Outline Series - 4002.
5. Elements of Machine Design - N. C. Pandey and C. S. Shah – ChorotarPublishing house – 4002.

Question paper pattern: The question paper will have TEN questions. There will be TWO questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer FIVE full questions, selecting ONE full question from each module.

STATISTICS FOR ENGINEERS

Subject Code	: 17IM54	IA Marks	:	40
No. of Lecture Hrs./ Week	: 04	Exam Hours	:	03
Total No. of Lecture Hrs.	: 50	Exam Marks	:	60

MODULE	COURSE CONTENT	HOURS
1	**THE ROLE OF STATISTICS IN ENGINEERING:** Statistical Thinking, Collecting data, Statistical Modelling Frame work. **DATA SUMMARY AND PRESENTATION:** Measure of central tendency and variance, Importance of Data summary and Display, Tabular and Graphical display	**08**
2	**DISCRETE RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS:** Discrete Random variables, Probability distributions and Probability mass functions, Cumulative distribution functions, Mean and Variance of a discrete random variable, Discrete uniform distribution, Binominal distribution, Hyper Geometric distribution, Poisson distribution. **CONTINUOUS RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS:** Continuousrandomvariables, Probability distributions and probability density functions, cumulative distribution functions, Mean and Variance of a continuous random variable, uniform distribution, Normal distribution, Normal approximation to Binominal and Poisson distribution	**12**

3	**ESTIMATION THEORY:** Statistical Inference, Random sampling, Properties of Estimators, Sampling distribution, Sampling distribution of mean, variance and proportion. Introduction to confidence intervals. **STATISTICAL INFERENCE FOR A SINGLE SAMPLE:** Hypothesis testing, Inference on the mean of a population (variance known and unknown), Inference on the variance of a normal population, Inference on a population proportion.	**11**
4	**STATISTICAL INFERENCE FOR TWO SAMPLES:** Inference for a difference in Means, Variances known, Inference for a difference in means of two normal distributions, Variances unknown, Inference on the Variances of two normal populations, Inference on two population proportions. **NON-PARAMETRIC TESTS-** Chi-square tests, Goodness of fit and	**07**

	Contingency table tests	
5	**SIMPLE LINEAR REGRESSIONS AND CORRELATION:** Simple Linear Regression, Properties of Least square Estimators and Estimation of variances, Common abuses of regression, Prediction of new observations, Assessing the adequacy of regression model, Transformations to a straight line, Introduction to multiple regression (no problems), Correlation **DESIGN OF EXPERIMENTS:** Strategy of experimentation, completely randomized single - factor experiment, Tests on individual treatment means, the random effects model, the randomized complete block design, one way analysis of variance and two way analysis of variance.	**12**

TEXT BOOKS:

- **Applied statistics and Probability for Engineers** – Douglas C Montgomery, George C Runger, 2 nd Edn, John Wiley and Sons, ISBN-0-471-17027-5
- **Statistics for Management -** Richard I Levin, David S Rubin, 6th Edn, Prentice Hall India, ISBN-81-403-0893-X

REFERENCE BOOKS:

- **Probability and Statistics in Engineering** - William W Hines, Douglas C Montgomery, 2nd Edn, John Wiley and Sons
- **Business Statistics for Management and Economics** - Daniel, Terrell, 6th Edn, Houghton Mifflin Company, ISBN-0-395-62835-0
- **Probability and Statistics** - Walpole & Mayer, MacMillan Publishing Company, 198

MECHANICAL LAB

Subject Code	:	17IML 57	IA Marks	:	40
No. of Practical/ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	42	Exam Marks	:	60

PART - A

(Individual experiments)

Determination of Flash point and Fire point of lubricating oil using Abel Pensky Martins Apparatus

Determination of Calorific value of solid and gaseous fuels.

Determination of Viscosity of a lubricating oil using Redwoods and Say bolts – Viscometers.

PART - B

Group experiments

Performance Tests on Four stroke Petrol and Diesel Engines, Calculations of IP, BP, Thermal efficiencies, SFC, FP and heat balance sheet

Performance Test on Four stroke Petrol - Calculations of IP, BP, Thermal efficiencies, SFC. Multi cylinder petrol / diesel engine (Morse Test)

Calibration of Venturi meter, Flow through pipes Performance test on centrifugal and reciprocating pumps

WORK STUDY AND ERGONOMICS LAB

Subject Code	:	17IML/IPL58	IA Marks	:	40
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	42	Exam Marks	:	60

PART - A

METHOD STUDY

Recording Techniques**:** Preparing the following charts and diagrams (Minimum 3 Charts)

Outline process chart

Multiple Activity Chart

Flow process chart and Flow diagram

String diagram,

Experiments on the Application of principle of motion economy, Two handed process chart. Exercises on conducting method study for assembling simple components and office work. Development of Layout plans using SLP technique. Experiments on Line balancing.

PART - B

WORK MEASUREMENT

- Rating practice using: walking simulator, pin board assembly, dealing a deck of cards and marble collection activity

- Determining the standard time for simple operations using stopwatch time study
- Exercises on estimating standard time using PMTS.
- Determination of standard time using PDA device and time study software
- Measurement of parameters (heart beat rate, calorie consumption) using walking simulator
- Measurement of parameters (heart beat rate, calorie consumption, revolutions per minute) using ergometer
- Effect of Noise, Light, Heat on human efficiency in work environments.

REFERENCE BOOKS:

8. **ILO, Introduction to work study** - III Revised Edition, 1981
9. **Motion and Time study** - Ralph M Barnes; John Wiley, 8th Edition, 1985.
10. **Engineered work Measurement** - Wledon, ELBS , 1991
11. **Motion and Time study**- Marvin E. Mundel-, PHI, 1st edition

PROFESSIONAL ELECTIVES

ENGINEERING ECONOMY

Subject Code	**: 17IM/IP551**	**No. of Credits**	**: 4 -0-0**
No. of Lecture Hours / Week	**: 04**	**Exam Hours**	**: 3**
Total No. of Lecture Hours	**: 50**	**Exam Marks**	**: 60 IA : 40**

COURSE OBJECTIVES

2. To acquire a clear understanding of the fundamentals of engineering economics.

3. To learn the concepts of decision making, problem solving, and comparison of the alternatives and elements of cost.

4. To inculcate an understanding of concept of money and its importance in the evaluation of projects.

5. To illustrate concept of money and its importance in evaluating the projects.

6. To evaluate the alternatives based on the present annual worth and equivalent annual worth methods.

COURSE CONTENT

MODULE 1

Introduction: engineering decision – makers, engineering and economics, problem solving, intuition and analysis, tactics and strategy with an example.

Interest and Interest Factors: Interest rate, simple interest compound interest, interest formulae, time value equivalence exercises, problems and discussion.

10Hrs.

MODULE 2

Present Worth Comparison: Conditions for present worth comparisons, rule 72, basic present worth comparisons, present worth equivalence, net present worth, assets with equal and unequal lives, comparison of assets assume to have infinite lives, exercises and problems.

10 Hrs

MODULE 3

Equivalent Annual Worth Comparisons: Situations for equivalent annual worth comparison, net annual worth of a single project, comparison of net annual worth's, definitions of asset life, comparison of assets with equal and unequal lives, exercises and problems.

10Hrs

MODULE 4

Depreciation: Introduction, methods of depreciation, problems.

Replacement Analysis: Reasons- Deterioration, obsolescence, inadequacy, replacement criteria problems

08 Hrs

MODULE 5

Estimating and Costing: components of costs such as direct material cost, direct labour cost, Fixed, over – heads, factory costs, administrative – over heads, first cost, selling price, calculation of the total cost of various components, mensuration, estimation of simple components.

10 Hrs

COURSE OUTCOMES:

Upon completion of this course, students should be able to:

4. Recall the basic concepts of decision making, problem solving, tactics and strategy.
5. Defining the time value of money concept, interest formulae.
6. Explain the comparison by present worth method for different lives of the asset. Compare the asset on the basis of EAW comparison.
7. Explain the concepts of depreciation and replacement criteria.
8. Calculate the total cost of a component and explain the process for estimating simple components.

TEXT BOOKS

1. **Engineering economy** – Riggs J.L., McGraw Hill, 4002.

2. **Engineering economy** – Paul Degarmo, Macmillan Pub, Co., 4001

REFERENCE BOOKS

5 **Engineering Economy** – NVR. Naidu, KM Babu and G.Rajendra, New Age Inte rnational Pvt. Ltd., 4006.

6 **Industrial Engineering and Management** - O.P Khanna, DhanpatRai and Sons, 4000.

7 **Financial Management** – I M Pandey, Vikas Publishing House, 4002.

8 **Engineering Economy** – Theusen. G. PHI, 4002.

THEORY OF METAL FORMING Common to (IM & IP)

Subject code	17IM/IP552		IA Marks	40
Number of Lecture Hrs / Week	Lectures	3	Exam Marks	60
Total Number of Lecture Hrs	40		Exam Hours	03
CREDITS - 04				

MODULE: 1

Basics of plastic deformation & Introduction to metal forming process

Concept of true stress and true strain. Flow stress and strain hardening. Tresca's and Von-Mise's yiel d criteria and yield surface. Factors affecting yield strength of materials. Forming properties of materials.Ductility and formability.Classification of forming processes. Importance of temperature in metal forming.Hot and cold working.Effect of strain rate.Friction and its role in metal forming.Different methods of analysis of metal forming.

9 Hrs

MODULE: 2

Forging & Rolling Processes

Open-die and close-die forging processes. Brief description of the forging machines, equipments and heating furnaces. Slab analysis of upset forging of rectangular slab under plane strain condition. Forging load calculation.Common forging defects.Different types of rolling mills. Geometrical considerations in rolling.Role of friction in rolling and neutral point location. Simplified methods for calculating rolling load, torque and power required for rolling. Effect of back and front tension on rolling force. Residual stresses in rolling and common rolling defects.

8 Hrs

MODULE: 3

Extrusion & drawing of rods, wires and tubes

Types of extrusion processes. Metal flow pattern in extrusion. Extrusionequipments and dies.Extrusion of hollow sections. Slab analysis of extrusion of strips and circular sections and calculation of force and power required for extrusion. Common extrusion defects.Drawing equipments and dies. Analysis of rod or wire drawing and calculation of draw force and power required. Maximum possible reduction in drawing.Tube drawing using different types of mandrels, residual stresses and defect in drawn products.

8 Hrs

MODULE: 4

Sheet metal working, sheet metal drawing

Classification of sheet metal working and equipmentsused, Blanking and Piercing operation – Die design , cutting force required, slitting, trimming and shaving operations. Bending operation – Types of bending. Bend angle, bend radius, bend a llowance and force required for bending. Spring back effect in bending. Roll bending process. Brief description of spinning and stretch forming processes. Die design, Number of draws required, Blank size calculation, and drawing force necessary. Drawability and defects in drawn products.

8 Hrs**ODULE: 5**

High Energy Rate Forming (HERF)

Introduction, advantages, limitations and applications of HERF: Process description,parameters of Explosive forming, Electro discharge forming, Electromagnetic forming andElectro Hydraulic Forming. Newer forming processes: laser beam and plasma arc. Die less forming of sheet metal

7 Hrs

TEXT BOOKS:

4. Mechanical Metallurgy - Dieter G.E – McGraw Hill pu blication.
5. Fundamentals of Metal Forming Processes – Juneja B .L - New age International
6. Principle of Industrial Metal Working Processes – R owe Edward - CBS Publication

REFERENCE BOOKS:

2. Materials and Processes in Manufacturing – E.Paul, DeGarmoetal - PHI publication.
3. Fundamentals of Working of Metals – Sach G. - Perga mon press.
4. Mechanics of sheet metal forming - Z.Marciniak, J.L.Duncanand S.J. Hu – Elsevier-Butterworth-Heinemann -4006

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FINITE ELEMENT METHODS

Subject Code : 17IM/IP553
Hours/Week : 03
Total Hours : 40

IA Marks : 40
Exam Hours : 03
Exam Marks : 60

Course Objectives

The course objectives of Finite Element Methods are to teach the students and gain knowledge of:

CO1: Basic fundamentalsof continuum and structural mechanics andnumerical Technique.

CO2: Finite Element Method (FEM) as a Numerical Technique for engineering analysis of continuum and structuresusing variational and weighted residual approaches

CO3: Finite element formulation for one, two and three dimensionalcontinuum structural mechanics problemssubjected to static, thermal and dynamic loads and

CO4: Solving continuum and structural mechanics problemsusing finite element method. practical

CO5: Formulating, analyzing, error detecting, solution and interpretation of results for Problems using commercial software.

MODULE-1

Introduction.Generaldescription of Finite Element Method, application and limitations.Types of elements based on geometry.Node numbering, Half band width.Gauss-Elimination technique for solving linear algebraic equations.Numericalintegration : 1, 2 and 3 gaussian point for 1D and 2D cases.

08 hrs

MODULE-2

Principle of virtual work, principle of minimumpotential energy, Raleigh's Ritz method.Direct approach for stiffness matrixformulation of bar element.Galerkin's method.

Interpolation Models: Interpolation polynomials- Linear, quadratic andcubic. Shape functions Iso-parametric,Sub parametric and Super

parametric elementsand Jacobianmatrix. **08 Hours**

MODULE-3

Formulation of 1-D element: Bars, tapered and stepped bars.2D and 3D Truss element subjected to concentrated, distributed ,body forces and thermal loading. Problems of 1D members for displacements,reactions and stresses by using penalty approach and elimination approach.**Beams:** Hermite shape functions for beam element, Derivation of stiffnessmatrix. Numerical problems of beams carrying concentrated, UDL

andlinearly varying loads. **08 Hours**

MODULE-4

Formulation of 2D and 3D elements: Triangular, quadrilateral, tetrahedron and hexahedron elements, shape function formulation.

Dynamics: Determination of natural frqency and mode shape for 1D bar and beams only. **08 Hours**

MODULE-5

Heat Transfer: Steady state heat transfer, 1D heat conduction governingequations.Functional approach for heat conduction.Galerkin's approach forheat conduction.1D heat transfer in thin fins.

08 Hours

TEXT BOOKS:

3. **Finite Elements in Engineering**, T.R.Chandrupatla, A.D Belegunde,3rd Ed PHI.
4. **Finite Element Method in Engineering**, S.S. Rao, 4th Edition,Elsevier, 4006.

REFERENCE BOOKS:

1. **"Finite Element Methods for Engineers"** U.S. Dixit, CengageLearning, 4009
2. **Concepts and applications of Finite Element Analysis**, R.D. CookD.S Maltus, M.E Plesha, R.J.Witt, Wiley 4th Ed, 4009

3. **Finite Element Methods**, Daryl. L. Logon, Thomson Learning 3rd edition, 4001.

4. **Finite Element Method**, J.N.Reddy, McGraw -Hill InternationalEdition.

Course Outcome:

On completion of the course the student will be

CO1: Knowledgeable about the FEM as a numerical method.

CO2:Able to formulate any solid mechanics, structural mechanics and thermal problems

CO3:Able to solve and interpret the results of solid, structural and thermal problems

CO4: Developing skills required to use commercial FEA software

HYDRAULICS and PNEUMATICS

Subject Code	**: 17IM54**	**No. of Credits**	**: 4 -0-0**
No. of Lecture Hours / Week	**: 04**	**Exam Hours**	**: 3**
Total No. of Lecture Hours	**: 50**	**Exam Marks**	**: 60 IA:40**

COURSE OBJECTIVES

- To Study the fundamentals of Hydraulic Power Pumps, Actuators and Motors.
- To develop a sound knowledge of control components in Hydraulic Systems.
- To have basic skills to design Hydraulic Circuits and analyze them.
- To acquire the fundamental knowledge on pneumatic control.
- To develop skill sets to handle Pneumatic Actuators , Valves, Pneumatic circuits and logic circuits

COURSE CONTENT

MODULE 1

Introduction to Hydraulic Power and Pumps: review of fluid mechanics, Pascal's Law, structure of hydraulic control system. pumps: pumping theory, pump classification, gear pumps- external and internal type, vane pumps- simple, balanced, pressure compensated types, piston pumps- radial and axial (both swash plate and bent axis type), pump performance.

Hydraulic Actuators and Motors: Linear hydraulic actuators - single acting, double acting, tandem cylinder, telescopic rod cylinder, mechanics of hydraulic cylinder loading, cylinder cushioning, hydraulic rotary actuators, hydrostatic transmission – open and close circuit, performance of hydraulic motor.

12Hrs

MODULE 2

Control Components in Hydraulic Systems: directional control valves (DCV), constructional features, 2/2,3/2,4/2,4/3 DCV, center configuration in 4/3 DCV- open, closed, tandem, regenerative, floating centre configuration, actuation of DCVs- manual, mechanical, solenoid, and indirect actuation, relays for the solenoid operation, check valve, pilot check valve, pressure control valves – direct and pilot operated types, pressure reducing valve, flow control valves- fixed throttle, and variable throttle, throttle check valve, pressure compensated flow control valve- relief and reducing type **12Hrs**

MODULE 3

Hydraulic Circuit Design and Analysis: control of single and double acting hydraulic cylinder, regenerative circuit, counter balance valve application, cylinder sequencing circuits, cylinder synchronizing circuits, speed control of hydraulic cylinder – meter in and meter out, speed control of hydraulic motors, relay circuit design for the operation of solenoid directional control valve- single and double solenoid relay circuit

08Hrs

MODULE 4

Introduction To Pneumatic Control: choice of working medium, characteristics of compressed air, structure of pneumatic control system , supply, signal generators, signal processor, final control elements , actuators, production of compressed air – compressors - reciprocating and rotary type, preparation of compressed air – driers, filters, regulators, lubricators, distribution of compressed air – piping layout.

08Hrs.

MODULE 5

Pneumatic Actuators , Valves: linear cylinder – types, conventional type of cylinder – working, directional control valve, shuttle valve, quick exhaust value, twin pressure valve, direct and indirect actuation of pneumatic cylinder, memory valve, time delay valve.

Pneumatic circuits and logic circuits: supply air and exhaust air throttling, will dependent circuits, travel dependent controls – types – construction – practical applications, cylinder sequencing circuits, travel step diagrams, practical examples involving two or three cylinders, use of logic functions – OR, AND, NOR, NAND,YES, NOT functions in pneumatic applications, practical examples involving the use of logic functions.

10Hrs

OPEN ELECTIVES

PROFESSIONAL COMMUNICATION AND REPORT WRITING

Subject Code	: 17IM/IP561	No. of Credits	: 4 -0-0
No. of Lecture Hours / Week	: 03	Exam Hours	: 3
Total No. of Lecture Hours	: 40	Exam Marks	: 60 IA:40

COURSE OBJECTIVES

- **To know the nuances and importance of professional communication.**
- **To demonstrate the capability of explaining and making others understand.**
- **To plan and prepare Technical Reports for documentation and analysis.**
- **To appreciate the use of appropriate channel to maximize the reach of any Communication channel.**
- **To manage the organizational communication in very effective manner.**

COURSE CONTENT

UNIT – 1 Communication: Importance of communication, oral and written communication, role of oral and written communication in effectiveness, communication process with basic model, formal and informal communication in management , barriers to communication, feedback and its effectiveness, conflict communication.

08 Hours

UNIT – 2 Oral communication: factors: factors influencing effective oral communication, role of trust self confidence motivational factors, styles of oral communication, importance of listening, grapevine and its role, role of visual aids, advantages and disadvantages over written communication , informative and persuasive communication.

08 Hour

UNIT – 3 Written communication: Writing style, importance of writing skills, books review and its importance. **Letter writing:** Personal correspondence, formal and informal letters, official and Demi-official letters, business and commercial letter and other technical correspondence , choice of stationary. **Technical report writing:** Synopsis writing, formats for reports, report types- introductory report, progress report, incident report, feasibility report, marketing report, field report laboratory test report. **Project report:** Reference work, synopsis, general objective, specific objective, introduction, body, tabular and graphical representation, use of visual aids, conclusion, bibliography.

08 Hours

UNIT – 4 Effective Meetings: Meeting as a decision making body, psychology of member, chairmanship-outside meeting, , chairmanship control of progress, chairmanship control of the member, behavior in meeting, effective secretary and his role, Types of meetings, symposia, conference, convections.

Effective interviews: Interviewing, types of interview, selection interview, grievance interview, employee appraisal interview, informational interview, interrogational interview, organizing interview, types of question, effective questioning in the interview, responsibilities of an interviewer and an interviewee, interview assessment form and its importance.

08 Hours

UNIT – 5 **Problem Solving In Communication**: periodic training, role of conflicts, evaluation through possible solutions.

Individual Tasks: business correspondence, restructuring/reforming of some business correspondence, preparation of synopsis, role play, case studies, seminar on selected topics, other oral and written communication exercise. **Group Tasks**: preparation of project report, meeting, interviews, seminars, role play.

08MODULE Hours

COURSE OUTCOMES:

Upon completion of this course, students should be able to:

6. Make effective presentations.
7. Demonstrate good skills in handling oral communication.
8. Comfortably draft letters and reports for various agencies and stakeholders.
9. Handle meetings and interviews from both the sides.
10. Comfortably handle conflict situations and resolve the same through effective communication.

TEXT BOOKS

1. **Effective Communication-** Made Simple Series, Rupa and co., 1985.

2. **Urmila raj and S.M Rai**, Business Communication, Himalaya publishing house, 1989.

CONCURRENT ENGINEERING **Semester - V**				
Subject Code: **17IM/IP562**			IA Marks	40
Number of Lecture Hours/Week	03		Exam Marks	60
Total Number of Lecture Hours:	40		Exam Hours	03

CREDITS – 03

MODULE 1

MANUFACTURING COMPETITIVENESS: Review, Product andServices, Process and Methodologies, performance, the need for change,Sequential versus concurrent Engg.

4 Hours

PROCESS REENGINEERING: Managing change, Reengineeringapproaches, Enterprise models, concurrent process reengineering.

1.**Hours**

MODULE 2

CONCURRENT ENGINEERING: Introduction, Basic principles,components of CE models.

· **Hours**

MODULE 3

CONCURRENT ENGINEERING ORGANIZATIONS: Benefits, cooperativeconcurrent teams, Types of CE organisations.

4.**Hours**

SYSTEM ENGINEERING*:* Introduction, System thinking, Systemcomplexity, System Integration, Angle virtual company**.**

4 Hours

MODULE 4

INFORMATION MODELLING: Methodology, foundation of informationmodelling.

4 Hours

C. E. PROCESS: Concurrent engineering process invariant enterprise modelclass, product mode class, cognitive models.

3.**Hours**

MODULE 5

CE METRICS FOR IT: Based manufacturing – process efficiency metrics,Pr ocess effectiveness metrics.

8 Hours

TEXT BOOKS:

3. **Concurrent Engineering Fundamentals** - Prasad. B – IntegratedProduct and process organiz ation Vol. 1 & 2, Prentice HallEnglewood, Cliffs, New Jersey -1996.

4. **Concurrent Engineering -** Hartely R John– Shortening lead times,raising quali ty & Lowering costs, Productivity press, Portland,Oregon - 1992.

REFERENCE BOOK:

Concurrent Engineering - Carter DE & Baker BS, - The productdevelopment environment for the 1990's. Addison – WesleyPublishing company, Reading MA -1992.

Question paper pattern: The question paper will have TEN questions. There will be TWO questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer FIVE full questions, selecting ONE full question from each module.

TECHNOLOGY MANAGEMENT

Sub Code	**17IM/IP563**	IA Marks	40
No. of Lecture Hrs/week	03	Exam Hours	03
Total Lecture Hrs	40	Exam Marks	60

COURSE OBJECTIVES:

6. To understand the fundamentals Concepts of Technology
7. To apply the economics of technology to real world problems
8. To Analyze & adopt the Technology for Service and Manufacturing sectors.

MODULE 1

THE CONCEPT OF TECHNOLOGY: Introduction, The nature of knowledge, Aspects of classification, Concept and Meaning of technology,the character of a specific technology, Scope of technology, Examples ofclassification of technology, Scale of technology information, Levels of technology, Technology portfolios, Technology as an environment. **8 Hours**

MODULE 2

THE NATURE OF TECHNOLOGICAL CHANGE: Introduction, Meaning of technological change, Concept of invention, Nature of innovation, Emergence of new technologies, Life cycle of a technology, Motivation for technological change, Nature of technological progress,

Nature of mature technology, Nature of diffusion, Technological convergence. **8 Hours**

MODULE 3

THE ECONOMICS OF TECHNOLOGY&CORPORATE TECHNOLOGY STRATEGY: Introduction, Meaning of technological economics,

Examples of technological economics, Scope of technological economics, Engineering economics, Production economics, Concept of economy of scale, Concept of optimum size, Technology as a commodity, The Business Mission, Concept Of Business Strategy, Capability For Strategic Planning, Corporate Technology Strategy, Competitive Technology, Technological Alliances, , Technology Crisis.

8 Hours

MODULE 4

ANALYSIS FOR TECHNOLOGY STRATEGY&THE REALIZATION OF NEW TECHNOLOGY: Introduction, Technology assessment, Technology forecasting, Main techniques of technology forecasting, Technology forecasting system, Yield of technology forecasting, Concept of R&D policy, Stimuli for innovation, Sources of innovation, Intelligence function of R&D, Management of R&D, R&D team, Effectiveness of R&D,Marketing aspects of R&D, Finance for Design, Development, Manufacture and Marketing, Patterns for new technology development.

8 Hours

MODULE 5

THE ADOPTION OF NEW MANUFACTURING TECHNOLOGY& TECHNOLOGICAL COMPETITION ANALYSIS: Introduction, manufacturing strategy, Introduction of new technology, Challenges of factory automation, Stages of factory automation, Manufacturing FMS, CIM, CAD/CAM, Intelligent manufacturing systems, operation of new technology, Change management, People and technology at work, Work structures, securing competitive advantage, Technological competition analysis, Technological leadership, Adoption of new technology, marketing a new technology product, Retention of competitive advantages.

8 Hours

TEXT BOOK:

1. The Management of Technology Perceptions & Opportunities - Paul Lowe -Chapman & Hall, London - 1995.

REFERENCE BOOKS:

2. Strategic Management of Technology -Frederick Betz - McGraw- Hill Inc -1993.
3. Management of Technology & Innovation competing Through Technological Excellence - Rastogi P.N - Sage Publications – 1995.
4. Mastering the dynamics of innovation – J Utterba ck

HUMAN RESOURCE MANAGEMENT

Subject Code :17IM/IP564 IA Marks : 40

No. of Lecture Hrs./ Week : 03 Exam Hours : 03

Total No. of Lecture Hrs. : 40 Exam Marks :60

Module	Course content	Hours
1	**INTRODUCTION:** Evolution of HRM, Objectives, Functions and Policies. **HUMAN RESOURCE PLANNING:** Uses and benefits, Man Power Inventory, Man Power Forecasting, Methods of Man Power Forecasting, job Description, Job Specification	09
2	**RECRUITMENT:** Sources of Man power, Advertisement, Short Listing of Candidates calling Candidates for selection Process. **SELECTION:** Selection procedure – Written Test, Group Discussio n. Interview – Different methods, advantages and limit ations, Psychological testing – Advantages and limitations, Induction pro cedure, transfers, promotion, exit interview, (Tutorial on written test, Group Discussion, Interviews)	09
3	**TRAINING AND DEVELOPMENT:** Identification of Training needs, Training Evaluation, Training Budget, Executive Development – Different Approaches, Non-executive development – Different m ethods. **PERFORMANCE APPRAISAL:** Components (all round performance	10

	appraisal), Methods. Advantages and limitations of different methods, Personal Counselling based on Annual Confidential Reports.	
4	**COUNSELLING AND HUMAN RESOURCE ACCOUNTING:** Characteristics, Need, Function, Types, Suggestions for personnel development, communication function, communication process, effective communication. Human resource records, Advantages of HR accounting, Various methods of accounting.	6
5	**INDUSTRIAL RELATIONS:** Indian trade union act, standing orders act, Indian factories act **INDUSTRIAL DISPUTES AND SETTLEMENT:** Indian Industrial Disputes act, Industrial disputes settlement machinery. Works committee, Board of Conciliation, Voluntary Arbitration, Compulsory arbitration, Court	6

	of inquiry, Industrial tribunal, Adjudication.	

TEXT BOOKS

2 **Human Resources Management** – Dr. K Ashwathappa – Tata McGraw Hill - Edition 19 99.
2 **Management of Human Resources** – CB Mamoria – Himalaya Publication House – 4003.

REFERENCES BOOKS:

3. **Personnel / Human resource Management** – Decenoz and robbins- PHI - 4002
4. **Industrial Relations** – ArunMonappa – TMH - ISBN – 0-07-451710-8.
5. **Human Resources Management** – VSP Rao
6. **Human Resources Management** – Ravi Dharma Rao

VI SEMESTER

QUALITY ASSURANCE & RELIABILITY

Sub Code	**17IM61**	IA Marks	40

No. of Lecture Hrs/week	04	Exam Hours	03
Total Lecture Hrs	50	Exam Marks	60

COURSE OBJECTIVES:

3. To understand the fundamentals of Quality tools and techniques
4. To apply the quality and reliability tools and techniques to real world problems
5. To Interpret the results of quality and reliability study for decision making

MODULE 1:

Introduction: Definition of Quality, Quality function, Dimensions of Quality, Quality Engineering terminology, Brief history of quality methodology, Statistical methods for quality improvement, Quality costs – four categories costs and hi dden costs. Brief discussion on sporadic and chronic quality problems.

Quality Assurance: Definition and concept of quality assurance, departmental assurance activities. Quality audit concept, audit approach etc.

structuring the audit program, planning and performing audit activities, audit reporting, ingredients of a quality program. **12 Hours**

MODULE 2

Statistical Process Control: Introduction to statistical process control – chanc e and assignable causes variation. Basic principles of control charts, choice of control limits, sample size and sampling frequency, rational subgroups. Analysis of patterns of control charts. Case Studies on application of SPC. Process capability – Basic defi nition, standardized formula. **08 Hours MODULE 3**

Control Charts for Variables: Controls charts for X bar and Range ®, statistical basis of the charts, development and use of X bar and R charts, interpretation of charts. Control charts for X bar and standard deviation (S), development and use of X bar and S chart. Brief discussion on – Pre control X bar and S control charts with va riable sample size, control charts for individual measurements, cusum chart, moving-range charts

Control Charts for Attributes: Controls chart for fraction non- conforming (defectives) development and operation of control chart.

10 Hours

MODULE 4

Sampling Inspection: Concept of accepting sampling, economics of inspection, Acceptance plans – single, double and multip le sampling. Operating characteristic curves – construction and use. Determinations of average outgoing quality, average outgoing quality level, average total inspection, producer risk and consumer risk, published sampling plans. **10 Hours**

MODULE 5

Statistical Theory of Tolerances: Application of statistical theory of tolerances to design of tolerances in random assemblies and application in other areas.

Reliability and Life Testing: Failure models of components, definition of reliability, MTBF, Failure rate, common failure rate curve, types of failure, reliability evaluation in simple cases of exponential failures in series, paralleled and series-parallel device configurations. **10 Hours**

TEXT BOOKS

2. **Introduction to statistical Quality Control -** D C Montgomery 3rd Edition, John Wiley and Sons.
3. **Quality Planning & Analysis** - J M Juran, Frank M Gryna; Tata McGraw Hill, 3rd edition,
4. **Total Quality Management** – NVR Naidu, KM Babu and G. Rajendra – New Age Inte rnational Pvt. Ltd - 4006

REFERENCE BOOKS.

4. **Statistical Quality Control** - Grant and Leavenworth, McGraw Hill, 6th Edition

5. **The QS9000 Documentation Toolkit** - Janet L Novak and Kathleen C Bosheers," Prenctic e Hall PTR, 2nd Edition

6. **ISO 9000 a Manual for Total Quality Management** - Suresh Dalela and Saurabh, S Chand and Co. 1st Edition
7. **Total Quality Management** - Kesavan R, I.K. International, New Delhi – 4007.

OPERATION RESEARCH

Course Title: **Operations Research**	*Total Contact Hours*: 50	*Lecture hours/week: 04*	*Credits: 04*
Course Code: 17IM/IP62	*Total I.A. Marks*: 40	*SEE Duration:03 hours*	*SEE Marks*: 60

Module	Contents	Hours
1	**Introduction**: Evolution of OR, definition of OR, scope of OR, application areas of OR, steps (phases) in OR study, characteristics and limitations of OR, models used in OR, linear programming (LP) problem-formulation and solution by graphical method. **Solution of Linear Programming Problems**: The simplex method, canonical and standard form of an LP problem, slack, surplus and artificial variables, big M method and concept of duality, dual simplex method.	**10**
2	**Transportation Problem:** Formulation of transportation problem, types, initial basic feasible solution using different methods, optimal solution by MODI	**10**

	method, degeneracy in transportation problems, application of transportation problem concept for maximization cases. **Assignment Problem:** Formulation, types, application to maximization cases and travelling salesman problem, flight scheduling problem.	
3	**Project Management using Network Techniques:** Introduction, network construction - rules, Fulkerson's rule for numbering the events, AON and AOA diagrams; Critical path method to find the expected completion time of a project, floats; PERT for finding expected duration of an activity and project, determining the probability of completing a project, predicting the completion time of project; crashing of simple projects (network construction by AOA approach can be used for all the cases).	**10**
4	**Queuing Theory:** Queuing systems and their characteristics, Pure-birth and Pure-death models (only equations), empirical queuing models – M/M/1 and M/M/C models (no derivations) and their steady state performance analysis. **Game Theory:** Formulation of games, types, solution of games with saddle point, graphical method of solving mixed strategy games, dominance rule for solving mixed strategy games.	**10**
5	**Sequencing:** Basic assumptions, sequencing 'n' jobs on single ma chine using priority rules, sequencing using Johnson's rule-'n' jobs on 2 machines, 'n' jobs on 3 machines, 'n' jobs on 'm' machines. Sequencing 2 jobs on 'm' machines using graphical method.	**10**

	Introduction to Integer Programming: Pure and mixed integer programming problems, solution of simple Integer programming problems using Gomory's all integer cutting plane method and mixed integer method.	

Texts:

2. **Operations Research - Theory and Applications** - J K Sharma, Pearson Education Pvt Ltd., Recent edition.
3. **Operations Research -**P K Gupta and D S Hira, S Chand Publications, New Delhi, Recent edition.

References:

1. **Introduction to Operation Research** -Taha H A – PHI / Pearson Publications, Recent edi tion.

10. **Operations Research -**Paneerselvan, PHI
11. **Operations Research** -S.D. Sharma – Kedarnath, Ramnath& Co – Recent edi tion.

SIMULATION MODELLING AND ANALYSIS

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VI

Subject Code	17IM63	IA Marks	40
Number of Lecture Hours/Week	04	Exam Hours	03
Total Numberof Lecture Hours	50	Exam Marks	60

CREDITS – 04

Course Objectives:

This course will enable students to

9. Understand the basic concepts and applicability of discrete event simulation
10. Acquire the knowledge to model and analyze the systems using discrete event simulation technique.
11. Acquire the knowledge to validate the model

Modules	Teaching Hours	Revised Bloom's Taxonomy

		Level
Module -1 **INTRODUCTION:**Methods of analyzing systems, Simulation-meaning, advantages & disadvantages. Situations in which simulations can be used as an appropriate tool. Components of a system, Model of a system, Types of models. Steps in simulation study, Simulation software packages, Selection of simulation software	**8 Hours**	
Module -2 **SIMULATION EXAMPLES:**Simulation of Queuing systems, Simulation of inventory problems without backorder, Simulation of inventory problems with backorder, Simulation using normal random numbers. **GENERAL PRINCIPLES OF SIMULATION:**Concepts in discrete event simulation, Event Scheduling/ Time advance algorithm,	**10 Hours**	

simulation using event scheduling.		
Module -3 **RANDOM NUMBERS:**Properties of random numbers, Linear congruential method to generate random numbers. Tests for random numbers – Frequency test, Runs up and down test, Ru ns above and below mean test, Auto correlation test. **RANDOM VARIATE GENERATION:**Inversetransform technique for exponential and uniform distributions, Direct transformation for normal distribution, Acceptance – Rejection techniq ue for poisson distribution. **12Hours**		
Module -4 **INPUT DATA MODELLING:**Steps in input data modeling.Data collection, Identification of distribution, Parameter estimation for exponential and gamma distributions, Goodness of fit test for uniform, poisson and exponential distributions. **10 Hours**		
Selection of input models without data, multivaraiate and time series analysis **Module -5**		

10 Hours

VERIFICATION AND VALIDATION : Model building, verification, calibration and validation of models. Phases of validation test, Numerical problems.

OUTPUT ANALYSIS: Measures of performance, estimation – point estimation and interval estimation, output analysis of terminating simulation, output analysis of steady state simulation.

Course Outcomes :

After studying this course, students will be able to:

6. Explain the usefulness of discrete event system simulation in analyzing real time systems.
7. Analyze and model basic discrete event systems.
8. Generate random numbers and random variates and test random numbers.

7. Analyze input data and output data for model building , verification and validation

Graduate Attributes :

- Engineering Knowledge.
- Problem Analysis.
- Design / development of solutions
- Modern Tool Usage and Interpretation of data

Question paper pattern:

- The question paper will have ten questions and one full question to be answered from each module .
- Each full question consists of 16 marks.
- There will be 2full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

4. Discrete Event System simulation – Jerry Banks, Joh n S Carson, Berry L Nelson, David M Nicol – Pearson Edition – IV edition , ISBN 0-13-144679-7

Reference Books:

8. Simulation Modelling & Analysis – Averll M Law, W David Kelton – McGraw Hill International Editions – Industrial Engineering Ser ies, ISBN 0-07-100603-9
9. System Simulation with Digital Computer. – NasinghD eo – PHI publication (EEE) ISBN 0-07-100603-9

MATERIALS MANAGEMENT

Subject Code	:	17IM/IP64	IA Marks	:	40
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	60

MODULE - 1

Introduction: Dynamics of Materials Management - Materials Management at Micro-level, Materials Management at Macro-level. Definition of Material

Management

Systems Approach to Materials Management: Systems Approach - The Process of Management and the Materials Function, The Materials Function, Interfaces.Benefits of the Integrated Systems Approach.

8 Hours

MODULE - 2

Forecasting, Objectives and the Materials Organization: Systems Design, Integral Control of the Flow of Materials, Forecasting and Planning, Forecasting Methods, Objectives of Materials Management - Organization of Materials Management, Functional Organization Model for Materials Management.

Materials Planning: Making the Materials Plan Work, The Materials Cycle and Flow Control System.

Purchasing: Purchasing Principles, Procedures and Practices, Fundamental Objectives of Purchasing - Scope, Responsibility and Limitations, Sources of Supply and Supplier Selection, Purchasing Policy and Procedures.

12 Hours

MODULE -3

Purchasing in Materials Management System Concept: Price Determination, Price Forecasting, Price-Cost Analysis, Negotiation, Reciprocity, Cost-Plus Contracts, Hedging, Forward Buying, Buying Ethics, Principles and Standards of Purchasing, Make-or-Buy, Information, Documentation and Purchasing Library, Legal Aspects of Purchasing, Law of Agency, Law of Contract, Legal Status of the Buyer, Warranties and Conditions, Right of Inspection, Right of Rejection, Vendor-Vendee Relations, Vendor Development, Vendor Rating.

Purchasing and Procurement Activities under Materials Management: Supplier Quality Assurance Programme, Buyer-Supplier Relationship.

Incoming Material Quality Control: Significance of Inspection, Metrology or Engineering Measurement, Purchase Inspection, Sampling Inspection, Sampling Technique, Different Types of Population, Different Types of Sampling.

10 Hours

MODULE - 4

Purchasing Capital Equipment, Plant and Machinery: Responsibility and Decision, Purchasing v/s Leasing,

International Buying, Import Purchasing, and Governmental Purchasing: Industrial Needs, Import Procedure and Documents, Basis of Licensing, Import Purchasing Procedures, Letter of Credit, Income-Tax Clearance, Customs Tariff-Registration of Licenses at Port. Governmental Purchasing: Policy and Procedures, Tenders.

Registration of Firms, Procedure for Registration, Terms of Registration, Removal of the Firms from the List, Blacklisting of Firms, Banning of Firms,

Suspension of Firms.

Inventory Management and Control Systems: Definition of Inventories, The Need for Inventory Audits Control, Types of Inventories, Inventory Control, Max-Min System, Inventories and Demand Uncertainty, Determining Safety Stock.

11 **Hours**

MODULE-5

Q-system or Quantity Control System or Re-order Point System-Effect of Quantity Discounts, P-system or Periodic Review or Periodic Count System or Replenishment System, Optional Replenishment System or "S, s" Policy. Discussion on ABC Analysis, advantages and disadvantages. MRP system and MPS system

Stores Management and Operation: Storage System, Stores Location and Layout,

Materials Management Information System and Computer: MIS - Management and MM, Computer System for MIS and MM, In-process Materials and Management Control.

13 **Hours**

Text Book:

A.K. Datta., **Materials Management,** PHI Pvt. Ltd, New Delhi, 4001.

Reference Book:

P. Gopalakrishnan, **Handbook ofMaterials Management**, PHI Pvt. Ltd, New Delhi, 4002.

CAD/CAM LAB

Subject Code	:	17IML 67	IA Marks	:	40
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	42	Exam Marks	:	60

PART - A

Modelling of simple machine parts using Graphics Package like Solid Works,

Uni Graphics, Catia etc. – Minimum 5 Exercises.

Study of Finite Element Analysis Package - 1D, 2D, Structural problems, Evaluation of displacement (Strain) and Stress. Problems involving Beams and Trusses. - Minimum 7 Exercises.

.PART - B

Modelling and Simulation of Machining process of simple machine parts using CAM packages. - Minimum 7 Exercise

SIMULATION LAB

Subject Code	: 17IML 68	IA Marks	:	40
No. of Lecture Hrs./ Week	: 03	Exam Hours	:	03
Total No. of Lecture Hrs.	: 42	Exam Marks	:	60

PART - A

Introduction to Simulation Packages

Understanding theSimulation Package

Identifying probability distributions for given data

Building simulation models for manufacturing operations (Electronic assembly – With Basic templates) Building simulation models for manufacturing operations (Electronic assembly – With Common templates) Building simulation models for manufacturing operations with transport System Building simulation models for manufacturing operations with layout

PART - B

Building simulation models for manufacturing operations with layout and transport System

Building simulation Models for Banking service (Bank teller problem)

Building simulation Models for Mortgage application problem

Building simulation Models for food processing problem

Building simulation Models for Post office animation

Statistical Analysis of Simulation models (input analysis)

Statistical Analysis of Simulation models (output analysis)

Suggested Software Packages

Promodel, Arena, Quest, Witness, Extend

PROFESSIONAL ELECTIVES

FINANCIAL MANAGEMENT

Sub Code	**17IM 651**	IA Marks	40
No. of Lecture Hrs/week	03	Exam Hours	03
Total Lecture Hrs	40	Exam Marks	60

Course objectives:

3. To provide the concepts and foundations of managing finance in business enterprises.
4. To equip students with tools and techniques for managing finance.
5. To orient students regarding financial management practices in Indian companies and Global enterprises.

MODULE – 1

Introduction: Evolution of Financial Management, Goals, Forms of Business. **Risk and Required Return:** Risk and return relationship, Business risk, financial risk, and risk in portfolio context, expected rate of return, Capital asset pricing model.

Capital Budgeting: Risk analysis in Capital Budgeting, Cost of Capital – Debt, Preference Equity forms of capital

08 Hours

MODULE – 2 .

Capital Structure and Firm Value: Assumption, Definition and approaches, Modigliani and Miller Mode, Capital Structure decisions – EBIT , EPS analysis, ROI, REI analysis and Cash Flow comparative Analysis.

Working Capital Management: Factors influencing working capital requirement, determination of operating cycle and working capital.

08 Hours

MODULE-3

Long Term Financing: Raising of finance form primary and secondary markets, Valuation of securities, features of convertibility securities and warrants, SEBI guide lines on capital issues, stock market in India, Venture capital, Initial Public Offering.

Merger Acquisition and Restructuring: Reasons, Mechanics, Cost and benefits of a merger, Evolution, terms and purchase of a division,

Takeovers, Acquisitions, Portfolio and financial restructuring **08 Hours**

MODULE – 4

Securities and Portfolio Analysis: Derivatives, Futures Trading,

Financial Statement Analysis: Ratio analysis, time series analysis, Du pont analysis, funds flow analysis

08 Hours

MODULE– 5

International Financial Management: World Monitoring system, Foreign Exchange Markets, International Parity Relationships, International Capital budgeting, Financing Foreign Operations, Raising Foreign Currency Finance, Financing Exports, Documents in International Trade.

Financial Management in Sick Units: Definition of sickness, Causes of sickness, Symptoms of sickness, Prediction of sickness, Revival of a sick unit **08 Hours**

TEXT BOOKS:

9. Financial Management Theory and practice – Prasa nna Chandra – TMH – ISBN– 007-044501-X, 5th edn.

10. Financial accounting – B.S. Raman – United publi cation – VoI II

REFERENCE BOOKS:

3. Financial Management Text & Problems – Khan & Ja in – TMH – ISBN 0—07-460408-X.

4. Financial management – IM Pandey – Vikas Pub. Ho use – ISBN 0- 7069-5435-1.

INDUSTRIAL AUTOMATION

Sub Code	**17IM 652**	IA Marks	40
No. of Lecture Hrs/week	03	Exam Hours	03

Total Lecture Hrs	40	Exam Marks	60

COURSE OBJECTIVES:

1.To identify potential areas for automation and justify need for automation

2.To select suitable major control components required to automate a process or an activity

3.To identify suitable automation hardware for the given application.

MODULE- 1

Introduction: Automation in Production System, Principles and Strategies of Automation, BasicElements of an Automated System, Advanced Automation Functions, Levels of Automations. Flow lines & Transfer Mechanisms, Fundamentals of Transfer Lines. **08Hours**

MODULE 2

Material handling and Identification Technologies: Overview of Material Handling Systems,Principles and Design Consideration, Material Transport Systems, Storage Systems,Overview of Automatic Identification Methods. **08Hours**

MODULE 3

Automated Manufacturing Systems: Components, Classification and Overview of Manufacturing Systems, Manufacturing Cells, GT and Cellular Manufacturing, FMS, FMSand its Planning and Implementation

Quality Control Systems: Traditional and ModernQuality Control Methods, SPC Tools,InspectionPrinciples and Practices, InspectionTechnologies. **08 Hours**

MODULE 4

Control Technologies in Automation: Industrial Control Systems, Process Industries Versus Discrete-Manufacturing Industries, Continuous Versus Discrete Control, ComputerProcess and its Forms. **08Hours**

MODULE 5

Computer Based Industrial Control: Introduction & Automatic Process Control,

Building Blocks of Automation Systems: LAN, Analog & Digital I/O Modules, SCADASystems& RTU.

Distributed Control System: Functional Requirements, Configurations & some popularDistributed Control Systems.

08 Hours

Text Books:

6. Automation, Production Systems and Computer Integrated Manufacturing- M.P.Groover, Pearson Education.5th edition, 4009.

References:

10. Computer Based Industrial Control- Krishna Kant, EEE-PHI,2nd edition,4010
11. An Introduction to Automated Process Planning Systems- Tiess Chiu Chang & Richard A. Wysk
12. Performance Modeling of Automated Manufacturing Systems,-Viswanandham, PHI, 1st edition,4009.

SOFTWARE ENGINEERING & MANAGEMENT				
		Semester - V		
Subject Code: **17IM653**			IA Marks	40
Number of Lecture Hours/Week	03		Exam Marks	60
Total Number of Lecture Hours:	40		Exam Hours	03
CREDITS – 03				

MODULE 1

THE PRODUCT AND THE PROCESS: The product - Characteristics, Components, and Applications. The Process -Software process, Models - Linear, sequential, Prototype, RAD, ProcessTechnology, Software Development Life cycle.

4 **Hours**

SOFTWARE PROJECT MANAGEMENT CONCEPTS: TheManagement Specification, People, Problem, Process, project

4 Hours

MODULE 2

SOFTWARE PROJECT PLANNING: Objectives, Scope, Resource,Project estimation, Decomposition Techniques, Empirical EstimationModels. Make-buy decision, Automated estimation tools.

8 Hours

MODULE 3

RISK MANAGEMENT: Reactive v/s Proactive Risk Strategies, SoftwareRisks, Risk identification, Risk projection, Monitoring.

4 Hours

SOFTWARE PROJECT SCHEDULING AND TRACKING: Basicconcepts, defining a task set selection, Defining Scheduling, Project Plan

6 **Hours**

MODULE 4

SOFTWARE QUALITY ASSURANCE: Quality assurance concept, Costimpact of software defects, Technical review, statistical Quality assurance,software reliability, ISO 9000 Quality standards. 6 **Hours**

SOFTWARE TESTING: Objectives, Principles, Testability . 2 **Hours**

MODULE 5

SOFTWARE QUALITY AND RELIABILITY: Introduction, software modularity, language, Data reliability,Fault tolerance, software checking and software testing. **4 Hours OBJECT ORIENTED CONCEPT AND PRINCIPLES:** Object OrientedConcepts, Identifying the elements of an object model, Examples.

4 **Hours**

TEXT BOOK:

Software Engineering – Pressman - Computer Science Series - TATA McGraw- Hill Publications - 6th edition.

REFERENCE BOOKS:

Software Engineering – Somerville - Pearson Education,

Question paper pattern: The question paper will have TEN questions. There will be TWO questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer FIVE full questions, selecting ONE full question from each module.

COMPOSITE MATERIALS Common to (IM & IP)

Subject code	17IM654		IA Marks	40
Number of Lecture Hrs / Week	Lectures	3	Exam Marks	60
Total Number of Lecture Hrs	40		Exam Hours	03
CREDITS - 04				

MODULE: 1

Introduction to composite materials

Definition, classification and characteristics of composite materials:Fibrous, laminate, particulate, flakecomposites. Properties and types of reinforcement and matrix materials.Fibre reinforced plastic processing: basic steps in manufacturing of a composite, impregnation,lay-up, consolidation and solidification. Open and closed mould process, hand lay-up techniques, structural laminate vacuum bag and autoclave processing, filament winding, pultrusion, pulforming, thermo-forming, injection molding, resin transfer molding.

9Hrs

MODULE: 2

Fabrication of composites

Cutting: machining, drilling, mechanical fasteners and adhesive bonding: design guidelines for adhesive bonding. mechanical joining: design parameters for bolted joints, waterjet and laserjet cuttings. Challenge during machining of composites, failure mode during machining. Cutting tools and fabrication equipment.Ceramic matrix composites and their fabrication technologies.

7Hrs

MODULE: 3

Structural application of composites

Aerospace, air craft and military, medical, sporting goods and recreation, automotive.Marine, infrastructure. Micro analysis of a uni-directional lamina: definition of volume and mass fractions, density and void content. Derivation for longitudinal, transverse and shear modulus. Major and minor Poission'sratio's. Numerical problems.

8Hrs

MODULE: 4

Study properties of MMC's

Physical Mechanical, wear, machinability and other properties.Effect of size, shape and distribution of particulate on properties. Advanced composites such as Polymer based Sandwich structures. Introduction to shape memory alloys.

8 Hrs

MODULE: 5

Study of composite materials from natural resources

Introduction to natural composites: classification of natural fibers: plant, animal, mineral fibers and their sources; silk, human, feather, jute, sisal, flax, cotton, bamboo fibres. Advantages and disadvantages of natural fibres.Characteristics of natural fibres.Extraction of plant fibres.Recent developments in natural fibre composites, feature potential of natural fibre composites.

8 Hrs

TEXT BOOKS:

1. Composite Science and Engineering - K.K.Chawla - Springer Verlag - 1998.
2. Introduction to composite materials - Hull and Clyne - Cambridge University Press - 2nd Edition, 1990.
3. Composites Manufacturing: materials, product and process engineering - Sanjay K. Mazumdar CRC press - Firstedition 4010.

REFERENCE BOOKS:

1. Composite Materials hand book - MeingSchwaitz - McGraw Hill Book Company - 1984.
2. Forming Metal hand book - 9th edition, ASM handbook, V15, 1988, P327-338.
3. Mechanics of composites - Autar K kaw - CRC Press - 4002.
4. Fiber-Reinforced Composites – P.K. Mallick – Third Edition.

OPEN ELECTIVES

MANAGEMENT INFORMATION SYSTEMS

Sub Code	**17IM/IP661**	IA Marks	40
No. of Lecture Hrs/week	03	Exam Hours	03
Total Lecture Hrs	40	Exam Marks	60

Course objectives:

1. To elevate students' awareness of information Technology and develop an in-depth and systematic understanding of key aspects of IT management.
2. To help students gain a strategic perspective on business.
3. To evaluate the value of emerging technologies and their competitive advantage.

Course content:

MODULE– 1

Fundamentals of Information Systems: Information systems in business, fundamentals of information systems solving business problems with information systems. **7 Hours**

MODULE– 2

Information Systems for Business Operations: Business information systems, Transaction processing systems, management, information systems and decision support systems. Artificial intelligence technologies in business, information system for strategic applications and issues in information technology.

9 Hours

MODULE–3

Issues in Managing Information Technology: Managing information resources and technologies global information technology, management, planning and implementing change, integrating business change with IT, security and ethical challenges in managing IT, social challenges of information technology.

8 Hours

MODULE-4

E-Business Model: E-commerce frame work, Architectural frame work for e-commerce, Application services and transaction, Models – B2C Transactions, B2B Transactions, Intra-Organizational Transactions, WWW Architecture: Client server structure of the web, e-Commerce architecture, Technology behind the web.

8 Hours

MODULE-5

Consumer Oriented E-Commerce: Consumer oriented Application: Finance and Home Banking, Home shopping, Home Entertainment, Mercantile Process Models, Consumers perspective, Merchants perspective.

Electronics Data Interchange (EDI): EDI Concepts, Applications in business – component s of international trade, Customs Financial EDI, Electronic fund transfer, Manufacturing using EDI, Digital Signatures and EDI.

8 Hours

TEXT BOOKS:

1. Management Information systems – managing informati on technology in the internet worked enterprise – j ams. A O'Brien – Tata McGraw Hill publishing company limited – 4002.

2. Management Information Systems – Laaudon&Laudon – P HI – ISBN 81-403-1282-1.1998.

REFERENCE BOOKS:

1. Management Information systems – S. Sadogopan. – PH I – 1998Edn. ISBN 81-403-1160-9.
2. Information systems for modern management – G.R. Mu rdick – PHI – 2nd Edition.

ADVANCED MACHINING PROCESSES

Subject Code	**: 17IM/IP662**	**No. of Credits**	**: 4 -0-0**
No. of Lecture Hours / Week	**: 03**	**Exam Hours**	**: 3**
Total No. of Lecture Hours	**: 40**	**Exam Marks**	**: 60 IA:40**

COURSE OBJECTIVES

1. To learn the fundamental concepts of Non-Traditional Machining and their Mechanical Processes
2. To have a good knowledge of Abrasive Jet Machining and its application
3. To learn the fundamental principles of Electrochemical Machining Process (ECM

4. To have basic exposure to Chemical Machining (CHM) and Chemical Milling

5. To imbibe a the basic principles of Thermal Metal Removal Processes, Plasma Arc Machining (PAM)and Laser Beam Machining (LBM)

COURSE CONTENT

Unit 1

Introduction: History, need for non-traditional machining processes, classification, process selection.

Mechanical Process: Ultrasonic Machining (USM): Introduction, equipment, tool material and tool size, abrasive slurry, magnetostriction assembly, tool cone (concentrator), exponential concentrator of circular cross section and rectangular cross sections, effect of parameters, amplitude, frequency, grain diameter, applied static load and slurry,tool and work material. USM process characteristics: material removal rate, tool wear, accuracy, surface finish, applications, advantages and disadvantages of USM.

08Hrs

Unit 2

Abrasive Jet Machining (AJM): Introduction, equipment, variables in AJM: carrier gas, size of abrasive grain, velocity of the abrasive jet, mean no. abrasive particles per unit volume of the carrier gas, work material, stand-off distance (SOD), process characteristics-material removal rate. nozzle wear, Accuracy and surface finish, Applications, advantages and disadvantages of AJM.

08Hrs

Unit 3

Electrochemical Machining Process (ECM): Introduction, elements of ECM process: Cathode tool, anode work piece, source of DC power, electrolyte, chemistry of the process, ECM process characteristics - material removal rate, accuracy, surface finish, tool and insulation materials, tool size, electrolyte flow arrangement, applications, simple problems.

08Hrs

Unit 4

Chemical Machining (CHM): Introduction, elements of the process, chemical blanking process: preparation of work piece, preparation of masters, masking with photo resists, etching for blanking, accuracy of chemical blanking.

Chemical Milling (Contour machining):- Process steps-masking, etching, etc. process characteristics of CHM: - material removal rate, accuracy, surface finish, application of CHM.

08Hrs

Unit 5

Thermal Metal Removal Processes: Electrical Discharge Machining (EDM) - Introduction, mechanism of metal removal, dielectric fluid, spark generator,

EDM tool (electrode), electrode material selection, machining time,flushing: suction flushing, side flushing, pulsed flushing synchronized with electrode movement, EDM process characteristics: metal removal rate, accuracy, surface finish, heat affected zone, machine tool selection, applications, electric discharge grinding, traveling wire EDM.

Plasma Arc Machining (PAM): Principle of generation of plasma, equipment, non-thermal generation of plasma, selection of gas, mechanism of metal removal, PAM parameters, process characteristics.

Laser Beam Machining (LBM): Principle of generation of lasers, equipment and machining procedure, types of lasers, process characteristics, applications.

08Hrs

COURSE OUTCOMES:

Upon completion of this course, students should be able to:

1. Understand the need for advanced manufacturing process and explain the principle of operation of ultrasonic machining process.
2. Explain the characteristic features of Abrasive Jet Machining (AJM)
3. Define the process parameters influence the material removal rate with the help of characteristics curves.
4. Explain the principle of chemical machining and chemical milling process.
5. Summarize the various aspects of Electric discharge machining (EDM).Explain the principle of generation plasma and laser and their application in machining

Text Books:

1. **Modern Machining Process** by P C Pandey and H S Shan, Tata McGraw Hill,4008
2. **New Technology** by Bhattacharaya, Institution of Engineering Publication.

References:

1. **Production Technology**, by HMT Tata McGraw Hill.
2. **Modern Machining Methods** by Dr. M.Adithan, Khanna Publishers, 4008.
3. **Non-conventional Machining** by P K Mishra, Reprint 4006, Narosa publishing House, New – Delhi.

VALUE ENGINEERING

Subject Code	:	17IM/IP663	IA Marks	:	40
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	40	Exam Marks	:	60

MODULE – 1

INTRODUCTION TO VALUE ANALYSIS: Definition of Value, Value Analysis, Value Engineering, Value management, Value Analysis versus Value Engineering, Value Analysis versus Traditional cost reduction techniques, uses, Applications, advantages and limitations of Value analysis. Symptoms to apply value analysis, Coaching of Champion concept.

TYPE OF VALUES: Reasons for unnecessary cost of product, Peeling cost Onion concept, unsuspected areas responsible for higher cost, Value Analysis Zone, attractive features of value analysis. Meaning of Value, types of value & their effect in cost reduction. Value analysis procedure by simulation.Detailed case studies of simple products.

9 Hours

MODULE – 2

FUNCTIONAL COST AND ITS EVALUATION: Meaning of Function and Functional cost, Rules for functional definition, Types of functions, primary and secondary functions using verb and Noun, Function evaluation process, Methods of function evaluation. Evaluation of function by comparison, Evaluation of Interacting functions, Evaluation of function from available data, matrix technique, MISS technique, Numerical evaluation of functional relationships and case studies.

PROBLEM SETTING & SOLVING SYSTEM: A problem solvable stated is half solved, Steps in problem setting system, Identification, Separation and Grouping of functions. Case studies.

PROBLEM SETTING & SOLVING SYSTEM: Goods system contains everything the task requires. Various steps in problem solving, case studies.

10 Hours

MODULE - 3

VALUE ENGINEERING JOB PLAN: Meaning and Importance of Value Engineering Job plan. Phases of job plan proposed by different value engineering experts, Information phase, Analysis phase, Creative phase, Judgement phase, Development planning phase, and case studies. Cost reduction programs, criteria for cost reduction program, Value analysis change proposal.

7 Hours

MODULE- 4

VALUE ENGINEERING TECHNIQUES: Result Accelerators or New Value Engineering Techniques, Listing, Role of techniques in Value Engineering, Details with Case examples for each of the Techniques.

ADVANCED VALUE ANALYSIS TECHNIQUES: Functional analysis system technique and case studies, Value analysis of Management practice (VAMP), steps involved in VAMP, application of VAMP to Government, University, College, Hospitals, School Problems etc., (service type problems).

TOTAL VALUE ENGINEERING: Concepts, need, Methodology and benefits.

8 Hours

MODULE- 5

APPLICATION OF VALUE ANALYSIS: Application of Value analysis in the field of Accounting, Appearance Design, Cost reduction, Engineering, manufacturing, Management, Purchasing, Quality Control, Sales, marketing, Material Management Etc., Comparison of approach of Value analysis & other management techniques.

6 Hours

TEXT BOOKS:

Techniques of Value Analysis and Engineering– Lawrence D. Miles, McGraw – Hill Book Company, 2nd Edn.

Value engineering for Cost Reduction and Product Improvement – M.S. Vittal, Systems Consultancy Services Edn 19 93

Value Management, Value Engineering and Cost Reduction – Edward D Heller Addison Wesley Publishing Compan y 1971

REFERENCE BOOKS:

Value Analysis for Better Management – Warren J Ridge American Management Association E dn 1969

Getting More at Less Cost (The Value Engineering Way) – G.Jagannathan Tata M cgraw Hill Pub. Comp. Edn 1995

Value Engineering – Arther E Mudge McGraw Hill Book Comp. Edn 1981

DEVELOPMENT OF ENTERPRISES Semester - V				
Subject Code: **17IM/IP664**			IA Marks	40
Number of Lecture Hours/Week	03		Exam Marks	60
Total Number of Lecture Hours:	40		Exam Hours	03
CREDITS – 03				

MODULE 1

DEFINITION AND CONCEPT OF ENTERPRISE: Profile of an entrepreneur-need scope and characteristics of entrepreneurs. Attitude development, creativity–stress management-positive reinforcement. **8 Hours**

MODULE 2

METHODOLOGY OF PROJECT IDENTIFICATION: Short listing and zeroing on to product/service-project in outline project planning-technical and feasibility analysis-evaluation of project report. Project appraisal technical, commercial and financial appraisal - problems in

project equation - legal, financial and environmental aspects. **8 Hours**

MODULE 3

MARKETING: Market share-distribution-sale strategies-certification agencies-term finance-source and management working capital-coating and cost control (basic principles only) need analysis-product design (basic principles only)- developing operational expertise- innovation and change. **8 Hours**

MODULE 4

SMALL INDUSTRIES DEVELOPMENT: Small Industries development in India and its concepts- ancillary industries-starting a small scale industry steps involved-role of financing and other institutions providing assistance to small industries- preparation of project (case study).

8Hours

MODULE 5

ACCOUNTING PRINCIPLES: Conventions and concepts-balance sheet, profit and loss account.Accounting rate of return, pay back period, SSI duty practice. **8 Hours**

TEXT BOOK:

1. **Developing Entrepreneurship -**UdaiPareek and T.V. VenkateswaraRao, – A Hand Book Learning systems - ND. 1978.

REFERENCE BOOKS:

1. **EDI - 1 Faculty and External Experts**, A handbook for new entrepreneurs, Entrepreneurship development institute of India -1986.

2. **Entrepreneurship Development -** P. Saravanavel - Ess Pee Kay publishing house -1st Edition.

3. **Entrepreneurship and Small Business** - Anil Kumar - I K International Publishing house Pvt. Ltd - 1st Edition.

Question paper pattern: The question paper will have TEN questions. There will be TWO questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer FIVE full questions, selecting ONE full question from each module.

VII SEMESTER

FACILITY PLANNING AND DESIGN			
Subject Code	**17IM71**	**No. of Credits**	**: 3 -0-0**
No. of Lecture Hours / Week	**: 04**	**Exam Hours**	**: 3**
Total No. of Lecture Hours	**: 50**	**Exam Marks**	**: 60 IA:40**

COURSE OBJECTIVES

4. To know the importance of location, layouts and material handling
5. To know and distinguish between different approaches to layout and draw activity relationship chart
6. To compute space requirement and demonstrate skills in area allocation and construct the layout.
7. To examine the quantitative approaches to facility planning and identify the different models.
8. To know the different computerized techniques and model appropriate design.

COURSE CONTENT

UNIT-1

Plant Location: Factors influencing plant location, theories of plant location, plant layout – objectives of plant la yout, principles of plant layout, types of plant layout, their merits and demerits, facilities design function: objectives. Simple exerciseson layouts.

Introduction to Material Handling: Objectives and principles of material handling, unit load concept, Basic handling equipment types,Common material handling equipments

08 Hours

UNIT – 2.

Plant Design: Layout procedure, study of some approaches (Immer, Nadler, Muther, Apple James and Reed's approach), systematic layout planning, the activity relationship chart, Constructing the activity relationship chart,Activity relationship diagram.

12 Hours

UNIT – 3

Space Determination and Area Allocation: Factors for consideration in space planning, receiving, storage, production, shipping, tool room and tool crib, other auxiliary service actions, establishing total space requirement, area allocation factors to be considered, expansion, flexibility, aisles column, area allocation procedure, the plot plan.

Construction of the Layout: Methods of constructing the layout, evaluation of layout, efficiency indices, presenting layout to management..

12Hrs

UNIT – 4

Quantitative approaches to facilities planning: Deterministic models, single and multi facility models, Conventional layout model: Block stacking,location allocation models,

Layout Models: Warehouse layout models,waiting line models,Storage models.

08 Hours

UNIT – 5

Computerized Layout Planning: Computerized relative allocation of facility techniques (CRAFT),Plant layout Evaluation Techniques(PLANET), Computerized Relationship Layout Planning (CORELAP),Comparison of computerized layout techniques.

10 Hours

COURSE OUTCOMES:

Upon completion of this course, students should be able to:

4. Identify the planning srtrategies for implementation,evalution and maintaining the facility.
5. Arrive at suitable layout for given situations having understand different approaches.
6. Demonstrate the Space determination and area allocation procedure, construction of the layout.
7. Analyze the quantitative methods and models to determine for the plant location.Explain the warehouse and waiting line models.
8. Demonstrates the ideas on various types of layout and evaluation techniques using computers.

TEXT BOOKS

7. **Plant layout and material handling**- James M. Apple, 3nd edition John, Wiley and sons, 1991.
8. **Facility layout and location** – Françoise, R.L. and White, J.A, McGraw Hill 2 nd edition, 1994.

REFERENCE BOOKS

8. **Practical layout** – Muther Richard -McGraw Hill-1956.

9. Plant layout design – James.M Moore, Mac Millon co.1962.

10. Facilities design – SundereshHeragu, PWS publishing company-ISBN-0-534-95183, August 4008

11. **Facilities planning –** Tompkins white –wiley India Pvt ltd 3 rd edition.
12. **Facility Layout and Location**, Richard LFrancies. 2nd Edition PHI learning Pvt. Ltd

OPERATIONS MANAGEMENT

Subject Code: 17IM/IP72 IA Marks : 40

No. of Lecture Hrs./ Week : 04Exam Hours : 03

Total No. of Lecture Hrs. : 50

Exam Marks : 60

Module 1

OPERATIONS MANAGEMENT CONCEPTS: Introduction, Historical development, The trend: Information and Non-manufacturing systems, Operations management, Factors affecting productivity.

OPERATIONS DECISION MAKING: Introduction, Management as a science, Characteristics of decisions, and Framework for decision making, Decision methodology, Decision support systems, Economic models, and Statistical models. 10 Hours

Module 2

FORECASTING DEMAND: Forecasting objectives and uses, Forecasting variables, Opinion and Judgmental methods, Time series methods, Exponential smoothing, Regression and correlation methods, Application and control of forecasts. 10 Hours Module 3

AGGREGATE PLANNING AND MASTER SCHEDULING: Introduction- planning and scheduling, Objectives of aggregate planning,

Aggregate planning methods, Master scheduling objectives, Master scheduling methods. 10 Hours

Module 4

MATERIAL AND CAPACITY REQUIREMENTS PLANNING: Overview: MRP and CRP, MRP: Underlying concepts, System parameters, MRP logic, System refinements, Capacity management, CRP activities.

SCHEDULING AND CONTROLLING PRODUCTION ACTIVITIES: Introduction, PAC, Objectives and Data requirements, Scheduling strategy and guide lines, Scheduling methodology, priority control, capacity control.

10 Hours

Module 5

SINGLE MACHINE SCHEDULING: Concept, measures of performance, SPT rule, Weighted SPT rule, EDD rule, minimizing the number of tardy jobs.

FLOW -SHOP SCHEDULING: Introduction, Johnson's rule for ‘n’ jobs on 2 and 3 machines, CDS heuristic. J OB-SHOP SHEDULING: Types of schedules, Heuristic procedure, scheduling 2 jobs on 'm' machines. 10 Hours

TEXT BOOKS:

7. Operations Management - Monks J.G. - McGraw-Hill International Editions - 1987.
8. Production and Operations Management - Pannerselvam. R – PHI – 2nd edition.
9. An introductory book on lean systems, TPS, Yasuhiro Monden

REFERENCE BOOKS:

4. Modern Production/Operations Management - Buffa - Wiely India Ltd. - 4th edition.
5. Production and Operations Management - Chary, S.N - TataMcGraw Hill. - 3rd edition
6. Production and Operatiosn Management – Adam & Ebert , PHI, 5th edition Financial Accounting And Costing

PROJECT MANAGEMENT

Subject Code	**17IM73**	**No. of Credits**	**: 4 -0-0**
No. of Lecture Hours / Week	**: 04**	**Exam Hours**	**: 3**
Total No. of Lecture Hours	**: 50**	**Exam Marks**	**: 60 IA:40**

COURSE OBJECTIVES

6. To know nuances of project management and explain project planning and estimating
7. To identify the importance of human resource component and apply project execution skills
8. To demonstrate project implementation using tools and techniques

9. To determine the necessary project direction and control activities

10. To evaluate the project performance for better performance.

COURSE CONTENT

UNIT-1

Project Management: Concepts, characteristics of project, phases of project life cycle

Project Planning and Estimating: Feasibility report, preparation of cost estimates, valuation of the project profitability

10 Hrs

UNIT – 2.

Organizing human resources and contracting: Delegation,project organization, Accountability in project execution, contracts, 3 'R's of contracting, Tendering and selection of contractors**.**

12 Hrs

UNIT – 3

Project implementation: Project work system design, work breakdown structure (WBS).

Tools and Techniques of Project Management: Project planning and scheduling techniques, bar (Gantt) chart, project evaluation and review technique

(PERT) planning – numerical.

12 Hrs

UNIT – 4

Project direction, Coordination and Control: Project communication, Project direction, Project co-ordination and Project control

08 Hrs

UNIT – 5

Project Management Performance: Performance indicators, The CM and DM companies for better project management

08 Hrs

COURSE OUTCOMES:

Upon completion of this course, students should be able to:

6. Recall the elementary concepts of projects and their management.
7. Plan and estimate a given project for its feasibility.
8. Organize human resources of a project and know the terms of contracting.
9. Select an appropriate tool/technique for project implementation.
10. Understand the knack behind directing, coordinating and controlling a project.
    Evaluate a project for its performance and know the project management scenario in our nation.

TEXT BOOKS

\endash **Project Management,** S.Choudhury Tata McGraw hill education PVT Ltd, 4013, 36th reprint.
\endash **Project Management –A** system approach to planning scheduling and controlling - Harold K**e**rzner, 10th edition 4009, John wiley and sons.

REFERENCE BOOKS

1. **Project Management**BhaveshM.Patel, Vikas Publication House, 4002.

2.**Project Planning Scheduling and Control,** James P.Lawis, Meo Publishing Company, 5th edition 4010.

3**. PERT and CPM**, L.S. Srinath, Affiliated East West Press Pvt. Ltd 4002.

MARKETING MANAGEMENT

Subject Code	: 17IM 741	IA Marks	: 40
No. of Lecture Hrs./ Week	: 03	Exam Hours	: 03
Total No. of Lecture Hrs.	: 40	Exam Marks	: 60

MODULE - 1

INTRODUCTION: Historical development of marketing management, Definition of Marketing, Core marketing concepts, Marketing Management philosophies, Micro and

Macro Environment, importance of marketing in the India Socio – economics system.

CONSUMER MARKETS AND BUYING BEHAVIOR: Characteristics affecting consumer behaviour, Types of buying decisions, Buying decision process, Classification of consumer products, Market segmentation.

8 Hours

MODULE - 2

MARKETING INFORMATION SYSTEMS AND RESEARCH: Components of marketing information system–benefits & uses marketing research system, marketing research procedure, measurement of market demand.

MARKETING OF INDUSTRIAL GOODS: Nature and importance of the Industrial market, classification of industrial products, participants in the industrial buying process, major factors influencing industrial buying behaviour, characteristics of industrial market demand. Determinants of industrial market demand Buying power of Industrial users, buying motives of Industrials users, the industrial buying process, buying patterns of industrial users

8 Hours

MODULE- 3

PRODUCT PLANNING AND DEVELOPMENT: The concept of a product, features of a product, classification of products, product policies – produc t planning and development, product line, product mix – factors in fluencing change in product mix, product mix strategies, meaning of New – product; major stages in new – product development, product life cycle.

BRANDING, LABELLING AND PACKAGING: Branding, Reasons for branding, functions of branding, features and types of brands, kinds of brand name.

LABELLING: Types, functions, advantages and disadvantages

PACKAGING: Meaning, growth of packaging, function of packaging, kinds of packaging.

8 Hours

MODULE - 4

PRICING: Importance of Price, pricing objectives, factors affecting pricing decisions, procedure for price determination, kinds of pricing, pricing strategies and decisions.

DISTRIBUTION: Marketing channels – functions, types of channels o f distribution, number of channel levels. Physical distribution – importance, total systems concept, strategy, use of physical distribution.

8 Hours

MODULE-5

PERSONAL SELLING: Objectives of personal selling, establishing the Sales force objectives, sales – force strategy, sale s force structure and size, salesmanship, qualities of good salesman, types of salesman, major steps in effective selling.

8 Hours

TEXT BOOKS:

8. **Principles of Marketing** - Philip Kotler - Prentice Hall - 11th Edn.
9. **Marketing Management -** Philip Kotler , Prentice Hall - 12th Edn.

REFERENCE BOOKS:

6. **Fundamentals of Marketing -** Wiliam J Stanton - McGraw Hill – 1994.
7. **Marketing Management Text & Cases** - Rajagopal- Vikas Publishing House - ISBN 81-259-0773-4.
8. **Marketing Management** - Michael R Czinkota - Vikas Publishing House - 2nd Edition ISBN 981-240-366-3.

ENTERPRISE RESOURCE PLANNING

Subject Code	:	17IM 742	IA Marks	:	40
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	40	Exam Marks	:	60

MODULE - 1

INTRODUCTION TO ERP: Introduction, Evolution of ERP, What is ERP, Reasons for the growth of the ERP market, The advantages of ERP, Why do Man ERP Implementations Fail? Why are ERP packages being used now?

ENTERPRISE – AN OVERVIEW : Introduction, Integrated Management Information, Business modelling, Integrated Data Model.

7 Hours

MODULE - 2

ERP AND RELATED TECHNOLOGIES: Introduction, Business Process Reengineering, Management Information System, Decision Support System, Executive Information Systems, Data Warehousing, Data Mining, On-line Analytical Processing, Supply Chain Management.

ERP- MANUFACTURING PERSPECTIVE: Introduction, ERP. CAD/CAM, Materials Requirements Planning, Bill of Material, Closed Loop MRP.Manufacturing Resource Planning, Distribution Requirements Planning.

13 Hours

MODULE - 3

KANBAN:JIT and Kanban, Product Data Management, Benefits of PDM, Make-to-order, and Make-to Stock, Assemble to order, Engineer to order, Configure-to order.

ERP MODULES: Introduction, Finance, Plant Maintenance, Quality Management, Materials Management.

10 Hours

MODULE - 4

BENEFITS OF ERP:Introduction, Reduction of Lead time, On-time shipment, Reduction in Cycle Time, Improved Resource Utilisation, Better Customer Satisfaction, Improved Suppler Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Decision – making capability.

ERP PACKAGES: Overview of ERP Software Introduction, SAP AG, Baan Company, Oracle Corporation, PeopleSoft, JD Edwards World Solutions Company, System Software Associates,Inc. QAD

12 Hours

MODULE – 5

ERP Implementation Life Cycle: Pre-Evaluations Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation of Team Training, Testing, Going Live, end user Training, Post Implementation

VENDOR, CONSULTANTS AND USERS: Introduction, In-house implementation – Pros and Co ns, Vendors, Consultants, End-users.

ERP- Case studies **8 Hours**

TEXT BOOKS:

- **Enterprise Resource Planning** - Alexis Leon - Tata McGraw Hill Publishing Company Ltd -1999.
- **Enterprise Resource Planning Concept and Practice** -Vinod Kumar Garg and Venkitakrishnan- PrenticeHall, India - 2nd Edition.

REFERENCE TEXT BOOK:

- **Manufacturing Planning & Controls** -Thomas Volloman, et,al.

STRATEGIC MANAGEMENT

Subject Code	:	17IM743	IA Marks	:	40
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03

Total No. of Lecture Hrs. : 40 Exam Marks : 60

MODULE- 1

STRATEGIC MANAGEMENT INTRODUCTION: Definition- Levels of strategy- Roles of Strategist- Strategic Management Process benefits and limitations. Mission-Objectives -Social responsibilities.

STRATEGY FORMULATION: Strategic Thinking, SWOT analysis- Techniques for environmental analysis- TOWS matrix, Balanced Score Card, Steps in strategy implementation -formulation of SBU strategy.

8 Hours

MODULE- 2

STRATEGY FORMULATION: Leadership implementation communicating the strategy- Annual and Functional objectives- Development of policies- Organisational Implementation- Evaluation and control. reward system.

STRATEGY AND STRUCTURE: Strategy- Structure relationship. Organizational restructuring and Transformation, Principles of Organization.

8 Hours

MODULE -3

STRATEGY EVALUATION AND CONTROL: Strategic control- Premise and Implementation control strategic Surveillance special alert control- Operational control-

Steps in Operational Control, Types of Operational control.

PORTFOLIO STRATEGY: Business portfolio analysis- BGC matrix, GE multi matrix, an evaluation of Portfolio models - factors influencing portfolio strategy.

8 Hours

MODULE - 4

COMPETITIVE ANALYSIS AND STRATEGIES: Structural analysis of industries threat of entry rivalry among existing competitors, threat of substitutes; Bargaining power of suppliers; structural analysis and competitive strategy -competitor analysis value chain.

7 Hours

MODULE - 5

BUSINESS GROWTH: Reasons, Risks and indicators of Business growth- Mergers and acquisitions. Management of M& A, determination of strategic purpose; screening, evaluation and choice, pitfalls in M&A, Defence strategies.

GLOBALIZATION: Meaning and Dimensions, Globalization of Indian business, Barriers to change, Implementation of marketing and change.

9 Hours

TEXT BOOKS:

- **Strategic Management** - Francis Cherunilam - Himalya Publishers,
- **Business Policy and Strategic Management** - AzharKazmi - Tata McGraw Hill -2nd Edn.
- **Strategic Management** - Michael Porter - Prentice-Hall – 1984.

MAINTENANCE ENGINEERING AND SAFETY

Subject Code	17IM744	Exam Hours	: 3
No. of Lecture Hours / Week	: 03	CIE Marks	40
Total No. of Lecture Hours	: 40	SEE Marks	60
No. of Credits	: 3	Total Marks	100

COURSE OBJECTIVES

1. To know the nuances and importance of maintenance in modern Manufacturing organizations.
2. To recognize the importance of Maintenance Planning and Scheduling
3. To demonstrate skills learnt on maintenance of conventional machinery.
4. To identify the importance of Industrial safety and exhibit awareness of safety standards.
5. To identify the importance of housekeeping and manage industrial pollution

COURSE CONTENT

UNIT-1

Introduction to Maintenance: Objectives and Functions of maintenance. Factors influencing plant availability, Maintenance control, Maintenance Strategies, Organization for Maintenance. Failure Statistics: Breakdown time distributions, Poisson, Exponential and Normal Distributions., Failure Probability, Survival Probability and age specific failure rates.

12 Hrs

UNIT – 2.

Maintenance Planning and Scheduling: Planning and Maintenance Activities for Maintenance. Allocation of resources including manpower. Planning and scheduling techniques for maintenance. Estimation of Maintenance work. Repair complexity. Control of maintenance activity.

12 Hrs

UNIT – 3

Maintenance of Machinery: Causes of Machine failure. Performance evaluation, Trouble shooting, Lubrication Charts, Checklists for maintenance for conventional machines like Engine Lathes, Drilling machines, and Milling machines. Spare parts for maintenance and their inventory control

10Hrs

UNIT – 4

Industrial Safety: Economic and other importance of industrial accidents. Types of safety organizations, Analysis of Accident Records, Accident investigation. Safety standards for machines as well as Material handling equipment.

Safety Standards for Electrical equipment, Classification of fires and fire fighting, Chemical hazards and handling.

08 Hrs

UNIT – 5

Housekeeping of buildings, Aisles, passages, floors, tool cribs, washrooms and canteen.

Industrial pollution: effluents and their treatment, waste management. Environment control.

08 Hrs

COURSE OUTCOMES:

Upon completion of this course, students should be able to:

1. To recognize the importance of Maintenance Engineering and apply its principles.
2. To plan and Schedule the maintenance program for an given manufacturing organization.
3. To recall the nuances of maintaining simple conventional machines.

4. To know the safety standards for various hazards that are common on the shop floor
5. To express the importance of housekeeping discuss ways of handling industrial pollution

TEXT BOOKS

1. **Maintenance Engineering and Management –** R.C.Misra and K.Pathak- Prentice Hall of India 2002
2. **Maintenance Engineering- Principles, Practices and Management**- Sushil Kumar Srivastava, S.Chand and Co, New Delhi 2013

REFERENCE BOOKS

1. **Management of Industrial Maintenance**-A KELLY AND M J HARRIS Butterworth's Co, Ltd.,
2. **Maintenance, Replacement and Reliability**- AKS JARDINE,Pitman publishing Co.
3. **Maintenance planning and control**- A KELLY, Butterworth Co, Ltd.,

OPEN ELECTIVES
FINANCIAL MANAGEMENT

Sub Code	**: 17IM751**	CIE Marks	: 40
No. of Lecture Hrs/week	: 03	Exam Hours	: 03
Total Lecture Hrs	:40	SEE Marks	: 80
Credits	03	Total Marks	100

Course objectives:

1. To provide the concepts and foundations of managing finance in business enterprises.
2. To equip students with tools and techniques for managing finance.
3. To orient students regarding financial management practices in Indian companies and Global enterprises.

UNIT – 1

Introduction: Evolution of Financial Management, Goals, Forms of Business.
Risk and Required Return: Risk and return relationship, Business risk, financial risk, and risk in portfolio context, expected rate of return, Capital asset pricing model.

Capital Budgeting: Risk analysis in Capital Budgeting, Cost of Capital – Debt, Preference Equity forms of capital **08 Hours**

UNIT – 2.

Capital Structure and Firm Value: Assumption, Definition and approaches, Modigliani and Miller Mode, Capital Structure decisions – EBIT, EPS analysis, ROI, REI analysis and Cash Flow comparative Analysis.

Working Capital Management: Factors influencing working capital requirement, determination of operating cycle and working capital. **08 Hours**

UNIT-3

Long Term Financing: Raising of finance form primary and secondary markets, Valuation of securities, features of convertibility securities and warrants, SEBI guide lines on capital issues, stock market in India, Venture capital, Initial Public Offering.

Merger Acquisition and Restructuring: Reasons, Mechanics, Cost and benefits of a merger, Evolution, terms and purchase of a division, Takeovers, Acquisitions, Portfolio and financial restructuring

08 Hours

UNIT – 4

Securities and Portfolio Analysis: Derivatives, Futures Trading,

Financial Statement Analysis: Ratio analysis, time series analysis, Du pont analysis, funds flow analysis

08 Hours

UNIT – 5

International Financial Management: World Monitoring system, Foreign Exchange Markets, International Parity Relationships, International Capital budgeting, Financing Foreign Operations, Raising Foreign Currency Finance, Financing Exports, Documents in International Trade.
Financial Management in Sick Units: Definition of sickness, Causes of sickness, Symptoms of sickness, Prediction of sickness, Revival of a sick unit

08 Hours

TEXT BOOKS:

1. Financial Management Theory and practice – Prasanna Chandra – TMH – ISBN– 007-044501-X, 5th edn.
2. Financial accounting – B.S. Raman – United publication – VoI II

REFERENCE BOOKS:

1. Financial Management Text & Problems – Khan & Jain – TMH – ISBN 0—07-460208-X.

2. Financial management – IM Pandey – Vikas Pub. House – ISBN 0- 7069-5435-1.

WORLD CLASS MANUFACTURING

Subject Code	17IM752	Exam Hours	: 3
No. of Lecture Hours / Week	: 03	CIE Marks	40
Total No. of Lecture Hours	: 40	SEE Marks	60
No. of Credits	: 3	Total Marks	100

MODULE -1

INTRODUCTION TO WORLD CLASS MANUFACTURING

Manufacturing Excellence and Competitiveness, What is world-Class Manufacturing?-Halls framework of world-Class Manufacturing (WCM), Gunn s Model of World-Class Manufacturing, Maskells Model of World- Class Manufacturing.

WORLD CLASS MANUFACTURING

The philosophy of world-class Manufacturing-The First Principles of World-Class Manufacturing, The practices of World-Class Manufacturing-The customers Interface ,The Supplier Interface, World-Class Practices in the factory.

MODULE -2

PRINCIPLES AND PRACTICIES OF WCM

Data collection plan, research-internal public domain sources, outside experts etc , original research, site visits, and code of conduct, Analyzing the gap: Top displaying data, deciding and combining best work practices, Balance Score Card Technique, Value Stream Mapping, validation, recommendations etc

MODULE -3

BENCHMARKING

Definition, mission and objectives, managing benchmarking process, training and code of conduct, future scope and benchmarking process , What to benchmark: concept of step zero, priorities, business processes linking to goals etc, investigation, documentation, performance measures, improving business processes , Whom to benchmarks: Developing candidate list, systematic search, refining the initial list

MODULE -4

DEFINITION OF REENGINEERING

Importance of 3Cs-customers takes charges, competition intensifies, and change becomes constant , Definition of Business Process Reengineering fundamentals rethinking, radical redesign, and dramatic improvement

Rethinking business process, new world of and enabling role of information technology

QUALITY MANAGEMENT SYSTEMS

ISO 9000-2000, IS 14000, Frame Work for Business Excellence - Malcolm Baldridge Award, Deming's Award

MODULE -5

SIX SIGMA

The Basics, The core of Six Sigma(DMAIC), design for Six Sigma, DFSS and the customer, Quality time and the Bottom line , core of DFSS-IDOV method , DFSS Metrics, DFSS Infrastructure People and resources, Implementing DFSS

ACTIVITY BASED MANAGEMENT (ABM)

Introduction, Traditional Cost Systems, Activity Based activity Based Costing, Activity Based Management, ABM Implementation, Case Study.

Course Outcomes: On completion of this course, students are able to:

1. Understanding the need for learning the world class manufacturing setup.
2. Learn the principles and practices of world class manufacturing.
3. Determine the quality practices as applied to world class product.
4. Standard practices of quality of conformance systems.

Text Books:

1. **World Class Manufacturing- A Strategic Perspective** – Sahay B S, Saxena K B C, Ashish Kumar – MacMillan India Ltd – ISBN 0333-93-4741. (unit 1 & 2)
2. **Finding and Implementing Best Practices- Business Process Benchmarking** -Champ, Robert C. – Vision Books, New Delhi – 2008.(unit 3 & 4)
3. **Reengineering the corporation – A Manifesto for Business revolution** – Hammer, Michael and James Champy – Nicholas Brealey Publishing , London.- 1993(unit 5 & 6)
4. **Six sigma for Managers**- Greg Brue – TMH – ISBN- 0-07-048639- 5 -2002.(unit 7)

Reference Books:

1. **Design for Six Sigma** –Grege – TMH – ISBN 0-07-058120. – 2003.
2. **Design for Six Sigmain Technology and Product Development** – Creveling -Pearson Education – 2008.
3. **Total Quality Management** -Dale H. Besterfield, carol Besterfield- Minchna, glen H Besterfield and Mary Besterfield scare – Pearson education – 3rd edition – ISBN 81-297-0260-6 (Part of Unit 6)

4. **Total Quality Management** – Kesavan R – I K International Publishing house Pvt. Ltd – 2008

Question paper pattern:

1. The question paper will have **ten** full questions carrying equal marks.Each full question consisting of **16** marks
2. There will be **two** full questions from each module.
3. Each full question will have questions covering all the topics under a module.
4. The students will have to answer **five** full questions, selecting **one**full question from each module.

PRODUCT DESIGN & MANUFACTURING

Subject Code	17IM753	Exam Hours	: 3
No. of Lecture Hours / Week	: 03	CIE Marks	40
Total No. of Lecture Hours	: 40	SEE Marks	60
No. of Credits	: 3	Total Marks	100

Course objectives:

1. Understanding the management role in the investigation, implementation and operation of manufacturing systems for efficiency, cost effectiveness and quality of product.
2. To match the manufacturing techniques with the product , company and the market.
3. To develop a flexible systems approach to originating, adapting, and developing processes and systems to meet the changing technology.

UNIT – 1

lntroduction to Product Design: Asimow's Model: Definition of Product Design, Design by Evolution; Design by Innovation, Essential Factors of Product Design,Production-Consumption Cycle, Flow and Value Addition in the Production-consumptionCycle, The Morphology of Design (The seven phases), Primary Design Phases andflowcharting, Role of Allowance, Process Capability, and Tolerance in Detailed Design andAssembly.

08 Hours

UNIT – 2.

Product Design Practice And Industry: Introduction, Product Strategies, Time to Market, Analysis of the Product, The Three S's, Standardization, Renard Series (PreferredNumbers), Simplification, The Designer and His Role, The Designer: Myth and Reality, The Industrial Design Organization, Basic Design Considerations, Problems faced by Industrial! Designer, Procedure adopted by Industrial Designers, Types of Models designed by Industrial Designers, What the Designer contributes, Role of Aesthetics in Product Design, Functional Design Practice

08 Hours

UNIT-3

Review of Strength, Stiffness and Rigidity considerations in Product Design: Principal Stress Trajectories (Force - Flow Lines), Balanced Design, Criteria and Objectivesof Design, Material Toughness: Resilience, Designing for Uniform Strength, Tension visavis-compression

08 Hours

UNIT – 4

Economic Factors Influencing Design: Product Value, Design for Safety, Reliability and Environmental Considerations, Manufacturing Operations in relation to Design,Economic anal ysis, Profit and Competitiveness, Break-even Analysis. **08 Hours**

UNIT – 5

Value Engineering and Product Design: Introduction, Historical Perspective, What is Value? Nature and Measurement or Value, Maximum Value, Normal Degree of Value,Importance of Value, The Value Analysis Job Plan, Creativity, Steps to Problem-solving andValue Analysis, Material and Process Selection in Value Engineering

Modern Approaches to Product Design: Concurrent Design, Quality Function Deployment (QFD), Implementation of QFD in production. **08 Hours**

TEXT BOOKS:

1. Product Design and Manufacturing by A.K. Chitale and R.C. Gupta, PHI.
2. Product Design & Development - Karl T. Ulrich & Steven D., TataMcGraw Hill, 3'dEdition, 2003

REFERENCE BOOKS:

1. New Product Development by Tim Jones, Butterworth Heinr1ann, Oxford, UIC 1997. .
2. New Product Development: Design & 'Analysis by Roland Enene, Kinetovicz, John Wiley and Sons Inc., N. Y. 1990.
3. Product Design for Manufacture and Assembly by GefferryBoothroyd, Peter Dewhurst and Winston Knight. '.
4.Successful Product Design by Jill Hollins, Stwout Pugh, Butterworth, London J 990.

ORGANIZATIONAL BEHAVIOR

Subject Code	17IM754	Exam Hours	: 3
No. of Lecture Hours / Week	: 03	CIE Marks	40
Total No. of Lecture Hours	: 40	SEE Marks	60
No. of Credits	: 3	Total Marks	100

COURSE OBJECTIVES

1. To know and recognize the importance of human behavior at work in organizations.
2. To relate human behavior with learning and demonstrate how the two go together.
3. To recognize the importance of motivation in learning and other performance attributes.
4. To know and locate the importance of group interactions and group behavior in organizations.
5. To manage and resolve conflicts through effective communication.

COURSE CONTENT

UNIT – 1

Introduction: Definition of Organization Behavior and Historical development, Environmental context (Information Technology and Globalization, Diversity and Ethics, Design and Cultural, Reward Systems).

The Individual: Foundations of individual behavior, individual differences. Ability. Attitude, Aptitude, interests. Values – Types of Values, Changing Values.

8 Hours

UNIT – 2

Learning: Definition, theories of learning, individual decision making, classical conditioning, operant conditioning, social learning theory, continuous and intermittent reinforcement.

Perception: Definition, Factors influencing perception, attribution theory, selective perception, projection, stereotyping, Halo effect.

8 Hours

UNIT – 3

Motivation: Maslow's Hierarchy of Needs theory, Mc-Gregor's theory X and Y, Hertzberg's motivation Hygiene theory, David Mc-Clelland's three needs theory, Victor Vroom's expectancy theory of motivation.

08 Hours

UNIT – 4

Groups Behavior: Definition and classification of groups, Factors affecting group formation, stages of group development, Norms, Hawthorne studies, group processes, group tasks, group decision making.

8 Hours

UNIT – 5

Conflict & Stress Management: Definition of conflict, functional and dysfunctional conflict, stages of conflict process. Sources of stress, fatigue and its impact on productivity.Job satisfaction, job rotation, enrichment, job enlargement and reengineering work process.

Communication: Principles of Communication**:** Useful definitions, communication principles, communication system, role of communication in management, barriers in communication, how to overcome the barriers, rule of effective communication.

8 Hours

COURSE OUTCOMES:

Upon completion of this course, students should be able to:

1. Appreciate human behavior at work.
2. Demonstrate how learning depends on behavioral aspects.
3. Value motivation and work and demonstrate their motivational skills.
4. To identify themselves as a part of a group and perform well.
5. To manage organizational conflict and be able to produce results.

TEXT BOOKS

1. **Organizational Behaviour,** Stephen P Robbins, 9th Edition, Pearson Education Publications, ISBN-81-7808-561-5 2002.
2. **Organizational Behaviour,** Fred Luthans, 9th Edition, Mc Grew Hill International Edition, ISBN-0-07-04-002.

REFERENCE BOOKS

1. **Organizational Behaviour**, Aswathappa - Himalaya Publishers, 2001.

2. **Organizational Behaviour,** (Human behaviour at work) 9th Edition, John Newstron/ Keith Davis, 2002.
3. **Organizational Behaviour,**Hellriegel, Srocum and Woodman, Thompson Learning, 9th Edition, Prentice Hall India, 2001.
4. **Organizational Behaviour,** VSP Rao and others, Konark Publishers, 2002.

ENTERPRISE RESOURCE PLANNING LAB

Subject Code	:	17IML 76	IA Marks	:	20
No. of Lab Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lab Hrs.	:	42	Exam Marks	:	80

PART - A

1. Process of customer orders under seasonal / unseasonable and Blanket orders.
2. Generating Bill of Materials for Various Engineering Designs
3. Creating Item Master for various Engineering Designs
4. Conduction of vendor Evaluation exercise
5. Basic Statistical Analysis
6. Creating Purchase order for Items
7. Creating Work order for Items
8. Perform inventory transaction

PART - B

1. Creating quotation process for Items
2. Creating Dispatch Instruction for Items
3. Creating Payment reconciliation.
4. MRP - II Generating of Various reports for confirmed orders
5. Basic statistical analysis
6. Analyse of existing capacity and defining routes optimizing the resources along routes.
7. Optimization problems using OR packages (two exercises only).
8. Scheduling of activities

Suggested Software Packages

1. Statistical Packages : SYSTAT / MINITAB / SPSS and such others
2. ERP Packages: SIXTH SENSE / RAMCO / MAARSMAN / CIMAS / UNISOFT / OPTIMIIZER 10.6 and such others.
3. Preactor – Scheduling Software OR Packages : Lindo / Lingo / STORM / such others

Note: A minimum of 12 exercises are to be conducted.

QUALITY ENGINEERING LAB

Subject Code	:	17IML 77	IA Marks	:	20
No. of Lab Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lab Hrs.	:	42	Exam Marks	:	80

PART - A

To test the Goodness of fit for the given quality characteristic using: Uniform distribution, Binomial distribution, Poisson distribution & Normal distribution.

Conduction of Repeatability and Reproducibility studies for appraiser and instrument using R&R Software

Assessing Process Capability of the given manufacturing process using Normal Probability paper method and process capability indices

Assessing Process Capability of the given manufacturing process using Digital Motorized Multifunctional Height Gauge and SQC Display unit

PART – B

1. Experiments on Application of 7 QC Tools as applied to Manufacturing and Service Operations.
2. Construction of control chart for variable quality characteristic using
3. Digital Motorized Multifunctional Height Gauge
4. SQC Display unit
5. SQC/SPC software
6. Construction of control chart for attribute quality characteristic
7. Construction of control charts using SYSTAT Software
8. Attribute sampling Plans – Single, Double and Multiple sampling plans.
9. Experiments on correlation and Simple linear regressions
10. Experiments on multiple linear regressions
11. Conduction of Design of Experiments – Full Factorial approach for the given quality characteristic for machining operations.
12. Exercises to demonstrate Taguchi's Orthogonal Array technique through DOE software.
13. Exercises on FMEA and Reliability
14. Exercises on QFD

Note: A minimum of 12 exercisers are to be conducted

REFERENCE BOOKS:

1. **Introduction to statistical Quality Control -** D C Montgomery - John Wiley and Sons - 3rd Edition.
2. **Quality Planning & Analysis**- J M Juran, Frank M Gryna - Tata McGraw Hill - 3rdedn.

VIII SEMESTER

SUPPLY CHAIN MANAGEMENT

Subject Code	:	17IM81	CIE Marks	:	40
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	SEE Marks	:	60

MODULE - 1

BUILDING A STRATEGIC FRAME WORK TO ANALYSE SUPPLY CHAINS: Supply chain stages and decision phase, process view of a supply chain. Supply chain flows. Examples of supply chains.Competitive and supply chain strategies.Achieving strategic fit.Expanding strategic scope. Drivers of supply chain performance. Framework for structuring drivers – Inventory, Transportation, Facilities, Information.Obstacles to achieving fit, Case discussions.

DESIGNING THE SUPPLY CHAIN NETWORK: Distribution Networking – Role, Design. Supply Chain Network (SCN) – Role, Factors, Framework for Design Decisions.

11 Hours

MODULE - 2

FACILITY LOCATION AND NETWORK DESIGN: Models for facility location and capacity allocation. Impact of uncertainty on SCN – discounted cash flow analysis, evaluating network design decisions using decision trees. Analytical problems.

PLANNING AND MANAGING INVENTORIES IN A SUPPLY CHAIN: Review of inventory concepts.,Concepts of Safety Inventory, Concept of Aggregation of Inventory, Concept of product availability.

11 Hours

MODULE - 3

SOURCING, TRANSPORTATION AND PRICING PRODUCTS: Role of sourcing, supplier – scoring & assessment, selection and contracts. Design collaboration.

Role of transportation, Factors affecting transportation decisions.Modes of transportation and their performance characteristics.Designing transportation network.Trade-off in transportation design.Tailored transportation, Routing and scheduling in transportation.International transportation.Analytical problems. Role of Revenue Management in the supply chain, Revenue management for: Multiple customer segments, perishable assets, seasonal demand, bulk and spot contracts.

11 Hours

MODULE- 4

COORDINATION AND TECHNOLOGY IN THE SUPPLY CHAIN: Co-ordination in a supply chain: Bullwhip effect. Obstacles to coordination. Managerial levers to achieve co-ordination, Building strategic partnerships.

The role of IT supply Chain, The Supply Chain IT framework, CRM, Internal SCM, SRM. The role of e-business in a supply chain, The e-business framework, e-business in practice. Case discussion.

10 Hours

MODULE-5

EMERGING CONCEPTS: Reverse Logistics, Reasons, Activities, Role.RFID Systems; Components, applications, implementation. Lean supply chains, Implementation of Six Sigma in Supply Chains.

7 Hours

SUGGESTED TEXT BOOK:

1. **Supply Chain Management – Strategy, Planning & Operation** - Sunil Chopra & Peter Meindl - Pearson Education Asia - ISBN: 81-7808-272-1. – 2001.

REFERENCE BOOKS:

1. **Supply Chain Redesign – Transforming Supply Chains into Integrated Value Systems** - Robert B Handfield, Ernest L Nichols, Jr. - Pearson Education Inc - ISBN: 81-297-0113-8. - 2002.
2. **Modelling the Supply Chain** -Jeremy F Shapiro, Duxbury - Thomson Learning – ISBN 0-534-37363. -2002.
3. **Designing & Managing the Supply Chain** -David Simchi Levi, Philip Kaminsky& Edith Simchi Levi - McGraw Hill.
4. S**upply Chain and Logistics Management** – UpendraKachuru

TOTAL QUALITY MANAGEMENT

Subject Code	:	17IM82	CIE Marks	:	40
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	SEE Marks	:	60

MODULE - 1

OVERVIEW OF TOTAL QUALITY MANAGEMENT: History of TQM. Axioms of TQM, contributions of Quality Gurus – Deming's approach, Juran,s quality trilogy, Crosby and quality treatment, Imai's Kaizen, Ishikawa;scompany wide quality control, and Fegenbaum;s theory of TQC, QFD.

10 Hours

MODULE- 2

EVOLUTION OF QUALITY CONCEPTS AND METHODS: Quality concepts. Development of four fitnesses, evolution of methodology, evolution of company integration, quality of conformance versus quality of design from deviations to weaknesses to opportunities. Future fitness's,

FOUR REVOLUTIONS in management thinking, and four levels of practice

10 Hours

MODULE - 3

FOCUS ON CUSTOMERS; Change in work concept marketing, and customers.

CONTINUOUS IMPROVEMENT: Improvement as problem solving process; Management by process, WV model of continuous improvement, process control, process control and process improvement, process versus creativity.

REACTIVE IMPROVEMENT; Identifying the problem, standard steps and tools, seven steps case study, seven QC tools.

10 Hours

MODULE– 4

PROACTIVE IMPROVEMENT: Management diagnosis of seven steps of reactive improvement. General guidelines for management diagnosis of a QI story, Discussion on case study for diagnosis of the seven

steps. Proactive Improvement; Introduction to proactive improvement, standard steps for proactive improvement, semantics, example-customer visitation, Applying proactive improvement to develop new products- three stages and nine steps.

TOTAL PARTICIPATION: Teamwork skill. Dual function of work, teams and teamwork, principles for activating teamwork, creativity in team processes, Initiation strategies, CEO involvement Example strategies for TQM introduction

10 Hours

MODULE– 5

INFRASTRUCTURE FOR MOBILIZATION: Goal setting (Vision/ Mission), organization setting, training and E education, promotional activities, diffusion of success stories, awards and incentives monitoring and diagnosis, phase-in, orientation phase, alignment phase, evolution of the parallel organization.

HOSHIN MANAGEMENT: Definition, phases in hoshin management-strategic planning (proactive), hoshin deploymentHoshin management versus management by objective,

SOCIETAL NETWORKING: Networking and societal diffusion – Regional and nationwide networking, infrastructure for networking, openness with real cases, change agents.

10 Hours

TEXT BOOKS:

1. **A New American TQM Four Practical Revolutions in Management** - Shoji Shiba, Alan Graham and David Walden – Productivity Press, Portlans (USA) -1993.
2. **Management for Total Quality** - N Logothetis- Prentice Hall of India, New Delhi - 1994.(1st Chapter)

REFERENCE BOOK:

1. **The Quality Improvement Hand Book** -Roger C Swanson - Publisher Vanity Books International, New Delhi - 1995.
2. **Total Quality Management** - Kesavan R - I K International Publishing house Pvt. Ltd – 2008.

PROFESSIONAL ELECTIVE

JUST IN TIME MANUFACTURING

Subject Code : 17IM831 CIE Marks : 40
No. of Lecture Hrs./ Week : 03 Exam Hours : 03
Total No. of Lecture Hrs. : 40 SEE Marks : 60

MODULE 1

JIT-AN INTRODUCTION: Speed of JIT movement, the new production system research association of Japan, some definitions of JIT, core Japanese practices of JIT, enabling JIT to occur, basic element of JIT, benefits of JIT.

MODERN PRODUCTION SYSTEM: Key feature of Toyota's production system, basic framework of Toyota production system. **KANBAN SYSTEM –** other types of kanban's, kanban rules, determining the number of kanban's in Toyota production system. 8 **Hours**

MODULE 2

PRODUCTION SMOOTHING IN TOYOTA PRODUCTION SYSTEM: production planning, production smoothing, adaptability to demand fluctuations, sequencing method for the mixed model assembly line

to realize smoothed production. EDP system for support of the Toyota Production system.

GLOBAL IMPLEMENTATION OF JIT: JIT in automotive industry, JIT in electronics, computer, telecommunication and instrumentation, JIT in process type industry, JIT in seasonal demand industry, other manufacturing industries, conclusion. 8 **Hours**

MODULE 3

JIT IMPLEMENTATION SURVEYS: JIT implementation in US manufacturing firms-analysis of survey results, just in time manufacturing industries, just in time production in West Germany, just in time productionin Hong Kong electronics indu8stry, conclusion.

DESIGN, DEVELOPMENT AND MANAGEMENT OF JIT MANUFACTURING SYSTEMS: plant configurations and flow analysis for JIT manufacturing, comparison of JIT's "demand pull" system withconventional "push type" planning and control systems, quality management system for JIT, product design for JIT human resource management in JIT, flexible workforce system at Toyota.
8 **Hours**

MODULE 4

SUPPLY MANAGEMENT FOR JIT: JIT purchasing-the Japanese way, some studies in JIT purchasing, experience of implementation organizations, surveys of JIT purchasing, buyer-seller relationship in JIT purchasing, Quality certification of suppliers in JIT purchasing, some problems in implementation of JIT purchasing, reduction freight costs in JIT purchasing, monitoring supplier performance for JIT purchasing, audit in JIT purchasing, implementation of JIT to international sourcing.
8 **Hours**

MODULE 5

FRAMEWORK FOR IMPLEMENTATION OF JIT: Implementation risk, risks Due to inappropriate understanding of JIT, risks due to technical, operational and people problems, risks associated with kanban system, some important activities to be performed during implementation, steps in implementation, a project work to approach to implementation, conclusion. 8 **Hours**

TEXT BOOKS:

1. **Just In Time Manufacturing** - M.G. Korgaonker – Macmillan India Ltd.- 1992

2. **Japanese Manufacturing Techniques -** Richard J. Schonberger - The Free Press – Macmillan Pub. Co., Inc. New York - 1988.

AUTOMATION IN MANUFACTURING

Course	Code	Credits	L-T-P	Assessment		Exam Duration
Automation In Manufacturing	17IM832	3	3-0-0	SEE	CIA	3 Hrs
				60	40	

Course Learning Objectives

CLO-1	To understand the concepts of automation in manufacturing systems
CLO-2	To impart the knowledge of a line balancing and assembly systems
CLO-3	To explore the idea of robotics and understand the computerized manufacturing planning
CLO-4	To gain the knowledge of automated inspection and shop floor control
CLO-5	To understand the concepts of additive manufacturing and latest trends in manufacturing

Module -1

Introduction: Production system facilities, Manufacturing support systems, Automation in production systems, Automation principles &strategies

Manufacturing Operations: Manufacturing operations, Product/production relationship, Production concepts and Mathematical models &costs of manufacturing operations. Problems on mathematical models **8 Hrs**

Module -2

Line Balancing: Methods of line balancing, Numerical problems on largest candidate rule, Kilbridge's and Wester's method, and ranked positional weights method, computerized line balancing methods.

Automated Assembly System: Design for automated assembly, types of automated assembly system, Parts feeding devices, Analysis of single and multi station assembly machines.

Module -3

Computerized Manufacture Planning and AGVS: Computer aided process planning (CAPP), Retrieval and Generative systems, and benefits of CAPP. Material requirement planning, Inputs to MRP system, working of MRP, Outputs and benefits. Automated Guided Vehicles System: Applications, Guidance and routing,

Industrial Robotics: Definition, Robot anatomy, Joints and links, Robot configurations, Robot control systems, Accuracy and repeatability, End effectors, Sensors in robotics. Industrial robot applications: Material handling, Processing, assembly and inspection. **9Hrs**

Module -4

Inspection Technologies: Automated inspection, coordinate measuring machines construction, Operation &programming, Software, application &benefits, Flexible inspection system, Inspection probes on machine tools, Machine vision, Optical inspection techniques & Non-contact Non-opticalinspection technologies.

Shop Floor Control and Automatic Identification Techniques: Shop floor control, Factory data collection system, Automatic identification methods, Bar code technology, Automatic data collection systems. An Introduction to QR Code Technology 9 **Hrs**

Module -5

Additive Manufacturing Systems: Basic principles of additive manufacturing, Slicing CAD models for AM, Advantages and limitations of AM technologies, Recent trends in manufacturing, Hybrid manufacturing.

Future of Automated Factory: Trends in manufacturing, the future automated factory, Human workers in future automated factory, Social impact.

8 Hrs

Text Books:

1. Automation, Production Systems and Computer-Integrated Manufacturing, by Mikell P Groover, 3rd Edition, 2009, PHI Learning.
2. Automation, Production Systems and Computer-Integrated Manufacturing, by Mikell P Groover, 1999, Prentice-Hall of India.
3. CAD / CAM Principles and Applications by P N Rao, 3rd Edition, 2015, TataMcGraw-Hill.
4. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, 2nd Ed. (2015), Ian Gibson, David W. Rosen, Brent Stucker
5. "Understanding Additive Manufacturing"**,** Andreas Gebhardt, Hanser Publishers, 2011

Reference Books:

1. Systems Approach to Computer-Integrated Design and Manufacturing by Dr.Nanua Singh,Wiley, 1996.
2. CAD/CAM/CIM P. Radhakrishnan, S. Subramanyan, U.Raju, New Age International Publication Revised Third Edition 2007.

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Course Outcome

After studying this course, students will be able to:

CO-1	Explain the basics of productions, automation system and manufacturing operations. Solve the simple problems on mathematical model.
CO-2	Analyze and solve problems on line balancing
CO-3	Explain CAPP and MRP system and analyze the AGVS
CO-4	Understand the inspection technologies and shop floor control
CO-5	Explain the modern trends in additive manufacturing and automated factory

LEAN MANUFACTURING

Sub Code	**17IM833**	CIE Marks	40
No. of Lecture Hrs/week	04	Exam Hours	03
Total Credits	03	SEE Marks	80

Course objectives:

1. To enable students to design a globally competitive manufacturing organization using lean manufacturing principles;
2. To develop the skills to implement lean manufacturing in industry and manage the change process to achieve continuous improvement of efficiency and productivity.

UNIT – 1

Just in time production system. JIT Logic -Pull system Japanese approach to production elimination of waste - JIT implementation requirements JIT application for job shops, Case studies

Kanban system:-Kanban rules, supplier Kanban and sequence schedule used by supplier, Monthly information & daily information. Later replenish system by Kanban sequenced withdrawal P system by sequence schedule table -problems & counter measures in applying Kanban system to subcontractors - Supplier Kanban circulation in the paternal manufacturer -structure of supplier Kanban sorting office.
10 Hours

UNIT – 2.

The rise of mass production: The rise & fall of Mass Production Mass production, work force, organization, tools, product –logical limits of mass production, Sloan as a necessary compliment to Ford. Case study:- Rouge Production Plant.

The rise of lean production: - Birth place, concrete example, company as community, Final assembly plant, product development and engineering. Changing customer demand, dealing with the customer and future of lean production 1**0 Hours**

UNIT-3
Shortening of production lead times -reduction of setup times, practical procedures for reducing setup time.
Standardization of operations.Machine layout, multi-function workers and job rotation. Improvement activities to reduce work force and increase worker morale -foundation for improvements
10 Hours

UNIT – 4

Elements o(lean production viz G M Framingharn -Toyota Takaoka Mass Production V /s lean production, diffusing lean production.

Managing lean enterprise:- Finance, Career ladders, geographic spread and advantages of global enterprise. 1**0 Hours**

UNIT – 5

Six sigma concepts: History, definitions, Statistical definitions, quality levels, Technical aspects, Six sigma for all: benefits to organizations, customers, suppliers and employers, Design for Six Sigma, DMAIC principles, DMADV principles, merits and demerits **10 Hours**

REFERENCE BOOKS:

1. **Productions and Operations Management** – ChaselAquilino - 10th Edition.
2. **Toyoto Production System -An integrated approach to Just in Time** - Yasuhiro Monden, - Engineering aild Management Press -Institute of Industrial Engineers – 1983.
3. James P Womack, Daniel T Jones, and Daniel Roos, **"The Machine that changed the World. The Story of Lean Production** -Harper Perennial edition published 1991.
4. **Quality Function Development -** James Bossert - ASQC Press 1991.
5. **Straight talk on design of experiments** - Launshy and Weese.
6. **Quality control**: Kulkarni V A &Bewoor A K, Wiley India.

AUTOMOBILE ENGINEERING

Subject Code	**17IM834**	**No. of Credits**	**: 3 - 0 - 0**
No. of Lecture Hours / Week	**: 03**	**Exam Hours**	**: 3**
Total No. Marks	**: 100**	**SEE Marks**	**: 60**
		CIE Marks	**40**

COURSE OBJECTIVES

6. To identify and name the various parts of an automobile.
7. To recognize the effects and types of Superchargers and Turbochargers.
8. To identify the various components of an Ignition System and know their functions
9. To describe the Transmission system and know the use .
10. To explain the modes of power transmission and indicate the types of braking

UNIT-1

Engine Components and Cooling & Lubrication systems: cylinder - arrangements and their relatives merits, cylinder Liners, Piston rings, connecting rod, crankshaft, valves, cooling requirements, Methods of cooling- lubrication system and Different lubrication methods.

08 Hrs

UNIT – 2.

Super Chargers And Turbochargers: Naturally aspirated engines, Forced Induction, Supercharging of SI Engines and CI Engines, Effects of supercharging on performance of the engines, supercharging limits. Methods of supercharging, Types of superchargers, Turbocharger construction and operation.

08Hrs

UNIT – 3

Ignition Systems: Introduction, Requirements of an ignition system, Battery Ignition systems components of Battery Ignition systems, magneto Ignition system- rotating armature type, rotating magnet type, Electronic Ignition system

08 Hrs

UNIT – 4

Transmission Systems: General arrangement of clutch, Principle of friction clutches, Torque transmitted, Constructional details, and Single plate, multi-plate and centrifugal clutches.

Gear Box - Principle of gear box, Sliding mesh gear box, constant mesh gear box, synchromesh gear box and Epicyclical gear box, over drives, fluid coupling and torque converters, principle of automatic transmission

08Hrs

UNIT – 5

Drive To Wheels: Propeller shaft, universal joints, differential, rear axle drives, Hotchkiss and torque tube drives, steering geometry, power steering,

Brakes: Types of brakes, Disk brakes, drum brakes, Hydraulic brakes and Air brakes, Antilock -Braking systems, purpose and operation of antilock-braking system

08Hrs

COURSE OUTCOMES:

Upon completion of this course, students should be able to:

1. Explain functions of piston and piston rings, valves, cooling system and lubrication system.
2. Differentiate between supercharger and turbocharger and their respective constructions.
3. Understand the working principles of various ignition methods used and their operations.
4. Develop the knowledge on different energy transmission systems and their applications.
5. Develop the knowledge on steering types and different braking methods.

TEXT BOOKS

1. **Automotive Mechanics**, S. Srinivasan, Tata McGraw Hill 2003.
2. **Automobile engineering**, Kirpal Singh. Vol I and II 2002.

REFERENCE BOOKS

1. **A course in I.C. Engines,** M.L. Mathur and R.P. Sharma 2001
2. **Internal Combustion Engines**, Ganeshan, Tata McGraw Hill, 2ndEdition, 2003.