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

B.E.: Industrial and Production Engineering

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 and Production Engineering

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 and Production Engineering

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	17IP51	Management and Entrepreneurship	IPE	04	-	03	60	40	100	4
2	17IP52	Work Study and Ergonomics	IPE	04	-	03	60	40	100	4
3	17IP53	Design of Machine Elements	IPE	04	-	03	60	40	100	4
4	17IP54	Hydraulics and Pneumatics	IPE	04	-	03	60	40	100	4
5	17IP55X	Professional Elective-I	IPE	03	-	03	60	40	100	3
6	17IP56X	Open Elective-I	IPE	03	-	03	60	40	100	3
7	17IPL57	Mechanical and Fluid Power Lab	IPE	-	1Hr-Instruction 2Hr-Practical	03	60	40	100	2
8	17IPL58	Work Study and Ergonomics lab	IPE	-	1Hr-Instruction 2Hr-Practical	03	60	40	100	2
TOTAL				**22**	**06**	**24**	**480**	**320**	**800**	**26**

Professional Elective-I		**Open Elective-I**	
17IP 551	Engineering Economy	17IP 561	Professional Communication and Report Writing
17IP 552	Theory of Metal Forming	17IP 562	Concurrent Engineering
17IP 553	Finite Elements Method	17IP 563	Technology Management
17IP 554	Composite Materials	17IP 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 and Production Engineering

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	17IP61	Computer Integrated Manufacturing	IPE	04	-	03	60	40	100	4
2	17IP62	Operations Research	IPE	04	-	03	60	40	100	4
3	17IP63	Tool Engineering and Design	IPE	04	-	03	60	40	100	4
4	17IP64	Materials Management	IPE	04	-	03	60	40	100	4
5	17IP65X	Professional Elective-II	IPE	03	-	03	60	40	100	3
6	17IP66X	Open Elective-II	IPE	03	-	03	60	40	100	3
7	17IPL67	CAD/CAM Lab	IPE	-	1Hr-Instruction 2Hr-Practical	03	60	40	100	2
8	17IPL68	Machine Tools Lab	IPE	-	1Hr-Instruction 2Hr-Practical	03	60	40	100	2
TOTAL				**22**	**6**	**24**	**480**	**320**	**800**	**26**

Professional Elective-II		**Open Elective-II**	
17IP651	Quality Assurance and Reliability	17IP661	Management Information Systems
17IP652	Analysis of Manufacturing Processes	17IP662	Advanced Machining Processes
17IP653	Total Quality Management	17IP663	Value Engineering
17IP654	Product Design and Manufacturing	17IP664	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 and Production Engineering

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	17IP71	Non-Conventional Machining Processes	IPE	04	-	03	60	40	100	4
2	17IP72	Operations Management	IPE	04	-	03	60	40	100	4
3	17IP73	Mechatronics	IPE	04	-	03	60	40	100	4
4	17IP74X	Professional Elective-III	IPE	03	-	03	60	40	100	3
5	17IP75X	Open Elective-III	IPE	03	-	03	60	40	100	3
6	17IPL76	Software Applications Lab	IPE	-	1Hr-Instruction 2Hr-Practical	03	60	40	100	2
7	17IPL77	CNC and Robotics Lab	IPE	-	1Hr-Instruction 2Hr-Practical	03	60	40	100	2
8	17IPP78	Project Work Phase-I + Project Seminar	IPE	-	03	--	--	100	100	2
TOTAL				**18**	**9**	**21**	**420**	**380**	**800**	**24**

Professional Elective-III		**Open Elective-III**	
17IP741	Marketing Management	17IP751	Financial Management
17IP742	Enterprise Resource Planning	17IP752	World Class Manufacturing
17IP743	Simulation Modelling and Analysis	17IP753	Product Data Management
17IP744	Automobile Engineering	17IP754	Machine Tool Design

- **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 and Production Engineering

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	17IP81	Supply Chain Management	IPE	4	-	3	60	40	100	4
2	17IP82	Facility Planning and Design	IPE	4	-	3	60	40	100	4
3	17IP83X	Professional Elective-IV	IPE	3	-	3	60	40	100	3
4	17IP84	Internship / Professional Practice	IPE	Industry Oriented		3	50	50	100	2
5	17IPP85	Project Work Phase-II	IPE	-	6	3	100	100	200	6
6	17IPS86	Seminar	IPE	-	4	-	-	100	100	1
TOTAL				**11**	**10**	**15**	**330**	**370**	**700**	**20**

Professional Elective-IV

17IP831 Just In Time Manufacturing
17IP832 Automation in Manufacturing
17IP833 Organizational Behaviour
17IP834 Advanced Joining Process and NDT

- **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&PRODUCTION ENGG.
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

1. The fundamentals of fluid mechanics, fluids and its properties.
2. An understanding of fluid statistics and hence the usage of manometers, forces on submerged bodies.
3. Study of Buoyancy, metacenter, continuity equation and different functions
4. Application of Bernoulli's equation to measure energy levels
5. Using different fluid equipment's to calculate fluid flow and using dimensional analysis to solve flow problems.
6. Understanding the phenomenon of losses during flow in pipes.
7. Study of Laminar flow and the viscous effects.
8. Evaluating the various parameters connected to flow around immersed bodies. …

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.
Course outcomes:

- After the completion of the course, a student will
- 1. examine the fundamental of fluid mechanics and fluids and apply the basic equations to find the force on submerged surfaces.
- 2. Calculate using known formula to calculate the center of buoyancy and find the velocity and acceleration.
- 3. Calculate various flow parameters using fluid flow meters and using dimension analysis to predict flow phenomena.
- 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 & PRODUCTION ENGG
B.E., III Semester,
[As per Choice Based Credit System (CBCS) scheme]

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

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

Course Objectives:

- …
- …

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

.. .

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

...

I.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.

Course outcomes:

- ..
- ..

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:

1. Thermodynamics, An Engineering Approach, YunusA.Cenegal and Michael A.Boles, Tata McGraw Hill publications, 2002
2. Engineering Thermodynamics, J.B.Jones and G.A.Hawkins, John Wiley and Sons..
3. Fundamentals of Classical Thermodynamics, G.J.VanWylen and R.E.Sonntag, Wiley Eastern.
4. An Introduction to Thermodynamcis, Y.V.C.Rao, Wiley Eastern, 1993,
5. B.K Venkanna, Swati B. Wadavadagi "Basic Thermod ynamics, PHI, New Delhi, 201

MECHANICAL MEAUREMENTS
INDUSTRIAL & PRODUCTION ENGG
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:

- …
- …

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.

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:

- ..
- ..

Text Books:

1. Mechanical Measurements, Beckwith Marangoni and Lienhard, Pearson Education, 6th Ed., 2006.
2. Engineering Metrology, R.K. Jain, Khanna Publishers, 1994.

Reference Books:

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

MECHANICS OF MATERIALS
INDUSTRIAL & PRODUCTION ENGG
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			

Course Objectives:

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

.. .

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:

- At the end of this course students will be able to:
- 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.
- Determine different stresses induced in cylinders carrying fluids at a pressure.
- Explain the phenomena of torsion in circular shafts and determine the power transmitted by solid and hollow circular shafts.
- Explain the concept of buckling in columns and be able to compute buckling load using Euler's and Rankine's equations.
- Explain the concept of bending in beams and determine the shear force and bending moment in beams subjected to different types of loads.
- 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
2. 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 & PRODUCTION ENGG
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

Course Objectives:

- …
- …

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:

- To understand various processes carried out in Foundry.
- To understand about ingredient of sand and types of Sand. • To understand various specialized casting process.
- To understand the principles, advantage, application and limitation of various type of joining process.
- 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:

1. "Manufacturing Process-I", Dr.K.Radhakrishna, Sa pna Book House,5th Revised Edition 2009.
2. "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.
2. "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 & PRODUCTION ENGG
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:

- …
- …

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

Course outcomes:

- ..
- ..

METALLOGRAPHY AND MATERIAL TESTING LAB

INDUSTRIAL & PRODUCTION ENGG

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:

- …
- …

PART – A

1. 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.
2. Heat treatment: Annealing, normalizing, hardening and tempering of steel. Hardness studies of heattreated samples.
3. To study the wear characteristics of ferrous, non-ferrous and composite materials for different parameters.
4. 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

1. Tensile, shear and compression tests of metallic and non metallic specimens using Universal Testing Machine
2. Torsion Test
3. Bending Test on metallic and nonmetallic specimens.
4. Izod and Charpy Tests on M.S,C.I Specimen.
5. Brinell, Rockwell and Vickers's Hardness test.
6. Fatigue Test.

- ..
- ..

COMPUTER AIDED MACHINE DRAWING
INDUSTRIAL & PRODUCTION ENGG
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 Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

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: • .. • ..
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 & PRODUCTION ENGG
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**

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
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Total Number of Lecture Hours	**50 (10Hours per Module)**	**Exam Hours**	**03**

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: • .. • ..
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 & PRODUCTION ENGG
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 & 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:

- .Course Outcomes
- To understand Tool Nomenclature, different types of machine tools , types, applications and operations
- Ability to understand failure criteria, heat generation and selection ofcutting fluids.
- To understand the tool life of different cutting tool materialsandIndexing in milling machine.
- To understand the working of shaping and grinding.
- 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 & PRODUCTION ENGG
B.E., IV Semester Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17IM/IP45**	**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 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
- To distinguish between steady and non-steady types of diffusions
- To appreciate the significance and construction of phase diagrams
- To construct the iron carbon equilibrium diagram and identify different phases
- 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:

- .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.
- ..

Text Books:

1. William D Callister, "An Introduction -Material' s Science and Engineering", John Wiley and Sons India Pvt Ltd., 6th Edition, 2006 New Delhi.
2. Smith -Foundation of Material Science and Engineering, 3rd Edition, McGraw Hill, 1997.
3. Donald R Askland, Pradeep.p.phule -Essentials of Materials for Science and Engineering, Thomson Engineering, 4th edition 2003.

Reference Books:

1. V Raghavan -Physical Metallurgy, Principles and Practices, PHI, 2nd Edition 2006, New Delhi.
2. H. Van Black and Addison -Elements of Material Science and Engineering, Wesley Edition,1998.
3. James F Shackelford -Introduction to Material Science for Engineering, 6th edition 4. Pearson Prentice hall, New Jersey,2006.

CAD/CAM
INDUSTRIAL & PRODUCTION ENGG
B.E., IV Semester
[As per Choice Based Credit System (CBCS) scheme]

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

Course Code	**17IM/IP46**	**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

Course Objectives:

To provide the student to

1. know the fundamentals of CAD
2 information regarding various CAD hardware
3 understand the fundamentals of CAM
4 programming concepts in CNC
5 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

1. understand the concepts of CAD and the required hardware
2 understand CAM and CNC machines
3 program CNC machines
4 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.

MACHINE SHOP

INDUSTRIAL & PRODUCTION ENGG

B.E., III/IV Semester

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

Course Code	**17IML/IPL47A/47B**	**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:

- ..
- ..

METROLOGY AND MEAUREMENTS LAB

DUSTRIAL & PRODUCTION ENGG

B.E., III/IV Semester

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

Course Code	**17IML/IPL48A/48B**	**CIE Marks**	**40**
Number of Lecture	**03=(1 Hour Instruction + 2 Hours**	**SEE Marks**	**60**

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

Hours/Week	**Laboratory)**		
RBT Levels	**L1, L2, L3**	**Exam Hours**	**03**
Credits – 02			

Course Objectives:

- …
- …

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
    a. Lathe tool Dynamometer
    b. 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:

- ..
- ..

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

MANAGEMENT AND ENTREPRENEURSHIP

SEMESTER – V

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

CREDITS – 04

Course Objectives:

1. To learn the basic concepts of Computer Integrated Manufacturing and the benefits that can be achieved by integrating . technology with manufacturing systems.

2. To have a fundamental knowledge of CNC Machine Tools.

3. To imbibe the basic knowledge of Robotics and their application to production

4. To develop the fundamental skill sets in CNC Programming

5. To inculcate the fundamental knowledge CIM, Group Technology and Flexible Manufacturing.

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 a science, art of profession - Management & Administration - Roles of Management, Levels of Management, Development of Management Thought - early management approaches - Modem management approaches. **PLANNING:** Nature, importance and purpose of planning process Objectives - Types of plans (Meaning Only) - Decision making Importance of planning - steps in planning & planning premises - Hierarchy of plans	**10 Hours**	**L1, L2, L3**
Module -2 **ORGANIZING AND STAFFING:** 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 Ordination. Meaning and steps in controlling - Essentials of a sound control system - Methods of establishing control	**10 Hours**	**L1, L2,L3**
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 t; Entrepreneur ship in India; Entrepreneurship - its Barriers.	**10 Hours**	**L2, L3, L4**

Module -4 **SMALL SCALE INDUSTRIES:** Definition; Characteristics; Need and rationale; Objectives; Scope; role of SSI in Economic Development. Advantages of SSI Steps to start and SSI - Government policy towards SSI; Different Policies of SSI; Government Support for SSI during 5 year plans. Impact of Liberalization, Privatization, Globalization on SSI Effect of WTO/GA TT 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 **INSTITUTIONAL SUPPORT:** 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; Guidelines by Planning Commission for Project report; Network Analysis; Errors of Project Report; Project Appraisal. Identification of business opportunities: Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study.	**10 Hours**	**L2, L3**

Course Outcomes :

After studying this course, students will be able to:

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

Graduate Attributes :

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

Text Books:

1.Principles of Management – P. C.Tripathi, P.N. R eddy – Tata McGraw H ill,

2.Dynamics of Entrepreneurial Development & Management Vasant Desai - Himalaya Publishing House

3.Entrepreneurship Development – Poornima. M. Charant imath Small Business Enterprises - Pearson Education - 4006 (2 & 4).

Reference Books:

2. Management Fundamentals - Concepts, Application , Skill Development - Robers Lusier - Thomson
3. Entrepreneurship Development - S.S.Khanka - S.Chand & Co.
4. Management - Stephen Robbins - Pearson Education/PHI - 17th Edition, 4003.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

WORK STUDY AND ERGONOMICS

SEMESTER – V

Course Code	**17IM/IP52**	**IA Marks**	**40**
Number of Lecture Hours/Week	**04**	**Exam Hours**	**03**
Total Number of Lecture Hours	**50**	**Exam Marks**	**60**

CREDITS – 04

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.

Modules	Teaching Hours
Module -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**
Module -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, conducting study with problems	**12 Hours**

Module -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	**08 Hours**
Module -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 activity. Cognitive: mental processes, such as perception, memory, reasoning, and motor response, mental workload, and decision-making. Organizational ergonomics: 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**
Module -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 :

After studying this course, students will be able to:

6. Recollect the basic concepts of productivity, work content and work study and definethe objective and scope of Work Study.
7. 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.
8. 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
9. Determine the basic concepts of Ergonomics and demonstrate a sound knowledge of Ergonomics in engineering applications.
10. Demonstrate a sound knowledge of Man-Machine Interfaces and design of displays and controls in engineering systems

Text Books:

- **Introduction to Work Study** – ILO, 4 th edition 1992
- **Mark. S. Sanders and Ernest. J McCornick**. "Human Factor in Engineering and Design", McGraw-Hill Book Co., Inc., New York, 1993

Reference Books:

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

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CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

DESIGN OF MACHINE ELEMENTS

SEMESTER – V

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

CREDITS – 04

Modules	**Teaching Hours**
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.	**08 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.	**08 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. re lay circuit	**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. **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.	**10 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, Laughlin Schaums - Outline Series - 4002.
5. Elements of Machine Design - N. C. Pandey and C. S. Shah – Chorotar Publishing house – 4002.

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CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

HYDRAULICS and PNEUMATICS **SEMESTER – V**			
Course Code	**17IM/IP54**	**IA Marks**	**40**
Number of Lecture Hours/Week	**04**	**Exam Hours**	**03**
Total Number of Lecture Hours	**50**	**Exam Marks**	**60**
CREDITS – 04			

Course Objectives:

1. To Study the fundamentals of Hydraulic Power Pumps, Actuators and Motors.

2.To develop a sound knowledge of control components in Hydraulic Systems.

3.To have basic skills to design Hydraulic Circuits and analyze them.

4.To acquire the fundamental knowledge on pneumatic control.

5.To develop skill sets to handle Pneumatic Actuators , Valves, Pneumatic circuits and logic circuits

Modules	**Teaching Hours**

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.	**08 Hours**
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.	**12 Hours**
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, design for the operation of solenoid directional control valve- single and double solenoid relay circuit	**08 Hours**

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.	**08 Hours**
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.	**08 Hours**
COURSE OUTCOMES: Upon successful completion of this course, the students will be able to 1. Recall the basic concept of fluid mechanics; identify different components of hydraulic system. 2. Analyze the requirement of control components and their selection.	

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CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

ENGINEERING ECONOMY **SEMESTER – V**			
Course Code	**17IM/IP551**	**IA Marks**	**40**

Number of Lecture Hours/Week	**04**	**Exam Hours**	**03**
Total Number of Lecture Hours	**50**	**Exam Marks**	**60**

CREDITS – 04

Course Objectives:

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

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

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

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

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

Modules	Teaching Hours
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.	**10 Hours**

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 Hours**
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.	**10 Hours**
Module -4 **Depreciation:** Introduction, methods of depreciation, problems. **Replacement Analysis**: Reasons- Deterioration, obsolescence, inadequacy, replacement criteria problems	**10 Hours**
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 Hours**
Course Outcomes : After studying this course, students will 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:

- **Engineering economy** – Riggs J.L., McGraw Hill, 4002.
- **Engineering economy** – Paul Degarmo, Macmillan Pub, Co., 4001

Reference Books:

- **Engineering Economy** – NVR. Naidu, KM Babu and G.Rajendra, New Age Inte rnational Pvt. Ltd., 4006.
- **Industrial Engineering and Management** - O.P Khanna, DhanpatRai and Sons, 4000.
- **Financial Management** – I M Pandey, Vikas Publishing House, 4002.
- **Engineering Economy** – Theusen. G. PHI, 4002.

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CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

THEORY OF METAL FORMING
SEMESTER – V

Course Code	**17IM/IP552**	**IA Marks**	**40**
Number of Lecture Hours/Week	**03**	**Exam Hours**	**03**

Total Number of Lecture Hours	**40**	**Exam Marks**	**60**
CREDITS – 04			

Modules	**Teaching Hours**
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.	**09 Hours**
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.	**08 Hours**
Module -3 **Extrusion & drawing of rods, wires and tubes** Types of extrusion processes. Metal flow pattern in extrusion. Extrusion equipments 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	**08 Hours**

required. Maximum possible reduction in drawing. Tube drawing using different types of mandrels, residual stresses and defect in drawn products. .	
Module -4 **Sheet metal working, sheet metal drawing** Classification of sheet metal working and equipments used, Blanking and Piercing operation – Die desig n, cutting force required, slitting, trimming and shaving operations. Bending operation – Types of be nding. Bend angle, bend radius, bend allowance 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.	**08 Hours**
Module -5 High Energy Rate Forming (HERF) Introduction, advantages, limitations and applications of HERF: Process description, parameters of Explosive forming, Electro discharge forming, Electromagnetic forming and Electro Hydraulic Forming. Newer forming processes: laser beam and plasma arc. Die less forming of sheet	**07 Hours**

Text Books:

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

Reference Books:

2. Materials and Processes in Manufacturing – E.Paul, DeGarmo etal - 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

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

FINITE ELEMENT METHODS
SEMESTER – V

Course Code	**17IM/IP553**	**IA Marks**	**40**
Number of Lecture Hours/Week	**03**	**Exam Hours**	**03**
Total Number of Lecture Hours	**40**	**Exam Marks**	**60**

CREDITS – 04

Course Objectives:

CO1: Basic fundamentals of continuum and structural mechanics and numerical Technique.

CO2: Finite Element Method (FEM) as a Numerical Technique for engineering analysis of continum and structures using variational and weighted residual approaches.

CO3: Finite element formulation for one, two and three dimensional continuum and structural mechanics problems subjected to static, thermal and dynamic loads

CO4: Solving continuum and structural mechanics problems using finite element method..

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

Modules	Teaching Hours
Module -1 Introduction. General description 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.Numerical integration : 1, 2 and 3 gaussian point for 1D and 2D cases.	**08 Hours**
Module -2 Principle of virtual work, principle of minimum potential energy, Raleigh's Ritz method. Direct approach for stiffness matrix formulation of bar element. Galerkin's method. Interpolation Models: Interpolation polynomials- Linear, quadratic and cubic. Shape functions Iso-parametric, Sub parametric and Super parametric elements and Jacobian matrix.	**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 stiffness matrix. Numerical problems of beams carrying concentrated, UDL and linearly 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 governing equations. Functional approach for heat conduction. Galerkin's approach for heat conduction. 1D heat transfer in thin fins. .	**08 Hours**

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

Text Books:

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

Reference Books:
1."Finite Element Methods for Engineers" U.S. Dixit, Cengage Learning, 4009

2.Concepts and applications of Finite Element Analysis, R.D. Cook D.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 International Edition.

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CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

COMPOSITE MATERIALS
SEMESTER – V

Course Code	**17IM/IP554**	**IA Marks**	**40**
Number of Lecture Hours/Week	**03**	**Exam Hours**	**03**
Total Number of Lecture Hours	**40**	**Exam Marks**	**60**

CREDITS – 04

Modules	**Teaching Hours**

Module -1 **Introduction to composite materials** Definition, classification and characteristics of composite materials: Fibrous, laminate, particulate, flake composites. 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.	**09 Hours**
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.	**07 Hours**
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's ratio's. Numerical problems.	**08 Hours**
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. .	**08 Hours**

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. .	**08 Hours**

Text Books:

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

Reference Books:

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

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CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

OPEN ELECTIVES

PROFESSIONAL COMMUNICATION AND REPORT WRITING

SEMESTER – V			
Course Code	**17IM/IP561**	**IA Marks**	**40**
Number of Lecture Hours/Week	**03**	**Exam Hours**	**03**
Total Number of Lecture Hours	**40**	**Exam Marks**	**60**

CREDITS – 04

Course Objectives:

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

Modules	Teaching Hours
Module -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**
Module -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	**08 Hours**

persuasive communication.	
Module -3 **Written communication:** Writing style, importance of writing skills, books review and its importance**.** **Letter writing:** Personal correspondence, formal and informal letters, official and Semi 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**
Module -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**
Module -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. .	**08 Hours**
Course Outcome:On completion of the course the student will be	

1.Make effective presentations.
2.Demonstrate good skills in handling oral communication.
3.Comfortably draft letters and reports for various agencies and stakeholders.
4.Handle meetings and interviews from both the sides.
5.Comfortably handle conflict situations and resolve the same through effective communication

Text Books:

- **Effective Communication-** Made Simple Series, Rupa and co., 1985.
- **Urmila raj and S.M Rai**, Business Communication, Himalaya publishing house, 1989.
- **S. Krishnamurthy Ithal**, Expository English.

Reference Books:

4. **Cheryl Hamilton and parker,** Communication for Results, Macmillan publication, 1986.
5. **Bill scoot**, The Skill of Communicating for Professional Engineers, Thomas Telford Ltd., London.
6. **Gartside Pitman**, Modern Business Correspondence,4th edition,1986.
7. **EM Mc Grathh**, Basic Managerial Skill for All, 3rd Edition, Prentice- hall of India, 1986.
8. **Houp and pearsall**, Reporting Technical Information, 5th edition, MacMillan, 1986.

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CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

CONCURRENT ENGINEERING

SEMESTER – V

Course Code	**17IM/IP562**	**IA Marks**	**40**
Number of Lecture Hours/Week	**03**	**Exam Hours**	**03**
Total Number of Lecture Hours	**40**	**Exam Marks**	**60**

CREDITS – 04	
Modules	**Teaching Hours**
Module -1 **MANUFACTURING COMPETITIVENESS**: Review, Product and Services, Process and Methodologies, performance, the need for change, Sequential versus concurrent Engg. **PROCESS REENGINEERING:** Managing change, Reengineering approaches, Enterprise models, concurrent process reengineering.	**08 Hours**
Module -2 **CONCURRENT ENGINEERING:** Introduction, Basic principles, components of CE models.	**08 Hours**
Module -3 **CONCURRENT ENGINEERING ORGANIZATIONS:** Benefits, cooperative concurrent teams, Types of CE organisations. **SYSTEM ENGINEERING***:* Introduction, System thinking, System complexity, System Integration, Angle virtual company	**08 Hours**

Module -4 **INFORMATION MODELLING:** Methodology, foundation of information modelling. **C. E. PROCESS:** Concurrent engineering process invariant enterprise model class, product mode class, cognitive models..	**08 Hours**
Module -5 **CE METRICS FOR IT:** Based manufacturing – process efficiency metrics, P rocess effectiveness metrics. .	**08 Hours**

Text Books:

· **Concurrent Engineering Fundamentals** - Prasad. B – Integrated Product and process organi zation Vol. 1 & 2, Prentice Hall Englewood, Cliffs, New Jersey -1996.

2. Concurrent Engineering - Hartely R John– Shortening lead times, raising qual ity & Lowering costs, Productivity press, Portland, Oregon -1992

Reference Books:

Concurrent Engineering - Carter DE & Baker BS, - The product development environment for the 1990's. Addison – Wesley Publishin g 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

SEMESTER – V

Course Code	**17IM/IP563**	**IA Marks**	**40**
Number of Lecture Hours/Week	**03**	**Exam Hours**	**03**
Total Number of Lecture Hours	**40**	**Exam Marks**	**60**

CREDITS – 04

Course Objectives:

COURSE OBJECTIVES:

1. To understand the fundamentals Concepts of Technology
2. To apply the economics of technology to real world problems
3. To Analyze & adopt the Technology for Service and Manufacturing sectors.

Modules	**Teaching Hours**
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 of classification of technology, Scale of technology information, Levels of technology, Technology portfolios, Technology as an environment.	**08 Hours**
Module -2 **THE NATURE OF TECHNOLOGICAL CHANGE**: Introduction, Meaning of	**08 Hours**

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.	
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. .	**08 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.	**08 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.	**08 Hours**

Course Outcome:On completion of the course the student will be 1.Make effective presentations. 2.Demonstrate good skills in handling oral communication. 3.Comfortably draft letters and reports for various agencies and stakeholders. 4.Handle meetings and interviews from both the sides. 5.Comfortably handle conflict situations and resolve the same through effective communication
Text Books: **1. The Management of Technology Perceptions & Opportunities** - Paul Lowe -Chapman & Hall, London - 1995.
Reference Books: & **Strategic Management of Technology** -Frederick Betz - McGraw- Hill Inc -1993. & **Management of Technology & Innovation competing Through Technological Excellence** - Rastogi P.N - Sage Publications – 1995. & **Mastering the dynamics of innovation** – J Utterba ck

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

HUMAN RESOURCE MANAGEMENT **SEMESTER – V**			
Course Code	**17IM/IP564**	**IA Marks**	**40**
Number of Lecture Hours/Week	**03**	**Exam Hours**	**03**

Total Number of Lecture Hours	**40**	**Exam Marks**	**60**
CREDITS – 04			
Course Objectives:			
COURSE OBJECTIVES: 1. To understand the fundamentals Concepts of Technology 2. To apply the economics of technology to real world problems 3. To Analyze & adopt the Technology for Service and Manufacturing sectors.			
Modules			**Teaching Hours**
Module -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 Hours**
Module -2 **RECRUITMENT:** Sources of Man power, Advertisement, Short Listing of Candidates calling Candidates for selection Process. **SELECTION:** Selection procedure – Written Test, Group Discussion. Interview – Different methods, advantages and limitations, Psychological testing – Advantages and limitations, Induction procedure, transfers, promotion, exit interview, (Tutorial on written test, Group Discussion, Interviews)			**09 Hours**
Module -3 **TRAINING AND DEVELOPMENT:** Identification of Training needs, Training Evaluation, Training Budget, Executive Development – Different Approaches, Non-executive development – Different methods.			**10 Hours**

PERFORMANCE APPRAISAL: Components (all round performance appraisal), Methods. Advantages and limitations of different methods, Personal Counselling based on Annual Confidential Reports.	
Module -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.	**06 Hours**
Module -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 of inquiry, Industrial tribunal, Adjudication.	**06 Hours**

Text Books:

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

Reference Books:

10. **Personnel / Human resource Management** – Decenoz and robbins- PHI - 4002
- **Industrial Relations** – Arun Monappa – TMH - ISBN – 0-07-451710-8.
- **Human Resources Management** – VSP Rao
- **Human Resources Management** – Ravi Dharma Rao

SCHEME OF TEACHING AND EXAMINATION 2017

MECHANICAL AND FLUID POWER LAB

Subject Code : 17IPL57	IA Marks : 40
No. of Lab Hours./ Week : 03	Exam Hours : 03
Total No. of Lab Hours : 42	Exam Marks : 60

PART – A

FLUID POWER LAB

5. a) Study of components of Hydraulic circuit.
   Study of symbols for components in hydraulic circuits.
6. Testing of Pump.
7. Testing of Flow Control Valve.
8. Speed control of Piston in Forward and Return stroke with Meter in Meter out circuit.
9. Study of Regenerative circuit and study of Bleed of circuit.
10. Study of Variation of Flow with pressure and with throttle.
11. Building of Circuits using different kinds of Valves.

PART - B

MECHANICAL ENGINEERING LAB

(At least Four experiments)

- Determination of viscosity of lubricating oil using Redwoods and Saybolts – Viscometers.
- Flash and Fire point of given oil
- Performance Tests on Four stroke Petrol and Diesel Engines, Calculations of IP, BP, thermal efficiencies, SFC, FP and heat balance sheet.
- Multi cylinder petrol / diesel engine (Morse test).
- Performance test on Centrifugal or Reciprocating pumps.
- Study of flow through pipes for fluid transport.

Note: A minimum of 12 exercisers are to be conducted

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SCHEME OF TEACHING AND EXAMINATION 2017

WORK STUDY AND ERGONOMICS LAB

Subject Code : 17IML/IPL58	IA Marks : 40
No. of Lab Hours./ Week : 03	Exam Hours : 03
Total No. of Lab Hours : 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

7. Effect of Noise, Light, Heat on human efficiency in work environments.

REFERENCE BOOKS:

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

VI SEMESTER

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CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

COMPUTER INTEGRATED MANUFACTURING **SEMESTER – VI**			
Course Code	**17IP61**	**IA Marks**	**40**
Number of Lecture Hours/Week	**04**	**Exam Hours**	**03**
Total Number of Lecture Hours	**50**	**Exam Marks**	**60**
CREDITS – 04			

Course Objectives:

1. To learn the basic concepts of Computer Integrated Manufacturing and the benefits that can be achieved by integrating technology with manufacturing systems.
2. To have a fundamental knowledge of CNC Machine Tools.
3. To imbibe the basic knowledge of Robotics and their application to production
4. To develop the fundamental skill sets in CNC Programming
5. To inculcate the fundamental knowledge CIM, GroupTechnology and Flexible Manufacturing.

Modules	**Teaching Hours**

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/CAM/CIM, **NC Technology:** NC, CNC, DNC modes, NC elements, advantages and limitations of NC and CNC.	**10 Hours**
Module -2 **CNC Machine Tools:** Turning tool geometry, milling tooling systems, tool presetting, ATC, work holding, CNC machine tools, overview of different CNC machining centers, CNC turning centers..	**10 Hours**
Module -3 **Introduction to Robotics:** Introduction, robot configuration, robot motions, programming the robots, robot programming languages, end effectors, work cell, control and interlock, robot sensor.	**08 Hours**
Module -4 **CNC Programming:** Steps involved in development of a part program, manual part programming-milling and turning, ISO programming in drilling, milling and turning with numerical problems**.**	**12 Hours**

Module -5 **CIM:** Computer aided process planning, computer integrated production planning system, material requirements planning, capacity planning, shop floor control. **Group Technology and Flexible Manufacturing:** Part families, part classification and coding, machine cell design and benefits of group technology, FMS work stations, planning the FMS, FMS layout configuration.	**14 Hours**

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

- Outline the use of computers and NC technology in CIM systems.
- Understand the concepts of CNC machine tool technology.
- Comprehend the applications of robots in CIM.
- Develop CNC programs for turning and milling operations.
- Plan and control the CIM systems effectively. Apply the GT and FMS in actual manufacturing practice.

Text Books:

4. **CAD/CAM Principles and Applications** – P.N. Rao, TMH, New Delhi, 4002.
5. **CAD/CAM** – Mikell P-groover, Emory W.ZimrnersJr Pearson Edu cation inc, 4003.

Reference Books:

4. **CAD/CAM/CIM**P.Radhakrishnan, S.Subramanyan, U.Raju, New Age International Publication Revised Third Edition 4007
5. **NC Machine programming and software Design**, Chno-Hwachang, Michel.A.Melkanoff, Prentice Hall, 1989.
6. **CAD/CAM**-Ibrahim Zeid, Tata McGraw Hill, 1999.
7. **Computer Aided Manufacturing**, P.N.Rao, N.K.Tewri and T.K.Kundra Tata McGraw Hill 1999.

8. **An Introduction to NC/CNC machines**, S. Vishal, 2nd edition, S.K. Kataria and Sons, 4010.

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SCHEME OF TEACHING AND EXAMINATION 2017

OPERATIONS RESEARCH

SEMESTER – VI

Course Code	**17IM/IP62**	**IA Marks**	**40**
Number of Lecture Hours/Week	**04**	**Exam Hours**	**03**
Total Number of Lecture Hours	**50**	**Exam Marks**	**60**

CREDITS – 04

Modules	**Teaching Hours**

Module -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 Hours**
Module -2 **Transportation Problem:** Formulation of transportation problem, types, initial basic feasible solution using different methods, optimal solution by MODI 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.	**10 Hours**
Module -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 Hours**
Module -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 Hours**

Module -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. **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	**10 Hours**

Text Books:

6 **Operations Research - Theory and Applications** - J K Sharma, Pearson Education Pvt Ltd., Recent edition.

7 **Operations Research -** P K Gupta and D S Hira, S Chand Publications, New Delhi, Recent edition.

Reference Books:

2. **Introduction to Operation Research** -Taha H A – PHI / Pearson Publications, Recent edition.
3. **Operations Research -** Paneerselvan, PHI

Operations Research -S.D. Sharma – Kedarnath, Ramnath & Co – Recent edition

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CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

TOOL ENGINEERING & DESIGN **SEMESTER – VI**			
Course Code	**17IP63**	**IA Marks**	**40**
Number of Lecture Hours/Week	**04**	**Exam Hours**	**03**

Total Number of Lecture Hours	**50**	**Exam Marks**	**60**
CREDITS – 04			

Modules	**Teaching Hours**
Module -1 **Introduction:** Concept, meaning and definitions of tool, tool design and tool engineering. Tools-types, classification, features & applications. **Design of Single Point Tool:** Tool Signature, Selection of Tool Angles, Design of shank section for single point tool to account for strength and rigidity. Design of Multi Point Tools – Drill, Reamers	**10 Hours**
Module -2 **DESIGN** of peripheral Milling cutters, Design of Broach. **Location and Clamping:** General principles of location, 3-2-1 Principle of Location, Principle of Radial location, General study of locating devices. General principles of clamping, Study of various Clamping devices.	**10 Hours**
Module -3 **Design of Fixtures:** Difference between a Jig and a Fixture, Design of Milling fixture, Study of other fixtures like Lathe fixture, Inspection fixture. Study of different types of Drill jigs. **Design of Gauges:** Types of gauges. Factors to be considered in the design of gauges, Design of Plug gauge, Design of Snap gauge.	**10 Hours**

Module -4 **Design of Press Tools:** A General study of Press operations. Elements of a Die, Strip layout, calculation of center of pressure. Design of Blanking Die, Design of Piercing Die, Design of Progressive Die**.**	**10 Hours**
Module -5 **Design of Forming Dies:** Study of Drawing and Bending process, Design of Drawing Die, Design of Bending Die **Tool Layout and Cam Design of Single Spindle Automats:** Classification of Automats and their applications. Tool layout and Cam design for automatic screw cutting machine..	**10 Hours**

Text Books:

1.Text book of Production Engineering – P. C. Shar ma – Chorotar Publishing house.

2.Tool Design – Donaldson and Golding – Tata McGra w Hill, New Delhi

Reference Books:

1. Fundamentals of Tool Design -ASTME

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CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

MATERIALS MANAGEMENT

SEMESTER – VI			
Course Code	**17IM/IP64**	**IA Marks**	**40**
Number of Lecture Hours/Week	**04**	**Exam Hours**	**03**
Total Number of Lecture Hours	**50**	**Exam Marks**	**60**
CREDITS – 04			

Modules	Teaching Hours
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.	**08 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**
	10 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.	
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.	**10 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.	**10 Hours**

Text Books:

1A.K. Datta., **Materials Management,** PHI Pvt. Ltd, New Delhi, 4001.

Reference Books:

1.P. Gopalakrishnan, **Handbook of Materials Management**, PHI Pvt. Ltd, New Delhi, 4002.

PROFESSIONAL ELECTIVES

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CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

QUALITY ASSURANCE & RELIABILITY

SEMESTER – VI

Course Code	**17IP651**	**IA Marks**	**40**
Number of Lecture Hours/Week	**04**	**Exam Hours**	**03**

Total Number of Lecture Hours	**50**	**Exam Marks**	**60**

CREDITS – 04

COURSE OBJECTIVES:

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

Modules	Teaching Hours
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 hidden costs. B rief 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 definition, standardized formula SPC. Process capability – Basic definition, standar dized 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 contro l X bar and S control charts with variable sample size, control charts for individual measurements, cusum chart, moving-range charts **Control Charts for Attributes:**	**10 Hours**

Controls chart for fraction non- conforming (defectives) development and operation of control chart.	
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. Deter minations 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:

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

Reference Books:

1. **Statistical Quality Control** - Grant and Leavenworth, McGraw Hill, 6th Edition
2. **The QS9000 Documentation Toolkit** - Janet L Novak and Kathleen C Bosheers," Prenctic e Hall PTR, 2nd Edition
3. **ISO 9000 a Manual for Total Quality Management** - Suresh Dalela and Saurabh, S Chand and Co. 1st Edition
4. **Total Quality Management** - Kesavan R, I.K. International, New Delhi – 4007.

ANALYSIS OF MANUFACTURING PROCESSES

SEMESTER – VI

Course Code	**17IP652**	**IA Marks**	**40**
Number of Lecture Hours/Week	**03**	**Exam Hours**	**03**
Total Number of Lecture Hours	**40**	**Exam Marks**	**60**

CREDITS – 04

Course Objective: The student will learn to

1.Understand basic manufacturing processes like casting and welding

2. Learn various aspects of different manufacturing techniques such as various casting methods, welding methods and advanced manufacturing methods.

Modules	**Teaching Hours**
Module -1 **ANALYSIS OF CASTING PROCESS:** Gating design for simple vertical gating and Bottom gating. Aspiration effect and Sprue design. Cooling and solidification of casting, rate of solidification. Riser design and placement. (Numerical Treatment). **ANALYSIS OF MACHINING PROCESS:** Estimation of torque and thrust force in drilling operation. Estimation of cutting force and thrust force and power consumption in milling operation. Estimation of tooth spacing and load estimation in Broaching. (Numerical Treatment).	**08 Hours**
Module -2	**08 Hours**

ANALYSIS OF FINISH MACHINING PROCESS: Components of grinding force. Estimation of uncut thickness, force per single grit and power consumption in grinding. Grinding wheel characteristics, wheel specification and selection, wheel life. (Numerical Treatment). **ECONOMICS OF MACHINING:** Optimization of cutting parameter for minimum cost. Optimizing cutting parameters for maximum production. Optimum cutting speed for maximum efficiency. (Numerical Treatment).SPC. Process capabil	
Module -3 **ANALYSIS OF WELDING PROCESS: S**tructure and characteristics of arc, Arc efficiency, electrical characteristics of an arc. Requirements for an arc. Welding power source. Volt-ampere characteristics of a welding power source. Process variables in submerged Arc welding, Gas Metal Arc welding. (GMAW), Shielded Arc welding (SAW). Economics of welding. (Numerical Treatment).	**08 Hours**
Module -4 **ANALYSIS OF ROLLING AND FORGING**: Assumptions in analysis of rolling. Determination of rolling pressure, roll separating forces, pressure distribution in rolling, torque and power required to drive the rolls, power loss in bearing. (Numerical Treatment). Assumptions made in open die forging of a flat strip. Determination of maximum force required for forging a strip and a disc between two parallel dies, forging of disc. (Numerical Treatment).	**08 Hours**
Module -5 **ANALYSIS OF ULTRASONIC MACHINING:** Assumptions made in analysis of material removal rate in ultrasonic machining. Calculating material removal rate in USM. Study of process parameters. (Numerical Treatment). **ANALYSIS OF ELECTRO-CHEMICAL MACHINING:** Electrochemistry of ECM process, Calculation of material removal rate. Kinematics and dynamics of the process, effect of heat and H2 Bubble generation. Study of factors affecting	**08 Hours**

the surface finish. Tool design ECM. (Numerical Treatment).	

Course Outcomes:

On completion of the course the student will be able to :

1. Understand basic manufacturing processes like casting and welding
2. Compute stresses and strains, both in-process and residual, for mechanical, thermal and thermo-mechanical processes
3. Compute temperatures and cooling trends in thermal processes
4. Effect on performance and application
5. Select the best suitable advanced manufacturing process for processing of unconventional materials employed in modern manufacturing industries

Text Books:

1. **Manufacturing Science -** Amitabh Ghosh and Ashok KumarMallik – Affiliated E ast-West Press Private Ltd.
2. **Welding Processes and Technology -** Dr.R S. Parmar – KhannaPublishers.

Reference Books:

1. **Principles of Machine tools -** Sen and Bhattacharya – Oxford IBM Publishing - 400 0.

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TOTAL QUALITY MANAGEMENT SEMESTER – VI			
Course Code	**17IP653**	**IA Marks**	**40**

Number of Lecture Hours/Week	**03**	**Exam Hours**	**03**
Total Number of Lecture Hours	**40**	**Exam Marks**	**60**
CREDITS – 04			
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Modules	**Teaching Hours**
Module -1 **OVERVIEW OF TOTAL QUALITY MANAGEMENT:** History of TQM. Axioms of TQM, contributions of Quality Gurus – Deming's approach, Juran,s quality tr ilogy, 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 na tionwide networking, infrastructure for networking, openness with real cases, change agents.	**10 Hours**
1.	

Text Books:

1.A New American TQM Four Practical Revolutions in Management - Shoji Shiba, Alan Graham and David Walden – Prod uctivity Press, Portlans (USA) -1993.

2. Management for Total Quality - N Logothetis- Prentice Hall of India, New Delhi - 1994.(1st Chapter)

Reference Books:

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 – 4008.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

PRODUCT DESIGN & MANUFACTURING

SEMESTER – VI

Course Code	**17IP654**	**IA Marks**	**40**
Number of Lecture Hours/Week	**03**	**Exam Hours**	**03**
Total Number of Lecture Hours	**40**	**Exam Marks**	**60**

CREDITS – 04

Course Objective: The student will learn to

1.Inculcate specialized knowledge and skill in production process optimization using the principles and methods of engineering analysis and design..

2.Cultivate the ability to build and implement new improved methods resulting in creation and distribution of value in operations

3.Cultivate work space design capability.

Modules	**Teaching Hours**

Module -1 **Introduction To product Design:** Asimow's Model : Definition of product Design, Design by Evaluation, Design by Innovation, Essential Factors of Product Design, Production-Consumption Cycle, Flow and Value Addition in the Production-Consumption Cycle, The Morphology of Design (The seven Phase), Primary Design phase and flowcharting , Role of Allowance **Product Design Practice And Industry:** Introduction, Product Strategies, Time to Market, Analysis of the Product, The three S's, Standardization, Renard Series (Preferred Numbers), Simplification, The designer and His Role, The Designer: Myth and Reality, The Industrial Design Organization, Basic Design Consideration, Problems faced by Industrial! Designer, Procedure adopted by Industrial Designers, Types of Models designed by Industrial Designers.	**08 Hours**
Module -2 **Review of Strength Stiffness And Rigidity Consideration In Product Design:** Principal stress Trajectories (Force – Flow Lines) , Balanced Design, Criteria and Objective of design, Material Toughness: Resilience, Designing for Uniform Strength, Tension vis-à-vis Compression. **Designing With Plastic, Rubber, Ceramics and Wood:** Approach to Design with Plastic, Plastic Bush Bearings, Gears in plastic, Fasteners in plastic, Rubber parts, Design Recommendation for Rubber parts, Distortion in Rubber, Dimensional Effects Tolerances, Ceramics and Glass parts, production Design Factors for Ceramics parts, Special Considerations for Design of Glass parts, Dimensional Factors and Tolerances, Wood. Optimum cutting speed for maximum efficiency. (Numerical Treatment).SPC. Process capability	**08 Hours**
Module -3 **Design of production – Metal Parts:** Producibility Requirements in the Design of Machine Components, Forging Design, Pressed Components Design, Casting Design for Machining Ease, The Role of process Engineer, Ease of Location and Clamping, Die Casting and Special Casting, Design for Powder Metallurgical Parts. **Optimization In Design:** Introduction, Siddal's Classification of Design Approaches, Optimization by Differential Calculus, Lagrange Multiplies, Linear Programming (Simplex Method), Geometric Programming, Johnson's Method of optimum Design.	**08 Hours**
Module -4 **Economic Factors Influencing Design:** Product value, Design for Safety, Reliability and Environmental Considerations, Manufacturing operations in relation to Design, Economic	**08 Hours**

Analysis, Profit and Competitiveness, Breakeven Analysis, Economics of a New product Design (Samuel Eilon Model). **Human Engineering Considerations In Product Design:** Introduction, Human being as Applicator of Forces, Anthropometry: Man as occupant of Space, the Design of Controls, The Design of Displays, Man/Machine Information Exchange.	
Module -5 **Modern Approaches To Product Design:** Concurrent Design, Quality Function Deployment (QFD). **Value Engineering and product Design**: Introduction, Historical perspective, What is value? Nature and Measurement of value, Maximum value, normal Degree of value, Importance of value, The value Analysis job plan, Creative, Steps to problem – solving and value Analysis, valu e Analysis Test.	**08 Hours**

Course Outcomes:

On completion of the course the student will be able to :

2. Understand the objectives of product design and the requirements of a good product design.
3. Use a systematic design process being fully aware of its benefits
4. Translate the concepts of economics in design, optimization of design and human factors approach to product design.
5. Understand and explain the methods employed in composite fabrication
6. A ppreciate the theoretical basis of the experimental techniques utilized for failure mode of composites

Text Books:

1. **Product Design and Manufacturing** - A.C. Chitale and R.C. Gupta –
2. **Product Design & Development** – Karl T. Ulrich & Steven D., Epinger

Reference Books:

1.Product Design - Kevin otto and Kristini - wood Pearson Education - 4004.

2.New product Development - Tim Jones, Butterworth Heinmam, Oxford - UIC -1997.

3.New product Development: Design & Analysis - Roland Engene Kinetovicz - John Wiley and Sons Inc., N.Y. – 1990.

4.Successful Product Design - Bill Hollins, Stwout Pugh, Butterworth - London 1990.

5.Design for Assembly, a Designer,s Hand book - Boothroyod & Dewhurst P. – University of Massachusets, Amherst - 1983.

OPEN ELECTIVES

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

MANAGEMENT INFORMATION SYSTEMS

SEMESTER – VI

Course Code	**17IM/IP661**	**IA Marks**	**40**
Number of Lecture Hours/Week	**03**	**Exam Hours**	**03**
Total Number of Lecture Hours	**40**	**Exam Marks**	**60**

CREDITS – 04

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.

Modules	**Teaching Hours**

Module -1 **Fundamentals of Information Systems:** Information systems in business, fundamentals of information systems solving business problems with information systems..	**07 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.	**09 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.	**08 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.	**08 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.	**08 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 – PHI – 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.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

ADVANCED MACHINING PROCESSES

SEMESTER – VI

Course Code	**17IM/IP662**	**IA Marks**	**40**
Number of Lecture Hours/Week	**03**	**Exam Hours**	**03**
Total Number of Lecture Hours	**40**	**Exam Marks**	**60**

CREDITS – 04

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)

Modules	Teaching Hours
Module -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.	**07 Hours**
Module -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.	**09 Hours**
Module -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.	**08 Hours**
Module -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.	**08 Hours**

Chemical Milling (Contour machining):- Process steps-masking, etching, etc. process characteristics of CHM: - material removal rate, accuracy, surface finish, application of CHM.	
Module -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.	**08 Hours**

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.

Reference Books:

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.

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VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

VALUE ENGINEERING

SEMESTER – VI

Course Code	**17IP663**	**IA Marks**	**40**
Number of Lecture Hours/Week	**03**	**Exam Hours**	**03**
Total Number of Lecture Hours	**40**	**Exam Marks**	**60**

CREDITS – 04

Modules	**Teaching Hours**

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.	**09 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.	**07 Hours**
Module -4 **VALUE ENGINEERING TECHNIQUES:** Result Accelerators or New Value Engineering	**08 Hours**

Obtimum cutting speed for maximum efficiency. (Numerical Treatment).SPC. Process capabil

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.	
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.	**06 Hours**

Text Books:

1. **Techniques of Value Analysis and Engineering**– Lawrence D. Miles, McGraw – Hill Book Company, 2nd Edn.
2. **Value engineering for Cost Reduction and Product Improvement** – M.S. Vittal, Systems Consultancy Services Edn 19 93
3. **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

SCHEME OF TEACHING AND EXAMINATION 2017

DEVELOPMENT OF ENTERPRISES **SEMESTER – VI**			
Course Code	**17IM/IP664**	**IA Marks**	**40**
Number of Lecture Hours/Week	**03**	**Exam Hours**	**03**
Total Number of Lecture Hours	**40**	**Exam Marks**	**60**
CREDITS – 03			

Modules	**Teaching Hours**
Module -1 **DEFINITION AND CONCEPT OF ENTERPRISE:** Profile of an entrepreneur-need scope and characteristics of entrepreneurs. Attitude development, creativity–stress management-positive reinforcement ..	**08 Hours**
Module -2 **METHODOLOGY OF PROJECT IDENTIFICATION: S**hort 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.	**08 Hours**

financial and environmental aspects. Optimum cutting speed for maximum efficiency.

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.	**08 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).	**08 Hours**
Module -5 **ACCOUNTING PRINCIPLES:** Conventions and concepts-balance sheet, profit and loss account. Accounting rate of return, pay back period, SSI duty practice.	**08 Hours**

Text Books:

1. **Developing Entrepreneurship -**Udai Pareek and T.V. Venkateswara Rao, – A Hand Boo k 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.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

CAD/CAM LAB

Subject Code : 17IML/IPL67	IA Marks : 40
No. of Lab Hours./ Week : 03	Exam Hours : 03
Total No. of Lab Hours : 42	Exam Marks : 60

PART – A

Modelling of simple machine parts using Graphics Package.

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

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PART - B

Modelling and Simulation of Machining process of simple machine parts using CAM packages.

Suggested Software Packages: Solid Works/ Uni Graphics/Catia and MASTER CAM or any other similar packages.

Note: A minimum of 12 exercisers are to be conducted

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017

MACHINE TOOLS LAB

Subject Code : **17IPL 68**	IA Marks : 40
No. of Lab Hours./ Week : 03	Exam Hours : 03
Total No. of Lab Hours : 42	Exam Marks : 60

PART – A

Machining of T - slot or L- slot on milling machine and Checking
Parallelism between the surfaces.
Perpendicularity between surfaces.

10. Exercise on Spur Gear cutting and Measurement of all the parameters of the gear.
11. Machining of Spiral slots on milling machine.
12. Measurement of Cutting forces, Determination of Shear angle, Chip Thickness Ratio and Verification of Merchants Angle Relationship in Turning Operation.

· Study the variation of Axial force and Torque in Drilling with respect to cutting speed and feed.

PART - B

1. A General study of Acceptance test of commonly used machine tool (Theory).
2. Test for True running of the main spindle of Lathe
3. Test for True running of the main spindle of Drill.
4. Alignment of centers in Vertical plane in Lathe.
5. Testing for true running of Headstock center of a Lathe
6. Disassembly of a) Lathe Tail Stock , b)Tool Head of a Shaper and measurement of component dimension

Note: A minimum of 12 exercisers are to be conducted

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

NON-CONVENTIONAL MACHINING PROCESSES

Sub Code	**17IP71**	IA Marks	40
No. of Lecture Hrs/week	04	Exam Hours	03
Total Lecture Hrs	50	Exam Marks	60

Course objectives:

1.The course aims in identifying the classification of unconventional machining processes.

· To understand the principle, mechanism of metal removal of various unconventional machining processes.

· To study the various process parameters and their effect on the component machined on various unconventional machining processes.

· To understand the applications of different processes.

UNIT – 1

INTRODUCTION: History, Classification, Comparison between conventional and non-conventional machining process selection.

MECHANICAL PROCESS: Ultrasonic machining (USM) : Introduction, Equipment, tool materials & tool Size, Abrasive slurry, Cutting tool system design : Magnetostriction assembly, Tool cone (Concentrator), & Exponential concentrator of circular cross section & rectangular cross section Hallow cylindrical concentrator**.** Mechanics of cutting : Effect of amplitude and frequency and vibration, Effect of grain diameter , Effect of applied static load, Effect of slurry, Tool and work material, USM process Characteristics ; Material removal rate, tool wears, Accuracy, surface finish., Applications, Advantages & Disadvantages of USM **10 Hours**

UNIT–2.

ABRASIVE JET MACHINING (AJM): Introduction, Equipment, Variables in AJM: carrier Gas Type of abrasive, 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) nozzle design shape of cut. Process characteristics – Material removal rate, No zzle wear, Accuracy & surface finish. Applications, Advantages & Disadvantages of AJM.

ELECTROCHEMICAL AND CHEMICAL METAL REMOVAL PROCESS: Electrochemical machining (ECM): Introduction, Study of ECM machine, Elements of ECM process: Cathode tool, Anode work piece, source of DC power, Electrolyte, ECM process characteristics – Material removal rate, Accuracy, Surface finish 1**0 Hours**

UNIT-3

ECM TOOLING: ECM tooling technique 7 example, Tool &insulation materials, Tool size Electrolyte flow arrangement, Handling of slug., Economics of ECM, Applications such as Electrochemical turning, Electrochemical Grinding, Electrochemical Horning, deburring, Advantages, Limitations.

CHEMICAL MACHINING (CHM): Introduction, Elements of process Chemical blanking process :- Preparation of work piece. Preparation of masters, masking with photo resists, etching for blanking, applications of chemical blanking, chemical milling (Contour machining) :- Process steps – masking, Etching, process characteristics of CHM :- material removal rate accuracy, surface finish, Hydrogen embrittlement, Advantages & application of CHM

10 Hours

UNIT – 4

EDM PROCESS: Introduction, machine, mechanism of metal removal, dielectric fluid, spark generator, EDM tools (electrodes) Electrode feed control, Electrode manufacture, Electrode wear, EDM tool design : Choice of matching operation, electrode material selection, under sizing and length of electrode Machining time.

EDM PROCESS CHARACTERISTICS: Flushing – Pressure flushing synchronized with el ectrode movement, EDM process characteristic: Metal removal rate, Accuracy surface finish, Heat affected Zone. Machine tool selection, Application: EDM accessories / applications.

1**0 Hours**

UNIT – 5

PLASMA ARC MACHINING (PAM): Introduction, equipment, generation of plasma, Mechanism of Metal removal, PAM parameters, Process characteristics.

LASER BEAM MACHINING & ION BEAM MACHINING: Introduction, metal removal mechanism, advantages and application

10 Hours

TEXT BOOKS:

1. Modern machining process - PANDEY AND SHAH - TATA Mc Graw Hill -4000.
2.Unconventional Manufacturing process – M K Singh, New age publications, ISBN 978-81-224-2244-3

REFERENCE BOOKS:

1.Production Technology - HMT - TATA McGraw Hill - 4001.
6. Thermal Metal cutting processes - B G Ranganath - I K International Publishing house Pvt. Ltd,
7. Fundamentals of Machining and Machine Tools - R.K.Singal - I K International Publishing house Pvt. Ltd.

OPERATIONS MANAGEMENT

Subject Code: **17IM/IP72** IA Marks : 40
No. of Lecture Hrs./ Week : 04 Exam 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:

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

REFERENCE BOOKS:

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

MECHATRONICS

Subject Code	:	17IP 73	IA Marks	:	40
No. of Lecture Hours./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hours.	:	50	Exam Marks	:	60

MODULE - 1

INTRODUCTION: Definition of Mechatronics, Multi-disciplinary scenario, Evaluation of Mechatronics, Objectives, Advantages & Disadvantages of Mechatronics, An Overview of Mechatronics, Microprocessor Based Controllers, Principle of Working of Automatic Camera, Automatic Washing Machine & Engine Management System.

REVIEW OF SENSORS AND TRANSDUCERS: Definition and Classification of Transducers, Definition & Classification of Sensors, Working Principle and Application of Displacement, Position & Proximity, Velocity and Motion, Force, Fluid pressure, Liquid flow, Liquid level, Temperature, Light sensors, Selection of transducers.

8 Hours

MODULE - 2

DIGITAL PRINCIPLES: Introduction, Digital Number System, Range and Weight of Binary Number System, Octal and Hexadecimal Number Systems, Conversion, BCD Number Systems, Gray Code, Boolean Algebra, Logic States, Logic Functions, More Logic Gates, Universal Gates, Exclusive-OR Gate, Combinational and Sequential Logic Circuits, Flip-Flops, Minimization of Boolean Expression, Karnaugh Map, TTL and CMOS, Memory.

MICROPROCESSOR: Intel 6085, ALU, Timing and Control Unit, Registers, Data and Address Bus, Pin Configuration, Intel 6085 Instructions, Op code and Operands, Instruction Word Size, Instruction Cycle, Fetch Operation, Execute Operation, Machine Cycle and State, Instruction and Data Flow, Timing Diagram, Timing Diagram for Op code Fetch Cycle, Memory Read, I/O Read, Memory Write, I/O Write, Instruction and Data Formats, Addressing Modes, Direct Addressing, Register Addressing, Register Indirect Addressing, Immediate Addressing, Implicit Addressing. 12 **Hours**

MODULE - 3

MICRO CONTROLLER: Introduction to microcontrollers, Intel 6051 Microcontroller Architecture and Pin diagram, Selection and Application of Microcontroller.

PLC: Programmable Logic Controllers, Basic Structure, Input/Output Processing, Programming, Mnemonics, Timers, Internal Relays and Counters, Shift Registers, Master and Jump controls, Data handling, Analogue input/output, Selection of a PLC. **8 Hours**

MODULE - 4

ACTUATORS: Definition, Classification of Actuators, Brief survey of Electromechanical actuators, Drive requirements for cutting movements, Requirements of feed drives, Calculation of drive requirements on feed motor shaft, DC motors & Control of DC motors, AC motors, DC & AC servomotors, Stepper motors- types, Characteristics, advantages, limitations and applications. **10 Hours**

MODULE - 5

SYSTEM MODELS: Mathematical models, Mechanical system building blocks, Electrical system building blocks, Fluid system building blocks, Thermal system building blocks.

12 Hours

TEXT BOOKS:

- **Mechatronics** - W. Bolton – Pearson Education Asia - 2 nd Edition, 4001.
- **Fundamentals of Microprocessor and Micro Computer** - B. Ram - Dhanpat Rai and Sons - 4th Revised Edition.

REFERENCE BOOKS:

5. **Mechatronics** Principles, Concepts and Application - Nitaigour and Premchand, Mahilik – Tata McGraw Hill - 4003.
6. **Mechatronics** by HMT - TMH.

SOFTWARE APPLICATIONS LAB

Subject Code	:	17IPL 76	IA Marks	:	40
No. of Lab Hours./ Week	:	03	Exam Hours	:	03
Total No. of Lab Hours.	:	42	Exam Marks	:	60

PART - A

11. Development of simple MIS application programs for use in :

    (i) Library, (ii) Bank, (iii) Business shop, and (iv) Hospital
12. Regression and Correlation analysis using any of the

    statistical packages.

PART -B

- Plotting Quality control chart using software packages.
- Use of software package to solve Operation Research (LPP) problems.

  Plotting appropriate charts and diagrams relevant to various industrial

applications.

Reference Book:

Lab manual prepared by the department/institution.

Suggested Software Packages: Oracle / MS SQL Server as the back-end,
and VB6.0 / Developer4000 as the front-end tools, SYSTAT and OR Packages.

Note: A minimum of 12 exercisers are to be conducted

CNC AND ROBOTICS LAB

Subject Code	:	17IPL 77	IA Marks	:	40
No. of Lab Hours./ Week	:	03	Exam Hours	:	03
Total No. of Lab Hours.	:	42	Exam Marks	:	60

PART - A

- Study of functions assigned to Alphabets and Symbols. G and M codes, grouping of codes, Assigned and Unassigned, Model and Non Model codes.

- Writing the program for Contour Milling - 4 exercises
- Writing the program using Canned Cycles, Subroutine Programs for Drilling, Reaming and Thread Cutting - 4 exercises
- Introductive concept of loop in loop program - 2 exercises.

Note:

6. The programs should be written with reference to one user manual provided by manufacture of control unit.
7. Atleast 10 programs must be simulated.

PART - B

1 Writing CNC program for Lathe - 2 exercises.

12. Exercises on Robots (only demonstration)

Study of a General Configuration of a Robot.
Study of Programming methods
Study of Overview of Robot languages.

Atleast 4 programs to be discussed with specific applications

PROFESSIONAL ELECTIVE

MARKETING MANAGEMENT

Subject Code	: 17IM/IP 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 influencing cha nge in product mix, product mix strategies, meaning of New – product; major stages in new – product de velopment, 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, s trategy, 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:

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

REFERENCE BOOKS:

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

ENTERPRISE RESOURCE PLANNING

Subject Code	:	17IM /IP742	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:

6. **Enterprise Resource Planning** - Alexis Leon - Tata Mc Graw Hill Publishing Company Ltd -1999.
7. **Enterprise Resource Planning Concept and Practice** -Vinod Kumar Garg and Venkitakrishnan - Prentice Hall, India - 2nd Edition.

REFERENCE TEXT BOOK:

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

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

SIMULATION MODELING AND ANALYSIS

Sub Code	**17IP743**	IA Marks	40
No. of Lecture Hrs/week	03	Exam Hours	03
Total Lecture Hrs	40	Exam Marks	60

Course objectives:

9. Define basic concepts of simulation modelling and replicating the practical situations in organizations.
10. Generate and test random number variates using different techniques and apply them to develop simulation models.
11. Analyse and interpret output data produced by a model, and test validity of the model.

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UNIT – 1

Introduction to Simulation: Simulation, advantages & disadvantages, Areas of application, System environment, Components of a system, Model of a system, Types of models, steps in a simulation study.

Simulation Examples: Simulation of Queuing systems, simulation of Inventory System **08 Hours**

UNIT–2.

General Principles: Concepts in discrete events simulation, event scheduling/Time advance algorithm, simulation using event scheduling.

Random Numbers: Properties, Generations methods, Tests for Random Number-Frequency test, Runs test, Gap Test, Poker Test
08 Hours

UNIT-3

Random Variate Generation: Inverse Transform Technique-Exponential, Uniform, Weibull, Triangular distributions, direct transformation for Normal and log normal Distributions, convolution methods-Erlang distribution, Acceptance – Rejection Techniqu es – Poisson distribution
08 Hours

UNIT – 4

Analysis of Simulation Data: Input Modelling: Data collection, Identification and distribution with data, parameter estimation, Goodness of fit tests, Selection of input models without data, Multivariate and time series analysis

Verification and Validation of Model – Model Building, Verification, Calibration and Va lidation of Models

Output Analysis: Stochastic Nature of output data, Measures of Performance and their estimation

08 Hours

UNIT – 5

Optimization via Simulation: Meaning, Difficulty, Robust Heuristics, Random Search Applications: Simulation of Manufacturing and Material Handling Systems, Simulation of Computer Systems

Simulation Softwares: Selection of Simulation Software, Simulation packages, Experiment and Statistical Analysis tool, Trend in Simulation Software.

08 Hours

TEXT BOOKS:

· Discrete Event system Simulation – Jerry Banks, Joh n S Carson, II, Berry L Nelson, David M Nicol - Pearson Education, Asia - III Edition, ISBN - 81-7608 – 505 - 4.

REFERENCE BOOKS:

· Systems Simulation with Digital Computer –NarsinghD eo-PHI Publication (EEE), ISBN – 0-87692-028-8.
· Simulation Modelling & Analysis – Averill M Law, W David Kelton - McGraw Hill International Editions – Industrial Engineering series, ISBN – 0-07-100603-9.
· System Simulation - Geoffrey Gordon - Prentice Hall publication, 2nd Edition, 1978, ISBN:81-403-0140-4.

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SCHEME OF TEACHING AND EXAMINATION 2017

AUTOMOBILE ENGINEERING

Subject Code	17IP744	No. of Credits	: 3 -0-0
No. of Lecture Hours / Week	: 03	Exam Hours	: 3
Total No. of Lecture Hours	: 48	Exam Marks	: 60 IA: 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.

10 Hrs

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

12 Hrs

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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

10 Hrs

COURSE OUTCOMES:

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

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

TEXT BOOKS

- **Automotive Mechanics**, S. Srinivasan, Tata McGraw Hill 4003.
- **Automobile engineering**, Kirpal Singh. Vol I and II 4002.

REFERENCE BOOKS

- **A course in I.C. Engines,** M.L. Mathur and R.P. Sharma 4001
- **Internal Combustion Engines**, Ganeshan, Tata McGraw Hill, 2ndEdition, 4003.

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CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2017
OPEN ELECTIVE

FINANCIAL MANAGEMENT

Sub Code	**17IM/IP751**	IA Marks	40
No. of Lecture Hrs/week	03	Exam Hours	03
Total Lecture Hrs	40	Exam Marks	60

Course objectives:

- To provide the concepts and foundations of managing finance in business enterprises.
- To equip students with tools and techniques for managing finance.
- 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:

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

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

REFERENCE BOOKS:

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

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

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SCHEME OF TEACHING AND EXAMINATION 2017

WORLD CLASS MANUFACTURING **SEMESTER-VII**	
Course Code : 17IM/IP752	**IA Marks : 40**
Contact Hours/Week : 03	**Exam. Hours : 03**
Total Hours: 40	**Exam. Marks : 60**
CREDITS-03	

MODULE S	**NO OF HRS**
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-ClassManufacturing,ThepracticesofWorld-Class Manufacturing-The customers Interface ,The Supplier Interface, World-Class Practices in the factory.	09
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	07
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	07

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 9000-4000, IS 14000, Frame Work for Business Excellence - Malcolm Baldridge Award, Deming's Award	09
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.	08

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

7. Understanding the need for learning the world class manufacturing setup.
8. Learn the principles and practices of world class manufacturing.
9. Determine the quality practices as applied to world class product.
10. Standard practices of quality of conformance systems.

Text Books:

· **World Class Manufacturing- A Strategic Perspective** – Sahay B S, Saxena K B C, Ashish Kumar – MacMillan India Ltd – ISBN 0333-93-4 741. (unit 1 & 2)

· **Finding and Implementing Best Practices- Business Process Benchmarking** - Champ, Robert C. – Vision Books, New Delhi – 4008.(unit 3 & 4)

· **Reengineering the corporation – A Manifesto for Bus iness revolution** – Hammer, Michael and James Champy – Nicholas Brealey Publish ing , London.- 1993(unit 5 &

6)

4. **Six sigma for Managers**- Greg Brue – TMH – ISBN- 0-07-048639- 5 -4002.(uni t 7)

Reference Books:

Design for Six Sigma –Grege – TMH – ISBN 0-07-058140. – 4003.

Design for Six Sigmain Technology and Product Development – Creveling - Pearson Education – 4008.

Total Quality Management -Dale H. Besterfield, carol Besterfield- Minchna, glen H Besterfield and Mary Besterfield scare – Pearson ed ucation – 3rd edition – ISBN 81-297-0260-6 (Part of Unit 6)

9. **Total Quality Management** – Kesavan R – I K International Publishing house P vt. Ltd – 4008

Question paper pattern:

- The question paper will have **ten** full questions carrying equal marks. Each full question consisting of **16** marks
- There will be **two** full questions from each module.
- Each full 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.

PRODUCT DATA MANAGEMENT			
Course Code	**17IP753**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

Product Data Management : Product life cycle, Complexity in Product Development, General Description of PDM Basic functionality of PDM: Information architecture, PDM System architecture, Applications used in PDM systems. Trends in PDM.

Module-2

Document Management Systems: Document management and PDM, Document life cycle, Content Management, Document management and related technologies, Document management resources on the Internet.

Module-3

Workflow Management in PDM: Structure Management, Engineering Change Management, Release Management, Version Management, Configuration Management.

Module-4

Creating Product Structures: Part centric approach, CAD centric approach, Product Structure configuration, Managing Product Structures,PDM Tools: Matrix One, TeamCenter, Windchill. Enovia, PDM resources on the Internet.

Module-5

PDM Implementation Case Studies: Sun Microsystems, Inc., Mentor Graphics Corporation, Ericsson Radio Systems AB, Ericsson Mobile Communications AB, ABB Automation Technology Products, SaabTech Electronics AB.

Course outcomes:

At the end of the course the student will be able to:

1. Explain the concepts, tools and techniques for managing product data.
2. Analyze various processes in the product data management frameworks.
3. Evaluate risks in large and complex workflow management environments.
4. Develop product data management plans for various types of organizations.
5. Understand the PDM and ABB technologies.

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from each module.

Reference Books

(1)Implementing and Integrating Product Data Management and Software Configuration Management - 20 - IvicaCmkovic Ulf Asklund
- AnnitaPerssonDahlqvist - ArchtechHousePublishers.

(2)Product Data Management - Rodger Burden - Publisher: Resource Publishing- ISBN-10: 0970035225, ISBN-13: 978-0970035226 –2003.

(3)The AutoCAD Database Book – Accessing and Managing CAD Drawing Information- Galgotia Publications – Third Edition.

MACHINE TOOL DESIGN

Subject Code	:	17IP754	IA Marks	:	40
No. of Lecture Hours./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hours.	:	40	Exam Marks	:	60

MODULE - 1

Principles of Machine Tool Design: General requirements of machine tool design - design process machine tool layout general requirements of machine tool design – design process machine tool layout.

Machine Tool Drives and Mechanisms: Working and auxiliary motion, Drives – Electric dr ives, Hydraulic transmission, Kinematic structure, Regulation of speed and feeds, stepped regulation, standardization of speed and feed, Stepless regulation of speeds and feeds. **8 Hours**

MODULE - 2

Cutting Force Analysis and Power Requirement: Turning, Milling, Drilling, Shaping and Broaching operation with simple problems, and General requirements of machine tools – Centre lathe, Milling machine.

Design of Machine Tool Structures: Functions – Requirements – Design criteria Materia l used – static and dynamic stiffness – Profile and basic design procedure for machine tool structures. Design of beds, columns, housing, bases, tables, cross-rails, arms saddle, carriages. **8 Hours**

MODULE- 3

Design of Guide Ways and Power Screws: Function and types of guide ways – Design and lubr ication of slide ways – aerostatic slide ways – ant ifriction guide ways, combination guide ways – protecting devices, design of power sc rews

Design of Spindle and Spindle Bearings: Functions – Requirements and materials for spindle compliance and machining accuracy, Design of spindles, antifriction bearing, Hydrodynamic and Hydrostatic bearing **8 Hours**

MODULE- 4

Dynamics of Machine Tools: Concept of dynamic cutting process, Physical causes of chatter and vibrations, Types of Chatter, chatter vibration in Lathe, Drilling machine, Grinding machine and Milling machine, **8 Hours**

MODULE - 5

Control Systems in Machine Tools: Functions, requirements and classification, Control system for speed and feeds centralized control, pre selective control, Control system for forming and auxiliary motions

8 Hours

TEXT BOOKS:

- **Machine Tool Design** - N. K. Mehta – Tata McGraw Hill - 4001.
- **Principles of Machine tools** - Sen and Bhattacharya **–** Oxford IBM Publishing - 4000.

REFERENCE BOOKS:

- **Machine Tool Design Volume** - N. Acharkan – MIR Publications - II and III - 40 00.
- **Design of Machine Tools** - S. K. Basu and D. K. Pal – 4000.

SUPPLY CHAIN MANAGEMENT

Subject Code	:	17IM/IP81	IA Marks	:	40
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam 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, In formation. Obstacles to achieving fit, Case discussions.

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

11 Hours

MODULE - 2

FACILITY LOCATION AND NETWORK DESIGN: Models for facility location and capacity allocation. Impact of uncertainty on SCN – discounted cash f low 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:

3. **Supply Chain Management – Strategy, Planning & Oper ation** - Sunil Chopra & Peter Meindl - Pearson Education Asia - ISBN: 81-7608-272-1. – 4001.

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. - 4002.
3. **Modelling the Supply Chain** -Jeremy F Shapiro, Duxbury - Thomson Learning – IS BN 0-534-37363. -4002.
4. **Designing & Managing the Supply Chain** -David Simchi Levi, Philip Kaminsky & Edith Simchi Levi - Mc Graw Hill.
5. S**upply Chain and Logistics Management** – Upendra Kachuru

FACILITY PLANNING AND DESIGN

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

Subject Code	17IM/IP82	No. of Credits	: 3 -0-0
No. of Lecture Hours / Week	: 03	Exam Hours	: 3
Total No. of Lecture Hours	: 48	Exam Marks	: 60

COURSE OBJECTIVES

- & To know the importance of location, layouts and material handling
- & To know and distinguish between different approaches to layout and draw activity relationship chart
- & To compute space requirement and demonstrate skills in area allocation and construct the layout.
- & To examine the quantitative approaches to facility planning and identify the different models.
- & 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 exercises on 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.

08 Hours

COURSE OUTCOMES:

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

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

TEXT BOOKS

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

REFERENCE BOOKS

· **Practical layout** – Muther Richard -Mc Graw Hill-1956.
· **Plant layout design** – James.M Moore, Mac Millon co.1962.
· **Facilities design –** Sunderesh Heragu, PWS publishing company-ISBN-0-534-95183, August 4008
· **Facilities planning –** Tompkins white –wiley India Pvt ltd 3rd edition.
· **Facility Layout and Location**, Richard L Francies. 2nd Edition PHI learning Pvt. Ltd

PROFESSIONAL ELECTIVE

JUST IN TIME MANUFACTURING

Subject Code : 17IM/IP831 IA Marks : 40
No. of Lecture Hrs./ Week : 03 Exam Hours : 03
Total No. of Lecture Hrs. : 40 Exam Marks : 60

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
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SCHEME OF TEACHING AND EXAMINATION 2017

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 production in 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" sy stem with conventional "push type" planning and con trol 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:

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

· **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	17IM/IP832	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 meth od, 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.

8 Hrs

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. **9 Hrs**

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:

6. Automation, Production Systems and Computer-Integrated Manufacturing, by Mikell P Groover, 3rd Edition, 4009, PHI Learning.
7. Automation, Production Systems and Computer-Integrated Manufacturing, by Mikell P Groover, 1999, Prentice-Hall of India.
8. CAD / CAM Principles and Applications by P N Rao, 3rd Edition, 4015, TataMcGraw-Hill.
9. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, 2nd Ed. (4015), Ian Gibson, David W. Rosen, Brent Stucker
10. "Understanding Additive Manufacturing" **,** Andreas Gebhardt, Hanser Publishers, 4011

Reference Books:

9. Systems Approach to Computer-Integrated Design and Manufacturing by Dr. Nanua Singh,Wiley, 1996.
10. CAD/CAM/CIM P. Radhakrishnan, S. Subramanyan, U.Raju, New Age International Publication Revised Third Edition 4007.

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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

ORGANIZATIONAL BEHAVIOR

Subject Code	**: 17IP833**	**No. of Credits**	**: 3 -0-0**
No. of Lecture Hours / Week	**: 03**	**Exam Hours**	**: 3**
Total No. of Lecture Hours	**: 40**	**Exam Marks**	**: 60**

COURSE OBJECTIVES

8 To know and recognize the importance of human behavior at work in organizations.
9 To relate human behavior with learning and demonstrate how the two go together.
10 To recognize the importance of motivation in learning and other performance attributes.
11 To know and locate the importance of group interactions and group behavior in organizations.
12 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:

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

TEXT BOOKS

5 **Organizational Behaviour,** Stephen P Robbins, 9th Edition, Pearson Education Publications, ISBN-81-7608-561-5 4002.
6 **Organizational Behaviour,** Fred Luthans, 9th Edition, Mc Grew Hill International Edition, ISBN-0-07-04-002.

REFERENCE BOOKS

3. **Organizational Behaviour**, Aswathappa - Himalaya Publishers, 4001.
4. **Organizational Behaviour,** (Human behaviour at work) 9th Edition, John Newstron/ Keith Davis, 4002.
5. **Organizational Behaviour,** Hellriegel, Srocum and Woodman, Thompson Learning, 9th Edition, Prentice Hall India, 4001.
6. **Organizational Behaviour,** VSP Rao and others, Konark Publishers, 4002.

ADVANCES IN JOINING PROCESS and NDT

Subject Code	**17IP834**	**No. of Credits**	**: 3 -0-0**
No. of Lecture Hours / Week	**: 03**	**Exam Hours**	**: 3**
Total No. of Lecture Hours	**: 40**	**Exam Marks**	**: 60 IA:40**

COURSE OBJECTIVES

9. To know the different types of welding and describe welding and cladding of dissimilar metals
10. To distinguish the weldability of metals
11. To identify the welding design principles and compute welding design parameters
12. To illustrate the symbols used in welding practice and identify the adhesive bonding applications
13. To Identify and use the welding inspection techniques and standards

COURSE CONTENT

UNIT-1

Types of Welding: Forge welding, Electro Slag Welding, Electron Beam Welding, Plasma arc Welding, Laser Beam Welding, Explosion Welding, Diffusion Welding, Ultrasonic Welding, Friction welding.
Welding and Cladding of Dissimilar Materials: Overlaying and surfacing, different methods and applications, thermal –Spray coating or metalizing.

8 Hours

UNIT – 2.
Weldability of Metals: like stainless steel, Cast iron, Copper, and Aluminium.
Advanced soldering and brazing processes-different types. Welding of plastics- different methods.

08 Hours

UNIT – 3

Welding design: Basic principles of sound welding design, welding joint design, welding positions, Allowable strength of welds under steady loads, allowable fatigue strength of welds, Design of welds subjected to combined stresses, Numerical examples

8 Hrs

UNIT – 4

Welding Symbols: Need for representing the welds, Basic weld symbols, location of weld, supplementary symbols, dimensions of weld, examples.

Adhesive Bonding: Adhesive materials and properties, non-structural and special adhesives, surface preparation and joint design considerations**.**

08 Hours

UNIT – 5

Inspection of Welds: ASTM standards for testing weldments, Destructive techniques like Tensile, Bend, Nick break, Impact and Hardness. Non Destructive techniques like 'X' rays, Ultrasonic, Magnetic particle, Dye penetrant

08 Hours

COURSE OUTCOMES:

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

6. Explain the importance of grain size control, methods to avoid distortion and residual stresses; also know the techniques of surfacing and cladding of surfaces.
7. Interpret and understand the advantages and limitations of different advanced welding process knowing fully the characteristic features, this identify research topics in the area of welding and related processes.
8. Explain the weld ability of engineering materials including plastics and the advanced soldering and brazing processes.
9. Design welds subjected to for various loading conditions.
10. Explain the symbols used to represent the welds: also be able to explain the methods of adhesive bonding of materials.

Inspect the welds in accordance with ASTM standards employing both destructive and non-destructive methods.

TEXT BOOKS

13. Welding Technology by O.P. Khanna, Dhanpat Rai Publication 4008.
14. Welding and welding Technology by Richard Little Tata Mc Graw hill 4005

REFERENCE BOOKS

· Welding Engineering Handbook by A.W.S. Ninth Edition.
· Advanced Welding processes – G.Nikolaev and N.Olsha nsky, MIR Publications 1977.
· ASM handbook on welding, brazing and soldering, Vol 6, 4005.