Syllabus
for
B.Tech.ProductionSem V &VI

Programme: B. Tech. (Production) Sem. V – 2014 Course

S.N	Course	Teaching Scheme (Contact Hrs/week)			Examination Scheme (Marks)							Total Credits		
		L	P/ D	T	End Sem Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/ OR	TW/ PR				
1.	Metal Forming	3	2	-	60	20	10	10	50	-	150	3	1	4
2.	Kinematics and Design of Manufacturing Machine	3		-	60	20	10	10		-	100	3		3
3.	Metrology & Quality Control	3	2	-	60	20	10	10	-	50	150	3	1	4
4.	Engineering Metallurgy	3	2	-	60	20	10	10	50	-	150	3	1	4
5.	Numerical Methods	3	2	1	60	20	10	10	-	-	100	3	2	5
6.	Professional skill Development – V	4	-	-	100	-	-	-	-	-	100	4	-	4
7.	Production Practice- IV	-	2	-	-	-	-		-	50	50	-	1	1
	Total	19	10	1	400	100	50	50	100	100	800	19	5	25

Programme: B. Tech. (Production) Sem. VI – 2014 Course

S.N	Course	Teaching Scheme (Contact Hrs/week)			Examination Scheme (Marks)							Total Credits		
		L	P/ D	T	End Sem Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/ OR	TW/ PR				
1.	Jig Fixture and Die Design *	3	2	-	60	20	10	10	50	-	150	3	1	4
2.	Production Management	3	2	-	60	20	10	10	-	-	100	3	1	4
3.	Computer Aided Design and Manufacturing	3	2	-	60	20	10	10	50	-	150	3	1	4
4.	Fluid Mechanics and Machine Tool Control	3	2	1	60	20	10	10	50	-	150	3	2	5
5.	Elective- I	3	2	-	60	20	10	10	50	-	150	3	1	4
6.	Professional skill Development – VI	4	-	-	100	-	-	-	-	-	100	4	-	4
	Total	**19**	**10**	**1**	**400**	**100**	**50**	**50**	**200**	**0**	**800**	**19**	**5**	**25**

* End Semester examination of duration 4 Hours.

Total Credits Sem. I – 25

Total Credits Sem. II – 25

Grand Total - 50

Subject :METAL FORMING		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	

Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of conventional and non conventional manufacturing processes.	
2.	Knowledge of material science.	
3.	Knowledge engineering drawing.	
Course Objectives:		
	To study the metal forming processes i.e wire drawing, rolling, forging, extrusion, sheet metal working etc.	
Course Outcomes:		
Students will be able to understand		
1.	To select wire drawing machine and understand its defects and remedies.	
2.	To select proper forging process and understand its defects and remedies.	
3.	To select type of rolling mills and understand its defects and remedies.	
4.	To select various sheet metal working processes and advance sheet metal processes.	
5.	To design simple and progressive and deep drawing die.	
6.	To select extrusion die and extrusion proper process and understand its defects and remedies.	
UNIT - I	**Fundamentals of Material Forming:** Introduction of forming processes. Concept of Formability, formability limits and formability diagram. **Wire and Tube Drawing:** Introduction rod and wire drawing machines - construction and working. Preparation of stock for wire drawing. Wire drawing dies, material and design. Heat treatment, variables in wire drawing, Maximum reduction in wire in one pass, forces required in drawing. Multiple drawing,defects in drawing and remedies, work hardening, lubrication in wire drawing. Tube drawing: Methods, force calculations, stock penetration. Lubrication in tube drawing.	**(06 Hours)**
UNIT – II	**Forging:** Introduction, classification of forging processes. Forging equipment-	**(06 Hours)**

	Hammers, presses, furnaces etc. construction working capacities and selection of equipment. Basic forging operations such as drawing, fullering edging, blocking etc. Forgability tests, design of forging as a product, friction in forging. Forging defects and the remedies. New technologies: Liquid metal forging, Isothermal forging, No draft forging, P/M forging, Rotary swaging, Roll forging, lubrication in forging.	
UNIT - III	**Rolling of Metals:** Scope and importance of rolling. Effect of grain direction in rolling Types of Rolling Mills- construction and working. Deformation in rolling and determination forces required. Process variables, redundant Deformation, Roll bite and friction. Roll flattening, Roll camber - its effect on rolling process, mill spring. Defects in rolling. Automatic gauge control- Roll pass classification & design. Lubrication in rolling.	**(06 Hours)**
UNIT - IV	**Sheet Metal Working:** Sheet Metal properties, gauges and surface conditions. various cutting and forming operations, types of dies used, force requirement, theory of shear, methods of force reduction, defects, lubricants used. Miscellaneous sheet metal working operations: Metal spinning, fine blanking, coining, embossing, rubber forming, stretch forming. Coining Embossing, Curling, Spinning and fine blanking. **Advanced Metal Forming Processes:** Introduction to High velocity forming- principles, comparison of high velocity and conventional forming processes. Explosive forming, Magnetic pulse forming, Electro hydraulic forming. Stretch forming, , Flow forming advantages, limitations and application of the process.	**(06 Hours)**
UNIT - V	**Design of Press Tools:** General classification and components of press tools, types of dies simple, compound, combination dies, various press working operations such as punching, blanking, deep drawing, bending, forming etc. Design and calculations for above press working dies.	**(06 Hours)**
UNIT - VI	**Extrusion:** Types: Direct, reverse, impact, hydrostatic extrusion. Dies for extrusion, stock penetration. Extrusion ratio of force equipment (with and without friction), metal flow in extrusion, defects. Role of friction and lubricants. Manufacture of seam-less tubes.	**(06 Hours)**
Term Work/Practical's:		
1. Design & working drawing of simple blanking die.		
2. Design & working drawing of progressive/compound/combination die.		

3. Design & working drawing of a deep drawing die.	
4. A report on factory visit, comprising of product range, processes, plant layout, AuxilIary equipment, process parameters etc.	
Assignments:	
1. Assignment based on each unit of syllabus.	
Text Books/Reference Books:	
1	Dieter, “Mechanical Metallurgy”
2	P. N. Rao, “Manufacturing Technology”, Tata McGraw Hill
3	G.W. Rowe, ”Principles of Industrial Metal Working Process”, Edward Arnold
4	Dr. R. Narayanswamy, “Metal Forming Technology”, Ahuja Book Co.
5	Surender Kumar, “Principles of Metal Working”
6	“ASM Metal hand book Vol: 4 forming”
7	P.C.Sharma, “Production Engineering”, S. Chand
8	Masleror and Berkvasky, “Theory of Plastic Deformation and Metal Working”, MIRPublications
9	J. N. Harris, “Mechanical Working of Metals”, Pergmon Press
10	Aviter, “Fundamental of Metal Working”, McGraw Hill Publisher
11	Schilles, “Press Working”
12	R.G.W. Pye; “Injection Moulding”, EWP.
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Subject : KINEMATICS & DESIGN OF MANUFACTURING MACHINES		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 00 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	00 Credit

Course Pre-requisites:	
The Students should have	
1.	Students should have Basic knowledge of Measuring Units, Mathematics, and Various terms like as displacement, Velocity, Acceleration.
2.	Students should have Basic knowledge of various Machine Structures and drives.
3.	Students should have Basic knowledge of Design Tolerance, Allowance and other related terms
Course Objectives:	
1	To study the kinematics design for various products, its aesthetics, ergonomics, statistical techniques and reliability.
Course Outcomes:	
Students will be able to understand	
1.	The analytical ability of students in synthesis of mechanism.
2.	The knowledge of gear design.
3.	Element of product design.
4.	To set familiarization of Aesthetic and Ergonomic consideration in design
5.	Importance of statistical consideration in design.
6.	Basic vibration modules, tribology of material.

UNIT - I	**Computer Aided Analysis and Synthesis of Mechanisms and Kinematics Structure of Machine Tools:** Computer Aided Analysis and coupler curves for four bar mechanism and. Slider crank mechanism, dimensional synthesis of mechanisms, three position synthesis of slider crank mechanism, Over lay method, Bloch Synthesis, Least square technique, Machine tool motion and their Transmissions, Kinematic balancing equation for motion transmitting elements, Kinematic structure of machine tool.	**(06 Hours)**
UNIT - II	**Spur Gears:** Design considerations based on Beam Strength, tangential loading, gear standards, types of gear tooth failures, Calculations of modules, teeth number . **Helical Gears:** Normal Module, Virtual no. of teeth, force analysis, Beam and wear	**(07 Hours)**

	strength, Introduction to Design of Helical Gears.	
UNIT - III	**Design for Manufacture:** General Principles for Design for Manufacture, Principles of design for casting, Forging, Machining, Welded Joints, etc., Design for Manufacturing & Assembly. **Product Design:** **Aesthetics:** Aim, basic forms of elements, contribution of factors like structure, elegance, rhythm, proportions, harmony, use of curves, joints, materials, surface finish &color. **Ergonomics:** Aim, man-machine relationship, use of anthropometrical data related with machine tool & control elements, design of controls & display.	**(05 Hours)**
UNIT - IV	**Friction and Lubrication:** Dry friction, friction between screw and nut, friction in turning pairs, friction circle and friction axis, friction in mechanism, principles of thick and thin film lubrication methods, principles of hydrodynamic and hydrostatic lubrication.	**(05 Hours)**
UNIT - V	**Fundamentals of Vibration:** a) Un-damped Free Vibration, Equilibrium method, Energy method, Rayleigh's method. b) Damped Free Vibrations of single degree freedom system, types of damping, free vibration with viscous damping, over damped system, critically damped system, under-damped system, logarithmic decrement, viscous dampers, dry friction or coulomb damping, frequency of damped Oscillations. c) Vibration measuring instrument, measurement of displacement, velocity, acceleration, frequency and damping of vibrating systems	**(07 Hours)**
UNIT - VI	**Statistical considerations in Design and Optimum Design:** **Statistical Considerations in Design:** Analysis of Tolerances, Design and Natural Tolerances, Factor of safety and reliability. **Optimum Design:** Objectives of Johnson's Method of optimum design, design for normal specification and redundant and incompatible specification.	**(06 Hours)**
Assignments:		
1. Assignment based on above six units.		
Text Books/Reference Books:		
1	Bhandari V.B:" Design of Machine Elements", Tata McGraw Hill Publication	
2	Shigly "Mechanical Engineering Design", Tata McGraw Hill Publication	

3	M.F.Spott" Design of Machine Elements", Prentice Hall
4	Thomas Bevan" Theory of Machines", CBS Publisher & Distributors
5	J.E. Shigly" Theory of Machines & Mechanisms", McGraw Hill
6	Bhargave. S.R." Theory of Machines-II", Technova Publishing House .
7	P.L.Ballany "Theory of machines", Khanna Publishing, New Delhi
8	R.S.Khurmi, J. K. Gupta, "Theory of Machines", E P H
9	G.K.Grover, Mechanical Vibrations
10	Sen and Bhatacharya,"Machine Tool Design
11	Phakatkar,"Theory of Machine-II"

Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Subject :METROLOGY AND QUALITY CONTROL		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/PR : 50 Marks	

Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of Measuring Units, Mathematics, and Various terms like as displacement, Velocity, Acceleration.	
2.	Basic knowledge of Design Tolerance, Allowance and other related terms.	
3.	Familiarity with elements of mechanical components like gear, screw thread, bearings etc.	
Course Objectives:		
	To make students have the basic principles of measuring methods and, have hands on experience on Measuring equipments and quality theories.	
Course Outcomes:		
Students will be able to understand		
1.	Make use of equipment like sine bar, angle gauge, Autocollimator, and angle dekkor to carry out angular measurement	
2.	Use of concepts like limits, fits and tolerances for designing the limit gauges	
3.	Read the symbols on drawing for surface finish and measure surface finish by instruments like Tomlinson surface meter, surftester etc	
4.	Measure the various screw thread parameters by using equipments like floating carriage micrometer, tool makers microscope and profile projector	
5.	Measure the gear tooth parameters with equipment like gear tooth vernier calliper, constant cord method, span micrometer, base tangent comparator etc	
6.	Familiarity with various TQM models	
UNIT - I	**Introduction:** Meaning of metrology, precision, accuracy, errors in measurement, calibration. Linear Measurement: Standards- line standard, end standard, wave length standard, classification of standards, precision and non precision measuring instrument, slip gauges. Angular Measurement: Sine bar, Sine center, Uses of sin bar, angle gauges, Auto Collimator & Angle Dekkor, Constant Deviation Prism Interferometry: Introduction, flatness testing by interferometry, NPL flatness interferometer. Laser interferometry.	**(04 Hours)**
UNIT - II	**Limits, Fits and Tolerances and Gauge design:** Meaning of limit, Fits and Tolerance, Cost-Tolerance relationship, concept of Interchangeability, Indian Standard System (ISS). Design of limits gauges: Types, Uses, Taylors principle, Design of	**(07Hours)**

	limit gauges. **Inspection of geometric parameters:** Flatness, Straightness, Parallelism, Concentricity, Squareness, circularity and Cylindricity. Comparators: Uses, types, advantages and disadvantages of various types of comparators. **Recent trends in Metrology:** Introduction to CMM, Measuring geometrical parameters with CMM. techniques for automated inspection – contact and non-contact inspection methods – in processes automated measuring methods-machine vision, optical inspection methods.	
UNIT - III	**Surface finish measurement:** Surface texture, Meaning of RMS and CLA values, Tomlinson's Surface meter, Taylor- hobson surface meter, grades of roughness, specifications. **Screw Thread Metrology:** External screw threads terminologies, floating carriage instruments, pitch and flank measurement of external screw thread, application of Tool Makers Microscope, use of profile projector. **Gear Metrology:** Spur gear parameters, gear tooth thickness measurement, gear tooth verniercaliper, constant chord method, span micrometer, base tangent comparator, lead and profile measurement.	**(07 Hours)**
UNIT - IV	**Introduction to Quality:** Meaning of quality, Approaches-Deming's Approach, Juran's Approach, quality of product, quality of service, cost of quality, value of quality, difference between inspection, quality control, quality circle, quality policy. **Introduction to quality control:** Meaning of Quality Control, 100% inspection and Sampling inspection, Statistics in selective inspection Introduction to statistical quality control: Control chart:- Attribute (P, np, C, U) and variable (X & R chart), sampling inspection, Operating Characteristic curves and sampling plans.	**(06 Hours)**
UNIT - V	**Quality Assurance Systems:** Total quality management (TQM): 7 tools of problem solving, cause and effect diagram, Pareto analysis etc, Quality Function Deployment (Q.F.D), Kaizen, Introduction to Six sigma, process capability index (Cp, Cpk) concept, methods of determining Cp and Cpk . **Reliability, availability and maintainability;** Distribution of failure and repair times; determination of MTBF and MTTR, reliability models; determination of system reliability; preventive maintenance and replacement. Design of Experiments	**(07 Hours)**

	(DOE).	
UNIT - VI	**Quality Management Systems:** History and evaluation of ISO9000 series, importance and over view of ISO9000-1998 series standards, structure of ISO9000-2000 series standards, clauses of ISO9000 series standards and their interpretation and implementation, quality system documentation, BIS standards ,ISO/TS 16949 and audit ISO14000: Environmental management concept, and requirement of ISO14001, benefits of environmental management systems. OH and AS standards.	**(05 Hours)**

Term Work/Practical's:
1. Measurement bearing Parameters by using Vernier Calliper and Micrometer Screwgauge
2. Measurement of Ovality Using Johanson Mikrokator.
3. Measurement of angle by sine bar/sine center.
4. Measurement of optical surface using Interferometer.
5. Study and experiment on profile projector / Tool makers microscope
6. Measurement of screw thread parameters using Floating Carriage Micrometer
7. Measurement of the surface roughness
8. Measurement of gear tooth thickness using gear tooth vernier caliper and span micrometer
9. Machine tool Alignment test on lathe/drilling/milling machine.
10. Experiment to measure Process Capability using Statistical Process Control Or Minitab Software
Assignments:
1. Quality and Quality Control
2. Quality Assurance syaytem and reliability
3. ISO 9000

Text Books/Reference Books:	
1	R. K. Jain, "Engineering Metrology", Khanna Publication
2	I.C.Gupta, "A Text book of Engineering Metrology", Dhanpat Rai and Sons.
3	K. J. Hume, "Engineering Metrology"
4	K. W. B. Sharp, "Practical Engineering Metrology", Pitman Publication
5	Grant, "Statistical Quality Control", McGraw Hill
6	"Hand Book of Industrial Metrology", A.S.T.M.E. Prentice Hall
7	J. M. Juran, "Hand Book of Quality Control", McGraw Hill Publication
8	Kaoru Ishikawa, "Guide to Quality Control", Asian Productivity Organisation, Series,

Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Subject : ENGINEERING METALLURGY		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	

Course Pre-requisites:		
The Students should have		
1.	Student should have knowledge of material science and mechanical properties of materials	
2.	Student should know about study of equilibrium diagrams ,phase ,crystal structures and microstructures .	
3.	Student should know about forging ,rolling and some manufacturing processes such as casting , machining etc.	
Course Objectives:		
	Student will understand different heat treatment for steel and select the materials as per requirement of industries .	
Course Outcomes:		
Students will be able to understand		
1.	The manufacturing of steel and will be able to identify different steels as per classifications	
2.	Different heat treatment that is to be carried out for steel as per requirement	
3.	Surface and core heat treatment for different applications	
4.	Types of tool steels and alloy steels and able to suggest as per requirement	
5.	Types of cast irons and able to choose different cast irons as per applications	
6.	Non ferrous material and their applications .	
UNIT - I	**Study of Metallography and steels.** Study of metallography & microscopes, Etching methods, macroscopic examination methods. Brief idea about iron & steel making, blast furnace, sponge iron, cast irons, Wrought irons, pig iron, Study of Iron-Iron carbide equilibrium diagram, different types of reactions & phases, critical temperatures, cooling of different steels, Classification & specifications of steels, Structure – property relationship, microstructures of plain carbon steels, Measurement of grain size.	**(06 Hours)**
UNIT - II	**Cast Irons :** Classification of Cast irons, effect of cooling rate and alloying elements on cast irons , Types of cast irons, Manufacturing methods, Properties, applications of each cast irons, alloy cast irons , Comparison of steels & cast irons, Heat treatments of cast irons.	**(06 Hours)**
UNIT - III	**Alloy Steels & Tool Steels :** Classification of alloying elements, Effect of alloying elements on properties, Various alloy steels,	**(06 Hours)**

	Stainless steels – Classification, Applications & properties, Tool Steels – Classification, Applications & properties, heat treatment of tool steels, mold tool steel.	
UNIT - IV	**Heat Treatment of steels :** Transformation products of austenite, Martensite transformation & characteristics of martensite, Time – Temperature Transformation curve, Critical Cooling rate, Heat treatment of steels - Annealing, Normalizing, Hardening , Hardenability, Martempering, Austempering, Retained austenite, Tempering, Ausforming, Secondary hardening, Quench cracks,	**(06 Hours)**
UNIT - V	**Surface treatments and furnaces :** Necessity of surface hardening, Carburizing & its types, nitriding& its types, Carbonitriding, Tuffriding, Flame & Induction hardening, Heat treatment furnaces, Atmospheres used in heat treatment, Defects in heat treatments.	**(06 Hours)**
UNIT - VI	**Study of Non-ferrous metals and its alloys:** Study of copper and it's alloys, equilibrium diagram of Cu-Zn system, Brasses , Bronzes, Study of Aluminum and its alloys, Al-Si equilibrium diagram, applications and properties of non ferrous alloys, Nickel and magnesium alloys, Materials for Bearings. Recent developments in materials like smart materials, magnetostristicmaterials etc.	**(06 Hours)**

Term Work/Practical's:

1. Study of metallurgical microscope and etching technique
2.Specimen preparation for metallography
3. Macroscopic examination tests.
4. Study of plain carbon steels and its microstructures.
5.Study of cast irons and its microstructures
6. Study of Non ferrous metals and its microstructures
7. Heat treatment for plain carbon steels.
8.Jomeny End Quench test for hard ability measurements
9. Any one surface Harding Heat treatment.

Assignments:

1.Describe in briefly the manufacturing of steels from ore ,list out the steel manufacturing industries

2. Collect the different component made from steels find out there heat treatment done on it describe in details and submit the component.

3. Visit the industries that do heat treatment on component and submit the report

4. Do collection of some tools write the chemical compositions ,manufacturing and supporting treatment etc. and submit the report

5. take any one cast iron component and write the details about it that is chemical composition ,manufacturing methods and properties

6. List out the nonferrous materials and its applications , properties and chemical composition.

Text Books/Reference Books:

1	“Material Science and Physical Metallurgy”, Dr.V.DKodgire , Everest Publication, Pune.
2	“Physical Metallurgy”, Vijendra Singh, Standard Publishers Distributors, Delhi.
3	“Physical Metallurgy”, S H Avner, Tata Micro hill Publication , Delhi
4	“Heat Treatments of Metals ” R K Rajput ,S K Kataria and Sons Publication, Delhi.
5	“Mechanical Metallurgy”, Ditter

Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

NUMERICAL METHODS		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
Tutorial : 01 Hour/ Week		01 Credit

Course Pre-requisites:	
The Students should have	
1.	Basic knowledge of Mathematics
2.	Basic knowledge of Differentiation and Integration
3.	Basic knowledge of Interpolation
Course Objectives:	
The student should recognize the difference between analytical and Numerical Methods and effectively use Numerical Techniques for solving complex Mechanical engineering Problems	
Course Outcomes:	
Students will be able to	
1.	Use appropriate Numerical Methods to solve complex mechanical engineering problems
2.	Find the roots of equations by various methods.
3.	Find the solutions to simultaneous equations by various methods
4.	Use the appropriate method of curve fitting for the given data.
5.	Use Numerical differentiation and Integration to solve the real time problems
6.	Write the program on ordinary differential equations

UNIT-I	**Introduction** MATLAB fundamentals, MATLAB graphics, simple matlab demonstration programs. Error Analysis Significant figures, Accuracy and Precision, Error definition, Round-Off errors, Truncation error, Total numerical error, Blunders, Formulation error and Data Uncertainty.	(06 Hours)
UNIT-II	**Roots of Equation** Bracketing methods-Bisection and False position method. Open methods-Simple fixed-point iteration, Newton Raphson method and Secant method. Engineering Applications.	(06 Hours)
UNIT-III	**Solutions of Simultaneous Equations** Navier Gauss elimination, pitfalls of Gauss Elimination, techniques of improving solutions, complex numbers. Gauss Jordon, Gauss seidal and LU Decomposition. Engineering application-spring mass system.	(06 Hours)
UNIT-IV	**Curve Fitting** Least-Square Regression-Linear regression, polynomial regression and multiple linear regressions. Interpolation -Newton's divided	(06 Hours)

	difference interpolating polynomial. Lagrange's interpolating polynomial, coefficients of interpolating polynomials. Inverse interpolation spline interpolation. Engineering Applications.	
UNIT-V	**Numerical Differentiation and Integration** Trapezoidal rule, Simson's rules, integration with unequal segment, multiple integral, romberg integration, Gauss Quadrature. Richardson Extrapolation, derivatives of unequally spaced data. Engineering Applications. Numerical Differentiation using Forward, backward and central difference.	(06 Hours)
UNIT-VI	**Ordinary Differential Equations** Euler's method, improvement of Euler's method, Runge-Kutta method, system of equations, Adaptive Runge Kutta method. Stiffness and multistep method. Engineering Applications.	(06 Hours)

Term work:
List of Experiments:

1. Program on Roots of Equation (Validation by suitable solver)
   Bisection Method, False position Method, Newton Raphson method and Successive approximation method
2. Program on Simultaneous Equations (Validation by suitable solver)
   Gauss Elimination Method, Partial pivoting, Gauss-Seidal method, Gauss Jordan method
3. Program on Numerical Integration(Validation by suitable solver)
   a) Trapezoidal rule,
   b) Simpson‟s Rules (1/3rd, 3/8th)
4. Program on Curve Fitting using Least square technique (Validation by suitable solver)
5. Program on Interpolation (Validation by suitable solver)
6. Program on Ordinary Differential Equations

Assignments:

Six Assignments based on above syllabus

Text Books / References

- S. S. Sastry, Introductory Methods of Numerical Analysis, PHI.
- Chapra, S. C and Canale, R. P. “Numerical Methods for Engineers”, 5th Edition, Tata McGraw-Hill, New Delhi, (2007).
- Grewal, B.S. and Grewal,J.S., “ Numerical methods in Engineering and Science”, 6th Edition, Khanna Publishers, New Delhi, (2004).
- Sankara Rao, K. “Numerical methods for Scientists and Engineers’, 3rd Edition Prentice Hall of India Private Ltd., New Delhi, (2007).
- M. K. Jain, S.R.K. Iyengar and R.K.Jain, (2003), Numerical Methods for Scientific and Engineering,
- Brian Bradie, “A friendly introduction to Numerical analysis”, Pearson Education Asia, New Delhi, (2007).
- Gerald and Wheatley, Applied Numerical Analysis, Pearson Education Asia
- E. Balagurusamy, Numerical Methods, Tata McGraw Hill

- P. Thangaraj, Computer Oriented Numerical Methods, PHI
- Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientist, Tata Mc-GrawHill Publishing Co-Ltd.
- Rao V. Dukkipati, Applied Numerical Methods using Matlab, New Age International Publishers.

Syllabus for Unit Test

Unit Test 1	Units I , II and III
Unit Test 2	Units IV, V and VI

PRODUCTION PRACTICE – IV		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Practical: 04 Hours / Week		01 Credit

Course Pre-requisites:

The Students should have

1	Basic knowledge of handling the Lathe machine.
2	Basic knowledge of handling the Milling machine.
3	Basic knowledge of handling the Grinding machine.

Course Objectives:

The students should able to manufacture the job on lathe, Milling and Grinding Machine

Course Outcomes:

Students will be able to performed

1	Different operations on lathe machine.
2	Gear Cutting on Milling machine.
3	Finishing operation on Cylindrical grinding machine and Surface grinding machine.

Term Work

Each Candidate shall be required to complete and submit the following jobs:

1. One Composite job consisting of 3 to 4 pieces as below:
Machining of components covering all operations on Lathe
(Including Internal and external threading, Taper Matching, Knurling)

Grinding operation on Above (Turning) Job - One Job

2. Gear Cutting on milling machine. -One Job

Note: Practical examination of 6 Hours duration shall be conducted at the end of Sem.-II based on the process and practical conducted in production practice-III

B.Tech.Production

Sem-VI

Subject :JIG FIXTURE AND DIE DESIGN		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	

Course Pre-requisites:	
The Students should have	
1.	Basic knowledge of conventional and non conventional manufacturing processes.
2.	Knowledge of casting processes.
3.	Knowledge plastic processes methods.
Course Objectives: To design jig, fixtures and dies for manufacturing system.	
Course Outcomes:	
Students will be able to understand	
1.	To understand the concept of jigs and fixture and its principles.
2.	To design jigs with use of standard components.
3.	To design fixture with use of standard components.
4.	To select plastic processes methods.
5.	To understand the concept of injection moulding and able to design the injection molding die.
6.	To design dies for the pressure die casting.

UNIT - I	**Fundamentals of Jigs And Fixtures:** Significance and purpose of jigs and fixtures and their functions in manufacturing processes. Classifications of Jigs and Fixtures. Design features of main elements of Jigs and Fixtures such as locating, clamping and guiding elements and their integrations. Indexing, locking and auxiliary elements. Bodies and bases or frames of Jigs and fixtures. Economics of Jigs and fixtures, Pneumatics & Hydraulics for Jig & Fixtures.	**(06 Hours)**
UNIT - II	**Design of Jigs:** General guidelines & procedures for design of Jigs. Design & selection of standard elements, Analysis of clamping force required & their magnitude, Design of drilling jigs.	**(06 Hours)**
UNIT - III	**Design of Fixtures:** General guidelines & procedures for design of fixtures. Design & selection of standard elements, Analysis of clamping force required & their magnitude, concept of modular fixtures & tool presetting fixtures. Design of milling, turning fixture and fixture for assembly. Economic analysis .	**(06 Hours)**

UNIT - IV	**Plastics Processing:** Materials used for plastic processing, Compression, transfer, injection & blow moulding processes - its working, construction, types & advantages and limitations.	**(06 Hours)**
UNIT - V	**Design of Injection Molds:** Specifications and elements of injection molding machine, Injection molding feed system: runner and gates, ejection methods, ejection force calculation, parting surface selection, cooling systems, Defects & remedies.	**(06 Hours)**
UNIT - VI	**Design of Die Castings Dies:** Die casting machines-Hot & cold chamber, metals for die casting, die locking methods, interlocks & safety devices, specific details of die constructions, casting, ejection, cores, slides, loose die pieces, types of cores, directional solidification, types of feeders, die venting, water cooling, classification of dies- single, combination, multi impression. General details of die design, Gating system, inserted impressions, die casting defects and remedies, die lubrication & rules for die lubrication.	**(06 Hours)**

Term Work/Practical's:	
1. Design & working drawing of one drilling jig.	
2. Design & working drawing of one fixture.	
3. Design & working drawing of a die casting die.	
4. Design & drawing of a injection molding die.	
Assignments:	
1. Six Assignment based on the syllabus.	
Text Books/Reference Books:	
1	Donaldson, Lecain&Goold, "Tool Design", Tata McGrw HillPRODUCTION
2	Doebler H. H., "Die Casting", McGraw Hill
3	P. N. Rao, "Manufacturing Technology", Tata McGraw Hill
4	Wilson, "Fundamentals of Tool Design", A. S. T. M. E.
5	M. H. A. Kempster, "Introduction to Jigs and Fixtures Design"
6	P. H. Joshi, "Press Tools", A.H. Wheeler
7	P. C. Sharma, "Production Engineering", S. Chand
8	Dr. Surender Kumar, "Production Engg. Design (Tool Design)", Satya Prakashan
9	R. G. W. Pye, "Injection Mould Design", EWP
10	A. S. Athalye, "Plastic Processing Handbook", Multitech
11	Richard Kibbe, John E. Neely, Meyer, White, "Machine Tool Practices"
12	Hoffman, "Introduction to Jigs and Fixtures"
13	"Tool Engineering Handbook", A. S. T. M. E.
14	R. K. Jain, "Production Technology", Khanna Publishers
15	Dr. Surender Kumar, "Production Engineering Design"
16	"Metals Handbook", Vol II ASME

17	"Toll and Die Design Handbook", McGraw Hill
18	Hiram and Grant, "Non Conventional Clamping Devices"

Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Subject :PRODUCTION MANAGEMENT		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit

Course Pre-requisites:	
The Students should have	
1.	Knowledge of Industrial Engineering.
2.	Knowledge of Industrial Management.
3.	Knowledge of Production Planning and Control.
Course Objectives:	
	The student should understand the scope, objective and application of Production Management tools and practices in manufacturing.
Course Outcomes:	
Students will be able to understand	
1.	To understand the evolution of Production Management, its scope, operations, organization.
2.	To understand the factors deciding location of plant, Layout of facility and objectives of material handling.
3.	To understand manpower planning and capacity planning techniques based on technology and objective of material, handling.
4.	To understand the organization and administration of maintenance function- it's types, principles, operations policies etc.
5.	To understand the concept of World-Class-Manufacturing, it's elements, problems and various contributors to develop World-Class-Manufacturing.
6.	To understand topics in Production Management such as Green/Agile and Lean manufacturing and energy conservation and energy efficiency manufacturing with knowledge based system (IT) application

UNIT - I	**Scope of Production Management** The evolution of Production management / Operations Management. Different production eras - Mass, Batch, Job production customization. Relationship of Production/Operations Management with materials, maintenance, quality control, design production engineering and sales. Scope, Definition and its relationship with other management functions such as marketing, finance and personal management. Production organizations for single product, multi product, single location, multilocation. **Product Design** Product life cycle, Relationship between product design and product cost. Stage of Product Design & Development, Functional, Economic, manufacturing and marketing aspects in product design, Concept of Concurrent engineering, 3S, House of Quality.	**(06 Hours)**

UNIT - II	**Location** Facility-location: Objectives, factors affecting site selection, , center of gravity method, profit volume rating and hub and scope model. **Layout** Layout types, material flow pattern. **Material handling** Material handling: Its relation with layout, Objectives, principles and types of material handling. AGV'. Unit load concept.	**(06 Hours)**
UNIT - III	**Manpower Planning and Capacity Planning** Manpower forecasting, manpower inventory, capacity and level strategies, aggregate capacity planning. **Productivity** Productivity : Factor productivity, Total productivity, Labor productivity, measurement of productivity, techniques of productivity Toyato Production System (TPS) ,Total Productivity Management(TPM) and Mangement Information System (MIS).	**(06 Hours)**
UNIT - IV	**Industrial Maintenance** Organization, Administration of maintenance function, types of maintenance, principles, operating policies, scope of maintenance management, budget and Total productive maintenance.	**(06 Hours)**
UNIT - V	**World Class Management:** Concept of World Class manufacturing, Emergence of information age, Manufacturing challenges of Information age, elements of business turbulent environment, Problems in manufacturing sector, Evolution of WCM, Contribution of Hall, Schoenberger, Gunn, Maskel, WCM practices in industries and WCM scenario in India.	**(06 Hours)**
UNIT - VI	**Recent Techniques of Production Management** Concept, implementation, applications, advantages and disadvantages of following tools and techniques: Energy conservation and Energy audit, Green Production, Waste heat treatment, Energy efficient manufacturing system, Lean and agile manufacturing, Knowledge Based System, Manufacturing Information System.	**(06 Hours)**
Assignments:		
1.Six Assignment based on above syllabus.		
Text Books/Reference Books:		
1	H. B. Maynard and others, "Modem manufacturing", IV edition - McGraw Hill Publications, ISBN 0-07-041084-4.	
2	H. B. Maynard and others, "Industrial Engineering Handbook", IV edition- McGraw Hill Publications, ISBN 0-07-041084-4.	
3	L. R. Higgnis, R. K. Mobley, Smith Ricky, "Maintenance Engineering Handbook", McGraw Hill Publications, ISBN 0-07-028819-4.	

4	Kanter Jerome, “Management Information System”, Prentice Hall, ISBN 0-87692-358- 9.
5	H. Noori and R. Radford, “Production and Operation Management”, Total Quality and Responsiveness international Edition - 1995 - McGraw Hill Inc.
6	B.S. Sahay, K B C. Saxena, Ashish Kumar, “World Class Manufacturing-A Strategic perspective”,McMillan India Ltd.
7	F. L. Francis, J. A. White, L. F. McGinnis, “Facilities Layout and Location”, Prentice Hall of India Pvt. Ltd., ISBN 81-203-1460-3.
8	T. E. Vollmann, W. L. Bery, “Manufacturing Planning and control Systems”, Galgotia Publication New Delhi, ISBN 81-7515-084-X.
9	Richard Muther, “Systematic Layout Planning”
10	J. L. Riggs, “Production Systems”, John Wiley and Sons.
11	Mayer, “Production Management”, Tata McGraw Hill Publications.
12	M. Telsang, “Industrial Engineering and Production Management”, S.Chand Publication

Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

COMPUTER AIDED DESIGN AND MANUFACTURING		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR: 50 Marks	

Course Pre-requisites:

The Students should have

1.	Basic knowledge of drawing.
2.	Basic knowledge of standards
3.	Basic knowledge of manufacturing processes.

Course Objectives:

To understand the basics of CAD/CAM and to learn about the geometric issues concerned to the manufacturing and its related areas.

Course Outcomes:

Students will be able to

1.	Understand the concepts of CAD and computer graphics system.
2.	Understand the curves and the concept of geometric modeling.
3.	Understand the concept of part families and cellular manufacturing
4.	Understand the concept of CIM and its models.
5.	Write the manual and APT part program for various machining operations
6.	Understand the process of computer aided process planning and various approaches.

UNIT-I	**Introduction:** Product Life Cycle, Design Process, Application of Computers for Design, Benefits of CAD, Computer configuration for CAD Applications, Grover's	(06)

	Model of Product life Cycle for Selection of CAD/CAM. Configuration of graphics workstations, Fundamentals of 2D graphics, Menu design and Graphical, User Interface (GUI), Homogeneous coordinate systems, Geometric transformations, graphics standards.	
UNIT-II	Space Curve design -Analytical and Synthetic approaches, parametric equations, modeling of cubic spline, Bezier curve, B-spline curve and NURBS and their manipulation techniques. Geometric modeling techniques- Wireframes, B-Rep, CSG and Hybrid modelers, Feature based, Parametric and Variation modeling.	(06)
UNIT-III	**Group Technology and FMS** Group Technology: Part families, Part Classification and coding, Cellular manufacturing and composite part concept. Concept of manufacturing systems and automation, automation strategies, concept of machine cell and CMS, Building blocks of FMS Planning and implementations of FMS.	(06)
UNIT-IV	**CIM:** Introduction, ESPRIT - CIM OSA model, The NIST - AMRF Hierarchical Model, The siemens model of CIM, The CIM model of Digital Equipment Corporation, IBM concept of CIM, Present Scenario, Rapid product development and manufacture, Extended Enterprises.	(06)
UNIT-V	**Advanced Manufacturing Techniques:** Principles of Numerical control, Types of CNC Machine Tools, Features of CNC Systems, Direct numerical control (DNC), Elements of CNC viz. Ball screws, rolling guide ways, structure, drives and controls, standard controllers, Virtual machining. Machining Centers and Interpolators. CNC Programming: Types, Manual Part Programming, Canned Cycle, Offset, APT. Introduction to Rapid prototyping, introduction to additive manufacturing	(06)

	techniques.	
UNIT-VI	**Computer Aided Process Planning:** Process Planning and Production Planning, manual experience based planning, Decision table and decision trees, Process capability analysis, Variant and Generative process planning approach, Process planning systems like CAM-I, CAPP, MIPLAN, APPAS, AUTOPLAN and PRO,CPPP Introduction to total integrated process planning systems	(06)
Term work: List of Experiments: 1. Manual part programming using G and M codes for Turning, Step turning, Taper turning, multiple turning, Facing, Multiple facing, thread cutting and radius turning on cylindrical components. 2. CNC Milling program involving linear motion and circular interpolation. 3. CNC Milling program involving contour motion and canned cycles. 4. CNC Milling program involving Pocket milling 5. CNC code generation using any CAM software. 6. Simulation of machining operations using any CAM software. 7. Route sheet generation using CAM software. 8. Study on Rapid Prototyping Technologies.		
Assignments: Six Assignments based on above syllabus. **Oral/Practical** Term work and oral will be based on above syllabus **Text Books / References** • RadhaKrishnan P and Subramanyam, "CAD/CAM/CIM", Wiley Eastern Ltd • M. Groover, E. Zimmers, "CAD/CAM: Computer-Aided Design and Manufacturing", Prentice Hall of India Pvt Ltd, 1995		

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- Mikell P. Grover, “Automation, Production System and Computer Integrated
- Manufacturing”, Prentice Hall of India Pvt Ltd, 1995.
- Zeid Ibrahim, CAD/CAM theory and practices, McGraw Hill international edition.

2009.

- Rogers D. F. and Adams A., Mathematical Elements for Computer Graphics,

  McGraw Hill Inc, NY, 1989.
- Faux I. D. and Pratt M. J., Computational Geometry for Design and Manufacture, John Wiley & sons, NY, 1979
- Mortenson M. E., Geometric Modeling, John Wiley &sons, NY, 1985
- Choi B.K., Surface Modeling for CAD/CAM, John Wiley & Sons, NY, 1991.

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Syllabus for Unit Test

Unit Test 1	Units I , II and III
Unit Test 2	Units IV, V and VI

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Subject : FLUID MECHANICS AND MACHINE TOOL CONTROL SYSTEM		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
Tutorial : 01Hours / Week		01 Credit
	TW/OR : 50 Marks	

Course Pre-requisites:	
The Students should have knowledge of	
1.	Fluids and its properties
2.	Fundamentals of engineering mechanics
3.	Basics of electrical and electronics component
Course Objectives:	
	The student should understand the scope, objective and application of industrial circuits in hydraulic and pneumatic.
Course Outcomes:	
Students will be able to understand	
1.	Used for fluid mechanics fundamentals, including concepts of mass and momentum conservation.
2.	An ability to apply the Bernoulli's equation to solve problems in fluid mechanics.
3.	An ability to apply control volume analysis to problems in fluid mechanics.
4.	Knowledge of laminar and turbulent boundary layer fundamentals.
5.	An exposure to recent developments in fluid mechanics, with application to industries.
6.	An ability to apply the concepts developed for fluid flow analysis to issues in industrial design.

UNIT - I	**Fluid Properties and Fluid Statics:** Definition of fluid, Newtonian and non Newtonian fluids. properties of fluids, Types of fluids, Viscosity, specific gravity, Compressibility, Surface tension, Capillarity etc. effect of temperature and pressure on hydraulic fluid. Pressure at a point, Pascal's law, measurement of pressure, methods, manometers, liquid pressure – horizontal, vertical plane surface.	**(06 Hours)**
UNIT - II	**Fluid Dynamics:** Types of flow, steady and unsteady, uniform and non uniform, streamline flow, laminar and turbulent flow, Use of Reynolds's number in flow through pipes. Continuity equation, energy equation, momentum equation. Euler's equation of motion along a stream line, Bernoulli's equation, Application of Bernoulli's equation to pitot tube, Venturimeter, Orifices, Orifice Meter, Triangular & Rectangular notch. Calculations of flow, friction and work done by fluid under pressure	**(06 Hours)**

UNIT - III	**Fluid power:** Introduction to fluid power: Classification, general feature and application in various fields, hydraulic and pneumatic ISO symbols in fluid power applications Fluids for hydraulic power: functions, properties and conditioning of hydraulic fluids. Sources of fluid power: classification, types and selection of pumps: positive displacement pumps and negative displacement pumps,types ofcompressors. Distribution of fluid power: selection of conductors for system considering various factors, sealing and packing devices	**(06 Hours)**
UNIT - IV	**Control of fluid power:** Pressure control valves- direct acting type, pilot operated, sequence, counter balancing, unloading, pressure reducing, construction and working: Direction control valves- types, construction and working, spool actuation methods, spool centre positions. Flow control valves- compensated and non compensated type, construction and working. Actuators: types, applications and selection	**(06 Hours)**
UNIT - V	**System components and circuits:** Study of various accumulators, intensifiers, hydraulic jack, power jack, etc. Linear and regenerative circuits with accumulators and intensifiers. Study of various hydraulic and pneumatic circuits for machine tools: components, working and applications. Performance of system (descriptive treatment only). Fluid power maintenance and safety. Introduction to fluidics, maintenance and study of simple logic gates,Use of hydraulics V/s Pnuematics in industry.	**(06 Hours)**
UNIT - VI	**Pneumatic system Elements:** Piping materials and pressure ratings, piping layout, calculation of pressure drop in pneumatic line; Air compressors, types, working, selection criteria; FRL unit, construction and working; pneumatic cylinders and air motors, construction and working; types , calculation of force and air consumption of air, hydraulic and electric motor Hydro pneumatic system: concept, working and applications (Descriptive treatment only).	**(06 Hours)**
Term Work/Practical's:		
A journal containing record of any eight experiments of the following: 1. Verification of modified Bernoulli's equation.		
2. flow through orifice/ Venturimeter **3.** At least two experiments on Hydraulic Trainer. 4. Practical performance using Automation Studio Software		

Assignments:	
1. study of symbols used in fluid power	
2.) study of different types of valves used in fluid circuits	
3. Study of actuators / Intensifier/ Accumulators	
4. Design of control circuit for a machine tool.	
5. study of power pack unit	
6. Design of hydraulic and pneumatic circuits.	
Text Books/Reference Books:	
1	Modi, Seth: 'hydraulics and fluid mechanics': standard book house, Delhi
2	Dr. j. lal: 'Fluid mechanics & hydraulics with computer application'. Metropolitan Book co. pvt. Ltd. Delhi
3	Garde, mirajgaonkar : `Engineering fluid mechanics': Nemchand& bros. Roorkee
4	D. A. Pease :`Basic fluid power': Prentice hall
5	H. L. Stewart :`pneumatic & hydraulics': Industrial Press
6	A. Esposito :`Fluid power with application': Prentice hall
7	A. B. Goodwin: `Power hydraulics'.
8	A. B. Goodwin: ` Fluid Power system'
9	Eatons Vickers: `Industrial Hydraulic manual'.
10	Festo's `manual on pneumatic principle, Applications'

Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Subject :ELECTIVE I MARKETING MANAGEMENT		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	

Course Pre-requisites:	
The Students should have	
1.	Basic Management Concept.
2.	Functions of Management.
3.	Principles of Management.
Course Objectives: The objective of this course is to facilitate understanding of the conceptual framework of marketing and its applications in decision making under various environmental constraints.	
Course Outcomes:	
Students will be able to understand	
1.	Structure, functions and strategies of Marketing department.
2.	Design the product marketing and cost for the product marketing.
3.	The distribution channels and their selection.
4.	Importance of Market Segmentation.
5.	Implementation of Marketing Information System & Marketing Research.
6.	Advance tools in marketing and their implementation.

UNIT - I	**Marketing** – Definition, Concepts Significance & functions of Marketing, Approaches to the study of Marketing, Relevance of Marketing in a developing economy. Role & functions of Marketing Manager Marketing mix; Strategic marketing planning – an overview. Introduction to 8P for marketing.	**(06 Hours)**
UNIT - II	**Product Decisions**: Concept of a product; Classification of products; Major product decisions; Product line and product mix; Branding; Packaging and labeling; Product life cycle – strategic implications; New product development and consumer adoption process. **Pricing Decisions**: Factors affecting price determination; Pricing policies and strategies; Discounts and rebates.	**(06 Hours)**
UNIT - III	**Distribution Channels and Physical Distribution Decisions**: Nature, functions, and types of distribution channels; Distribution channel intermediaries; Channel management decisions; Retailing and wholesaling.	**(06 Hours)**

	Factors influencing channels, Elements of Promotion Mix – Sales Promotion System. Recent Trends in Promotion Sale. Advertising – Role of Advertising, Advertising Media, B to B and online marketing.	
UNIT - IV	**Market Segmentation** Meaning, Definition, Different ways to Segmentation, Essential of effective Market Segmentation, Destination between Differential Marketing & Concentrated Marketing.	**(06 Hours)**
UNIT - V	**Marketing Information System & Marketing Research.** Concept & components of a Marketing Information System – Marketing Research – Meaning & scope – marketing research procedure – types & techniques of Marketing Research – Managements use of Marketing Research.	**(06 Hours)**
UNIT - VI	**Issues and Developments in Marketing**: Social, ethical and legal aspects of marketing; Marketing of services; International marketing; Green marketing; Cyber marketing; Relationship marketing and other developments of marketing.	**(06 Hours)**

Assignments:

1. Six Assignment based upon above syllabus

Text Books/Reference Books:

1	Kotlar, Philip, Marketing Management, Prentice Hall, New Delhi.
2	Stanton, Etzel, Walker, Fundamentals of Marketing, Tata-McGraw Hill, New Delhi.
3	Saxena, Rajan, Marketing Management, Tata-McGraw Hill, New Delhi.
4	McCarthy, E.J., Basic Marketing: A managerial approach, Irwin, New York.
5	John Frain., Principles and practice of Marketing
6	Kanuk , Consumer Behavior By Schiffman
7	Davis – Olsan , Marketing Information System
8	Gandhi , Marketing – A Managerial Introduction

Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Subject :ELECTIVE I DESIGN FOR MANUFACTURING AND ASSEMBLY		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	

Course Pre-requisites:		
The Students should have		
1.	Basic Knowledge of Manufacturing processes.	
2.	Knowledge of Materials and its properties.	
3.	Knowledge of Casting and metal extrusion.	
Course Objectives:		
	To make the student well conversant with the relations between design for manufacturing and design for assembly.	
Course Outcomes:		
Students will be able to understand		
1.	The steps in DFMA.	
2.	Carry out sand castings and manufacture powder metallurgy products.	
3.	The process of design for machining.	
4.	The process for metal extrusion and forging	
5.	The process for assembly	
6.	The use of CAD in DFMA	
UNIT - I	**Introduction to DFMA:** History of DFMA, Steps for applying DFMA during product design, Advantages of applying DFMA during product design, Reasons for not implementing DFMA, Introduction to Manufacturing Process: Classification of manufacturing process, Basic manufacturing processes, Mechanical properties of material: Tensile properties, Engineering stress-strain, True stress strain, Compression properties, Shear properties, Introduction to materials and material selection: Classification of engineering materials, Material selection for product design	**(06 Hours)**
UNIT - II	**Sand casting:** Introduction to sand casting, Typical characteristics of a sand cast part, Design recommendation for sand casting, Investment casting: Introduction, Steps in investment casting, Design consideration of Investment casting, Typical characteristics and applications, Die casting: Introduction to die casting, Advantages of the die casting process, Disadvantages of the die casting process, Applications, Suitable material consideration, General design consideration, Specific design recommendation, Injection moulding: Introduction	**(06 Hours)**

	to injection moulding, Typical characteristics of injection moulded parts, Effect of shrinkage, Suitable materials, Design recommendations, Design for powder metal processing: Introduction to powder metal processing, Typical characteristics and applications, Limitations, Design recommendations.	
UNIT - III	**Design for machining:** Introduction to machining, Recommended materials for machinability, Design recommendations, Design for tuning operation: Process description, Typical characteristics and applications, Suitable materials, Design recommendations, Design for machining round holes: Introduction, Suitable materials, Design recommendations, Recommended tolerances, Parts produced by milling: Process description, Characteristics and applications of parts produced on milling machines, Design recommendations for milling, Dimensional factors and tolerances, Parts produced by planning, shaping and slotting: Process description, Design recommendation planning, Design for broached parts: Process description, Typical characteristics of broached parts, Suitable materials for broaching, Design recommendations.	**(06 Hours)**
UNIT - IV	**Metal Extrusion:** Process, Suitable material for extrusion, Design recommendation for metal extrusion, Metal stamping: Process, Characteristics and application of metal stamping, Suitable materials for stamping, Design Recommendations for metal stamping, Fine blanked parts: Fine blanking process, Material suitable for fine blanked parts, Design recommendations for piece parts, Rolled formed section: Process, Design recommendations rolled section, Impact or cold extrusion: Process, Design recommendations for backward extrusion, Forward extrusion: Process, Design recommendations for forward extrusion, Design for Forging: Forging processes, Forging nomenclature, Suitable materials for forging, Design recommendations, Metal injection moulded parts: Process, Materials suitable, Design recommendations for metal injectionmolded parts.	**(06 Hours)**
UNIT - V	**Introduction to Assembly:** The assembly process, Characteristics and applications, Example of common assembly, Economic significance of assembly, General taxonomies of assembly operation and systems, Assembling a product, Design for Assembly: Introduction, Design consideration, Design for Fasteners: Introduction, Design recommendation for fasteners.	**(06 Hours)**
UNIT - VI	**Introduction to CAD:** Geometric Representation in CAD, Extraction of part feature	**(06 Hours)**

	information from CAD Model: Introduction, Feature recognition techniques, Free Form Features, Hybrid Techniques, Reference, Extraction of assembly feature information from CAD Model: Introduction, Assembly features, Definition of assembly feature attributes, Characterization of assembly feature, Examples of Assembly feature, Overview of procedure to extract assembly features from CAD model of Assembly, Description of steps in the assembly feature extraction procedure, Examples of assembly feature extraction: Aircraft wing and automotive chassis assembly.	

Term Work/Practical's:
1. Introduction to DFMA
2. Sand casting and Powder metallurgy
3. CAD
Assignments:
1. Design for Machining
2. Metal Extrusion and Forging
3. Design for Assembly

Text Books/Reference Books:	
1	A.K. Chitale and R.C. Gupta, (1999) Product design and Manufacturing, Prentice Hall of India, New Delhi.
2	J. Lesko, (1999) Industrial Design, Materials and Manufacture Guide, John Willy and Sons, Inc
3	George E. Dieter and Linda C. Schmidt (2009), Engineering Design, Fourth edition, McGraw-Hill companies, New York, USA
4	Geoffrey Boothroyd, Peter Dewhurst and Winston Knight (2002) Product Design for Manufacture and Assembly, Second Edition, CRC press, Taylor & Francis, Florida, USA
5	O. Molloy, S. Tilley and E.A. Warman (1998) Design for Manufacturing and assembly, First Edition, Chapman &Hall, London, UK.
6	D. E. Whitney, (2004) Mechanical Assemblies: Their Design, Manufacture, and Role in Product Development, Oxford University Press, New York
7	A.K. Chitale and R.C. Gupta, (1999) Product design and Manufacturing, Prentice Hall of India, New Delhi.
8	James G. Bralla (1998) Design for Manufacturability Handbook, Second Edition, McGraw-Hill companies, New York, USA
9	Geoffrey Boothroyd (2005) AssemblyAutomation and Product Design, Second Edition, CRC press, Taylor & Francis, Florida, USA
10	G. Q. Huang (1996) Design for X, Concurrent Engineering Imperatives, First Edition, Chapman &Hall, London, UK A joint venture by IISc and IITs, funded by MHRD, Govt of India

Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Subject : ELECTIVE I NON TRADITIONAL MANUFACTURING		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	

Course Pre-requisites:

The Students should have

1.	Conventional manufacturing Processes
2.	Engineering materials and its properties
3.	Basics of electrical, thermal and chemical energy.

Course Objectives:

	To learn about various unconventional machining processes, the various process parameters and their influence on performance and their applications

Course Outcomes:

Students will be able to understand

1.	Appreciate use of nonconventional machining methods
2.	The working principles and working parameters of mechanical processes.
3.	Electrochemical and electro chemical grinding processes.
4.	Various techniques in chemical machining process
5.	Terminology used in (EDM) nontraditional manufacturing industries.
6.	Various techniques in laser beam machining.

UNIT - I	**INTRODUCTION:** Non Traditional machining, Definitions of various processes. Classification of NCMP, Historical background of New - Technological processes.	**(06 Hours)**

UNIT - II	**MECHANICAL PROCESSES:** Processes principles, equipment process Parameters and applications. Examples of Abrasive jet machining, Ultrasonic machining, Abrasive flow machining, water jet machining, magnetic abrasive machining. Evaluation of material removal rate (MRR) in AJM	**(06 Hours)**
UNIT - III	**ELECTRO CHEMICAL MACHINING (ECM):** Background of ECM process, Classification of ECM processes introduction to ECD fundamental principles of ECM. Electrochemistry of ECM, Equipment required in ECM. Process capabilities processes parameters and application examples. Trouble shootings. Evaluation of MRR of pure metal in ECM. ELECTRO CHEMICAL GRINDING: Process principles, process parameters, Applications.	**(08 Hours)**
UNIT - IV	**CHEMICAL MACHINING:** Introduction, Fundamental principles, process parameters, classification and Selection of etchant resistant materials, Photo chemical machining	**(04 Hours)**
UNIT - V	**ELECTRICAL DISCHARGE MACHINING (EDM):** Fundamental principle of EDM, Equipments required for EDM process Parameters, process capabilities. Application example trouble shooting, Introduction to wire EDM, Process principle and parameters, process Capacities and its applications.	**(06 Hours)**
UNIT - VI	**LASER BEAM MACHINING (LBM):** Introduction, Background of laser action, production of photon cascade in solid optical laser. Machining applications of laser wire drilling, cutting, marking, welding, heat treating, cladding. Introduction and process principle of thermal energy method, EBM. **PLASMA ARC CUTTING (PAC):** Process principles, equipment, applications, and examples	**(08 Hours)**
Term Work/Practical's: List of Practical (Any Eight) **1) study and demonstration of ECM** **2) Study and demonstration on EDM** **3) study and demonstration of ECDM**		

4) study and demonstration of ECM with ultrasonic vibrations	
Assignments: - Six assignments based on above syllabus	
Text Books/Reference Books:	
1	Vijay.K. Jain "Advanced Machining Processes" Allied Publishers Pvt. Ltd., New Delhi, 2007
2	Benedict. G.F. "Nontraditional Manufacturing Processes" Marcel Dekker Inc., New York (1987).
3	Pandey P.C. and Shan H.S. "Modern Machining Processes" Tata McGraw-Hill, New Delhi (2007).
4	Mc Geough, "Advanced Methods of Machining" Chapman and Hall, London (1998).
5	Paul De Garmo, J.T.Black, and Ronald.A.Kohser, "Material and Processes in Manufacturing" Prentice Hall of India Pvt. Ltd., New Delhi ,8th Edition, 2001.

Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI