DAYANANDA SAGAR UNIVERSITY

SCHOOL OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
B.Voc in Tool Engineering

OVERALL SYLLABUS

B.Voc in Tool Engineering

Semester – 1

General Education Components: 12 Credits,180h				
Sl.No.	**Subject Code**	**Subject Name**	**Credits**	**Hours**
1.	17VT101	English-I	2	30
2.	17VT102	Mathematics-I	2	30
3.	17VT103	Applied Science	2	30
4.	17VT104	Production Technology -I	3	45
5	17VT105	Quality Management-I	3	45
Skill Components :18 Credits,270h				
1.	17VT106	Engineering Drawing and CAD-I	6	90
2.	17VT107	Work Shop -I	9	135
3.	17VT108	Quality Management lab-I	3	45

Semester – 2

General Education Components :12 Credits,180h				
Sl.No.	**Subject Code**	**Subject Name**	**Credits**	**Hours**
1.	17VT201	English-II	2	30
2.	17VT202	Mathematics-II	2	30
3.	17VT203	Production Technology – II	2	30
4.	17VT204	Basic Electrical & Electronics	2	30
5	17VT205	Material Technology-I	2	30
6	17VT206	Quality Management-II	2	30
Skill Components :18 Credits,270h				
1.	17VT207	Engineering Drawing and CAD-II	5	75
2.	17VT208	Work Shop-II	8	120
3.	17VT209	Electrical & Electronics lab	2	30
4.	17VT210	Quality Management lab-II	3	45

B.Voc in Tool Engineering

Semester – 3

General Education Components: 12 Credits,180h				
Sl.No.	**Subject Code**	**Subject Name**	**Credits**	**Hours**
1	17VT301	Production Technology -III	2	30
2	17VT302	Material Technology & Heat Treatment	2	30
3	17VT303	Strength of Materials-I	2	30
4	17VT304	Press Tool Technology-I	2	30
5	17VT305	Jigs & Fixtures	2	30
6	17VT306	Quality Management-III	2	30
Skill Components :18 Credits,270h				
7	17VT307	Work Shop –III	6	90
8	17VT308	Tool design drawing-I	6	90
9	17VT309	Materials laboratory	4	60
10	17VT310	Quality Management lab-III	2	30
Audit Course				
11	17VT311	Constitution and Ethics		

Semester – 4

General Education Components :12 Credits,180h				
Sl.No.	**Subject Code**	**Subject Name**	**Credits**	**Hours**
1.	17VT401	Mould technology	2	30
2.	17VT402	Production technology-IV	2	30
3.	17VT403	Strength of Materials-II	2	30
4.	17VT404	Press Tool Technology-II	2	30
5	17VT405	Pneumatic & Hydraulics	2	30
6	17VT406	CNC Technology	2	30
Skill Components :18 Credits,270h				
7	17VT407	Work Shop -IV	8	120
8	17VT408	Tool design drawing-II	4	60
9	17VT409	Pneumatic & Hydraulics Lab	6	90
Audit Course				
10	17VT411	Kannada Language*		

B.Voc in Tool Engineering

Semester – V

General Education Components: 12 Credits,180h				
Sl.No.	**Subject Code**	**Subject Name**	**Credits**	**Hours**
1.	17VT501	Press Tool Technology-III	03	45
2.	17VT502	Mould Technology-II	03	45
3.	17VT503	Production Management control	02	30
4.	17VT504	CNC Technology	02	30
5	17VT51X	Elective-I	02	30
Skill Components :18 Credits,270h				
1.	17VT506	Tool Design Drawing-III	06	90
2.	17VT507	Workshop Practical-V	06	90
3.	17VT508	Injection mold and press tool design using CAD Software	06	90

Audit Course:

1	17VT509	Environmental Science	---	15

Course Code	**Elective-I**
17VT511	Advanced Mold Techniques
17VT512	Additive Manufacturing

Semester – VI

General Education Components :12 Credits,180h				
Sl.No.	**Subject Code**	**Subject Name**	**Credits**	**Hours**
1.	17VT601	Press Tool Technology-IV	03	45
2.	17VT602	Mould Technology-III	03	45
3.	17VT603	Estimation & Costing	02	30
4.	17VT604	Industrial Management	02	30
5	17VT61X	Elective -II	02	30
Skill Components :18 Credits,270h				
1.	17VT606	Tool Design Drawing-IV	06	90
2.	17VT607	Workshop Practical-VI	04	60
3.	17VT608	Project work	08	120

Course Code	**Elective-II**
17VT611	Lean Manufacturing Systems
17VT612	Quality and Reliability Engineering

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OVERALL SYLLABUS

B.VOC FIRST SEMESTER SYLLABUS

Course code: 17VT101 Total Hours: 30 hrs	ENGLISH-I	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to enable students : 1. To improve their lexical, grammatical competence. 2. To enhance their communicative skills. 3. To equip students with oral and appropriate written communication skills. 4. To inculcate students with employability and job search skills.				
Course Outcomes	Students after the completion of this course will be able to : 1. Achieve proficiency in English 2. Demonstrate good oral and written communication skills 3. Write resume with reasonable competence				

Module 1

Understanding the alphabet, Middle and last alphabet, Final consonants, Capital & Small letters , Basic punctuation, Reading activity. Articles- 'a', 'an', & 'the, Reading activity, Writing in patterns, Reading activity, Common nouns, Proper nouns, Singular and plural nouns, writing short sentences, Reading activity. Masculine and feminine nouns.
Description of simple objects like a note book, a pen, a watch, a switch etc, Pronouns, Reading activity, Adjectives. **05Hrs**

Module 2

Vocabulary- simple, Articles and diterminers, Information in order,Common noun, Singular and plural noun, Countable and uncountable nouns, Masculine and femine nouns, Proper nouns. Pronouns. Using word families. Adjectives, Adverbs, Verb- "Be",Prepositions, Questions, Have, Has, Do, Does, Did, Tenses, Making sentences, Connectors.

05Hrs

Module 3

Common noun, Proper noun, Singular and plural, Forming plurals. Possessives, Syllables, Hidden words and silent words, Using prefixes and suffixes, Proof reading for spelling errors, Adjectives of numbers- cardinal and ordinal. Action verb, Simple present tense, Simple past tense, Formation of past tense. Questions, Negative sentence, Contractions. Types of sentences. **05Hrs**

Module 4

Common and proper noun, Collective and abstract noun, Possessive noun, Noun numbers, Adjective of quality, Adjective of number, Parts of speech. Infinitives, Tense formation, Active and passive voice, Direct and indirect speech, Writing in time, Pick a noun, Using relative pro nouns, Reading activity, Writing activity. Reading activity. Conjunctions, writing activity, Reading activity, Types of adverbs. Comparison of adverbs, short talk, Writing activity- writing an autobiography Degrees of comparison, Reading activity, Auxiliary verb or models. Homophones, The gerund, Transitive and intransitive verbs. Tag questions, Simple conversation, Question answer session

07Hrs

Module 5

Sentence transformation- simple, compound, complex Common errors in English. Synonyms & Antonyms; one word substitutions.

Communication- definition-basic purpose- types- process Skills in communication- reading skills-guidelines, definition-types, Listening skills: definition-essentials for good listening- barriers-difference, between hearing & listening, Speaking skills- guidelines for effective oral communication, Writing skills- guidelines.

speaking skill- activity, listening skill – activity

Business correspondence – ii: Layout & form, Types of letters: letter of request, letter of complaint, letter of enquiry

Graphic communication: Definition, types & uses uses/Interpreting graphs and figures/Drawing, graphs using a set of information**.** **08Hrs**

Text Books:

1. English Communication - TTTI Publication
2. A Practical English Grammar - A J Thomson
3. Intermediate English Practice - Pitt. S. Corden
4. Modern Business Letter Writing - J.S Bright
5. English without tears – Bhat

Reference Books:

1. Day.RA., Scientific English: A Guide for Scientists and Other Professional, 2nd ed. Hyderabad: Universities Press,2000.

Course code: 17VT102 Total Hours : 30 hrs	MATHEMATICS-I	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to make the students : 1. Exposed to fundamentals of Mathematics including fractions, Logarithms, Matrices & Determinants 2. Understand concepts of Complex Numbers & Trigonometry and their applications in engineering 3. Understand the basics of differentiation and differential calculus and solve application 4. Apply the concepts of mathematics to engineering problems.				
Course out comes	Upon successful completion of this course, the trainee will be able to: 1. Analyze and apply mathematical equations 2. Solve mathematically technical problems 3. Apply the concepts of mathematics to engineering problems.				

Module 1

Fundamentals of Mathematics- Fractions-Definition, Types of fractions, Algebra of fractions (Addition, Subtraction, Multiplication and Division), Use of Logarithmic table, Simple problems, Logarithmic laws, Indices and Laws of Indices, Solution of linear equations, Solutions of Quadratic equations-Factorization, Using formula.

05 Hrs

Module 2

Matrices and determinants-Definition of matrix and its types and matrix algebra, Problems on matrices addition, subtractions and multiplication, Transpose of a Matrix, Definition of determinant and its Evaluation, Properties of determinants.(Without Proof), Minors, Co-factors and Adjoint of a matrix, Inverse of a matrix, Solution of linear simultaneous equations using determinant method (Cramer'sRule).

05Hrs

Module 3

Complex numbers-Introduction of complex numbers, Representation of complex numbers, Algebra of complex numbers, Polar form of complex numbers, Exponential form of complex, Exercises on polar and exponential forms. **04 Hrs**

Module 4

Trigonometry-Defining the trigonometric functions, finding trigonometric values, Values of the trigonometric functions of 30°, 45°, 60° and 90°, Trigonometric functions of any angle and signs of trigonometric functions, Exercises on signs of trigonometric functions, Trigonometric identities, Exercises on trigonometric identities, Compound angles (sum or difference of two angles without proof), Exercises on compound angles, Multiple and Sub-Multiple angles, Exercises on multiple and sub multiple angles, Product formulae (No Problems), Heights and distances, Exercises on heights and distances(Simple Problems), Graphs of Trigonometric functions(Only Sin and Cos). **08 Hrs**

Module 5

Differential calculus- Limits definition and evaluation of limits (No derivations), Types of functions (only odd and even functions), Definition of derivative of a function and slope of tangent of the curve, Differentiation of algebraic and exponential funtions(Without Proof), Differentiation of trigonometric functions (Without Proof), Differentiation of sum, difference, product quotient of functions, Exercises on derivations of sum, difference, product, quotient of functions, Exercises on derivative of trigonometric functions, Derivatives functions of functions rule,Derivatives of inverse function, Differentiation of parametric equations, Successive differentiation, Application of differentiation-velocity and acceleration. **08 Hrs**

Text Books

1. Technical mathematics - Rice and Knight,Mc-Graw Hill Book he.
2. Applied mathematics for Polytechnics-H.K.Dass

Reference Books

1. Higher Engineering mathematics-B.S.Grewal
2. Higher Secondary Mathematics.

Course code: 17VT103 Total Hours: 30 hrs	APPLIED SCIENCE	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to make the students understand : 1. Usages of SI units and laws of motion 2. Composition and resolution of forces and condition of equilibrium 3. Understand properties of solids and fluids 4. Understand physics of heat transfer 5. acidic, basic and neutral nature of solutions 6. Basics of Industrial and Organic Chemistry 7. Fundamentals of Modern Physics, Wave motion and Laser technology				
Course Outcomes	After successful completion of the course, the students should be able to : 1. Understand fundamentals of Force, Motion & Energy and Laws governing them 2. Apply concepts of resolution of forces and Principles of Equilibrium 3. Understand properties of solids & fluid and physics of heat 4. Understand basics of industrial & organic chemistry and their applications 5. Understand fundamentals of Modern Physics, Wave motion and Laser technology				

Module 1

Physical World: Physical quantities, Types of systems of units, Fundamentals and derived quantities, S.I. Units, Dimensions. Force, Motion and Energy: Linear motion, Displacement, velocity, acceleration, Equations of motion, Problems, Newton's law of motion, Momentum, Law of conservation of momentum, Force, inertia, Work, power, energy, Law of conservation of energy, Circular motion, Angular displacement, angular velocity angular acceleration. **06 Hrs**

Module 2

Composition and resolution of Forces: Definition of composition, resultant, equilibrant, Law of parallelogram of forces, Triangle law of forces, Polygon law of forces. Equilibrium of forces: Introduction, System of forces, Principal of equilibrium,

Lamis theorem, Problems, Moments and its applications, Couple. Center of gravity & Moment of Inertia: Introduction, Centroid of plane figures, Methods of finding out centre of gravity of plane, Axis of reference, Problems, Center of gravity of solid bodies, Moment of inertia of an irregular plane area. **06 Hrs**

Module 3

Properties of solids and fluids: Plasticity, Elasticity, Stress, Strain, Hooke's Law, Young's modulus, Bulk modulus, Rigidity modulus, Surface tension, Capillarity, Viscosity. Heat: Definition of heat, Thermometry, Platinum resistance thermometer, Thermocouple, Pyrometer, Calorimetry, Specific heat capacity, Heat transfer, Expansion of gas. **06 Hrs**

Module 4

Theory of Acids and Bases: Introduction, Hydrogen ion Concentration (pH Value)
Industrial Chemistry: Corrosion, Types of corrosion, Industrial Water, Disadvantages of using hard water in industry. Organic chemistry: Introduction, Aliphatic hydrocarbons, Aromatic hydrocarbons (Benzene hydrocarbons), Nuclear Fission - Phenomenon of fission with example, Nuclear fusion - Phenomenon of fusion with example. **06 Hrs**

Module 5

Modern physics: structure of atom with schematic diagram, radio activity, nuclear fission, nuclear fusion. Wave motion: simple harmonic motion, relation between wave velocity, frequency and wave length, newton's laplace equation for velocity of sound.
Laser: meaning, materials used, types, working principle, application, reflection, refraction, optical fiber, types, working principle, application. **06 Hrs**

Text Books:

1. Applied Science (Physics and Chemistry) - TTTI, Madras
2. Applied Mechanics and Strength of Material - R.S. Khurmi
3. Text book of Applied Mechanics – Ramamrutham

Reference Books:

1. Engineering Mechanics (Statics & Dynamics) - Irving H.Shames
2. Engineering Mechanics - S.Timoshinko & Young

Course Code: 17VT104 Total Hours :45 hrs	PRODUCTION TECHNOLOGY - 1	L	T	P	C
			-	-	3
Course Objectives	The objective of this course is to make the students : 1. Importance of Safety precautions 2. Understand usage of fitting tools 3. Understand tool nomenclature and metal cutting theory 4. Comprehend various drilling operations including counter boring, counter sinking, reaming and tapping 5. Understand various parts of Lathe machine and its basic operations				
Course outcomes	Students after the completion of this course will be able to : 1. Explain basic machine tools for various machining operations 2. Understand machining parameters on surface finish, type of operations, production and tool life 3. Interpret type of tools for suitable machining operations based on machining parameters 4. Identify machine tools, operation and other condition for industrial machining components 5. Choose correct manufacturing process for a				

Module 1

Safety - Causes of accidents: Lack of interest, poor judgment, lack of confidence, lack of knowledge, overconfidence, poor physical fitness, personal problem, improper working environment. General Safety Precautions. **08 hrs**

Module 2

Manual Metal working: Metal working hand tools, devices, specification, types and applications- Work bench, vices, files, hammer, hacksaw, chisels, spanners, screw driver, scrapers. **08hrs**

Module 3

Metal cutting Theory: Metal cutting theory-speed, feed, depth of cut, shear plane Nomenclature of single point cutting tool-significance of positive, negative and zero rake angles different tool angles. **09 hrs**

Module 4

Drilling - Drills: Nomenclature of twist drill- types of drills-material of drill - sharpening of drills - drill size designation - designation drill according to Indian standard system(IS:599). Drilling machines: Different types of drilling machines, specification of a drilling machine, work holding devices, Tool holding devices, drilling machine mechanism, drilling machine operations, drilling time calculation. **10 hrs**

Module 5

Counter boring, counter sinking, reaming and tapping. Counter boring: Importance, Types of counter bores. Reamer: Hand reamer, machine reamer, reaming operation. Taps: Different types of taps, nomenclature of taps, tapping operation. Die:Types of Dies -solid die–split die-die stock-die passing operation. Lathe: Parts of Lathe, Types of lathe, lathe operations. **10hrs**

Text books

1.Serope Kalpak Jian; Steven R. Schmid (2010), Manufacturing Engineering and Technology, 6th Edition, Publisher: Prentice Hall, ISBN-10 0-13-608158-1, ISBN- 13 978-0-13-608158-5.

2.P.N. Rao. (2009), Manufacturing Technology – Foundry, Forging and Welding, Tata McGraw Hill Publishing Company Ltd., New Delhi.

Reference books

1.M P Groover (2007), Fundamentals of Modern manufacturing (materials, processes and systems) third edition, Wiley publications, ISBN-978-0-471-74485-6, USA

Course code: 17VT105 Total hours: 45	QUALITY MANAGEMENT-I	L	T	P	C
			-	-	3
Course objectives	The objective of this course is to make the students : 1. Understand terminology in Metrology and usage of measurements in industry 2. Familiarize with different measuring instruments and their working principles 3. Familiarize about marking and marking tools 4. Understand bore/hole measurement techniques 5. Exposed to different types of gauges 6. Use of slip gauges and their applications				
Course outcomes	Students after the completion of this course will be able to : 1. Understand the various terms and parameters used in measurements 2. Demonstrate knowledge on different measuring devices & instruments				

Module 1

Introduction to Metrology: Meaning of Metrology - objective of metrology, Importance of inspection in Industry– Quality Control, Units and Measurements – Definitions – Supplementary Units - S.I units The Do's and Don'ts, Precision vs. Accuracy. **10 hrs**

Module 2

Linear Measurements: Steel rules - steel tape, Types of Calipers: types of joints, legs – Transfer calipers –, Principle of Vernier, Vernier - Least count 0.1, 0.5 and 0.02, Vernier caliper- Vernier depth gauge- Vernier height gauge- Gear tooth Vernier, Micrometer – Screw thread micrometer – Dial indicating Micrometer – V anvil micrometer, Error on micrometer, **08 hrs**

Module 3

Marking and Marking Tool: Purpose of marking, Systems of marking: rectangular - polar- Jenny calipers, Tools for marking: surface plate - marking stand -scriber - divider - Vblock - angle plate – trammel.Bore measuring instruments: Bore gauge, Telescopic gauge, Hemi-spherical gauge. **10 hrs**

Module 4

Gauges: Classification: According to type - standard and limit, according to purpose - workshop - inspection – reference according to the elements to be checked- gauge for checking holes - shafts - tapers - threads – forms, Plug gauge - snap gauge - taper gauge - thread gauge - profile gauge - radius gauge - feeler gauge - plate and wire gauge, Material for gauge: requirements of good gauge material – HCS case hardened steel) cast steel -plated gauges - Invar - Elinvar -other alloy steels.

10 hrs

Module 5

Slip gauge: Description of slip gauge - number of blocks in standard sets – wringing property - grades - reference grade - inspection grade - calibration grade - workshop grade, Manufacturing of slip gauges-heat treatment to make wear resistant seasoning to ensure stability- lapping at 200^{0} C. **07 hrs**

Text Books:

1. Beckwith Marangoni and Lienhard, "Mechanical Measurements", Pearson Education, 6th Edition, 2006.
2. A. K Sawhney, "A course in Mechanical Measurements and Instrumentation", Dhanpat Rai Publications.
3. Mechanical and Industrial measurements - R.K Jain

Reference books

1. Alan S. Morris, "The Essence of Measurement", Prentice Hall of India, 1997
2. Beckwith T.G, and N. Lewis Buck, "Mechanical Measurements", Addison Wesley, 1991
3. Ernest O. Doebelin, "Measurement Systems Applications and Design",5th Ed., McGraw Hill Book Co.
4. N. V. Raghavendra and Krishnamurthy, "Engineering Metrology and Measurement", Oxford University Press.

Course Code17VT106 Total Hours : 90 hrs	ENGINEERING DRAWING AND CAD-I	L	T	P	C
			-		6
Course objective	The objective of this course is to make the students : 1. Understand the importance of engineering drawing and application of computer. 2. use engineering drawing instruments competently 3. Competency to write engineering script. Understand the importance of SP46 standards 4. Ability to construct &understand standard geometrical shapes. 5. In depth practice of pictorial projection with example. & in depth practice of orthographic projection with example. 6. Understand the Importance dimensioning in engineering drawing practicewith examples				
Course outcome	Students after the completion of this course will be able to: 1. Analyze and design the basic electronic circuits containing semiconductor devices. 2. Identify the need of Integrated Circuits and use the mineralizing circuit applications. 3. Analyze and implement basic Digital Electronic circuits for a given application. 4. Identify the applications and significance of electronics in interdisciplinary engineering domains.				

Module -1

Introduction - engineering drawing: Importance of engineering drawing & role of drawing in engineering education, engineering drawing equipment's, Basic drawing instruments T-square, Set Square. Compass, dividers, mini drafter pro-circles, Drawing board & pencil. Introduction to computer aided drafting Importance of computer aided drafting, menu selection, begin new drawing editing existing menu selection practice on computers. Basics of engineering drawing: Features' of lettering (Selection of suitable size of letters & numbers as per SP 46). Introduction to CAD. By using screen menu, tool bar &cursor menu, button menu Practice on computer. Exercises: Writing notes in engineering script. Introduction & explanation on utility commands, Help, End, Quit,

Save, Limits, Units, function key & Drafting setting practice. Drawing sheet sizes, (as per SP 46).Scale, full scale, reduced scale, Enlarged scale (as per SP 46) lines (As per SP 46). Introduction to entity draw commands Line, absolute, relative, polar co-ordinates, direct distance entry, Points, Undo, redo, and Move. Practice on computers Title block & sheet layout, (As per SP 46) **30 Hrs**

Module -2

Dimensioning: Importance of dimensioning, Elements of dimensioning &general rules of dimensioning size of arrowhead , placing of dimension line ,projection line , value of dimension &leader lines, System &method of indicating dimensions, Arrangement of dimensions chain dimensioning, parallel dimensioning, superimposed dimensioning, combined dimensioning, superimposed dimensioning & co-ordinate dimensioning, Special indication for dimensions (dimensioning practice). **15 Hrs**

Module -3

Geometric construction: Arc joints, by using compasses, exercises, Line joints. [Circle, arc, polygon ellipse hatch Practice on computers. 1 h for computers], Terminology of different shape, Bisecting an angle ,bisecting a line, finding a center of given circle &divide a line equal and un equal Conic section Construction of ellipse. Arc intersecting method, understand about parabola& hyperbola, cycloid construction, helix construction &understand about involute, [layers, line type properties modify command erase , copy mirror ,offset Practice. **15 Hrs**

Module 4

Projection: Introduction about projections. Practice on computers. [Array, rotate, scale, trim, extend, break2 h for computer] Isometric drawings, steps involved in preparing, construction of circle in isometric view isometric drawings. Practice on computer [chamfer, fillet, stretch, explode2 h for computer] Exercise on Isometric drawings. From the reference of direct isometric view Practice on computer [edit and display command, isometric snap, object snap, iso plane. **15 Hrs**

Module 5

Ortho graphic projections, planes of projections, first angle projection and third angle projection, why second angle and fourth angle not used in engineering drawing, construction details of front view top view and side view in first angle projection Exercise on orthographic projection. Practice on computer, Exercise on Isometric drawings. From the reference of orthographic view, Identification of view & missing view. **15 Hrs**

Note: All the drawing exercises are performed using AutoCAD.

Textbook:

1. Machine drawing - P I Varghese and K.C John
2. SP46 - BIS
3. Engineering Drawing - N.D. Bhatt
4. IS 696 - BIS
5. IS 8000 - BIS

Reference books:

1. PSG Hand book - PSG
2. CMTI Hand book

Course Code: 17VT107 Total Hours: 135	WORK SHOP-1	L	T	P	C
			--		9
Course objective	The objective of this course is to make the students : 1. Aware of safety aspects in handling of fitting tools and equipment and create different fitting joints 2. Fabricate various metal joining process including soldering, brazing and welding joints 3. Learn basics of development and create sheet metal models				
Course outcome	Students after the completion of this course will be able to : 1. Demonstrate fitting skills and create fitting joints 2. Exhibit welding, soldering & brazing skills and create models				

1. Fitting: Study of fitting tools, carry out fitting work of models involving rectangular, Triangular, semi-circular and dovetail joints.
2. Welding: Study the joining process (Welding) and carry out Welding exercises of Butt joint, Lap joint, T joint and L-joint.
3. Sheet Metal: Fabricate simple shapes using sheet metal.
4. To Perform Various Operations on a Lathe Machine
5. To Perform Various Operations on a Drilling Machine

Text Books:

1. DSU Work shop manual.

Course code: 17VT108 Total Hours: 45 hrs	QUALITY MANAGEMENT LAB-I	L	T	P	C
		-	-		3
Course Objectives	Students after the completion of this course will be able to: 1. Introduce the students to the need, standards and principles of measurement. 2. Introduce the students to the principles of various mechanical elements – such as screws, threads and gears. 3. Provide the students the basics of measurements systems.				
Course outcomes	Students after the completion of this course will be able to: 1. The purpose of this course is to provide the student with a basic understanding of the theory and practice of measurement and instrumentation. 2. Recognize the basic elements of common measurement systems. 3. Be able to estimate the accuracy of a measurement, identify possible sources of Measurement errors.				

1. **Calibration of Micrometer** - To calibrate the given micrometer using slip gauge, draw the calibration curve and to evaluate the errors occurred.
2. **Calibration of Vernier caliper and measurement of the given component** - To calibrate and measure the given component by using Vernier caliper.
3. **Measurements using Optical Profile Projector** – To measure the screw thread parameters of a given specimen using Optical Profile projector.
4. **Measurements using Toolmaker's Microscope** - To measure the screw thread parameters of a given specimen using Tool Maker's Microscope.
5. **Measurements of angle using Sine bar** - To determine the unknown angle of the given specimen using sine bar with the help of slip gauge.
6. **Measurements of angle using universal bevel protractor** - To determine the unknown angle of the given specimen using universal bevel protractor.
7. **Measurements of Screw thread parameters using two wire or three-wire methods** - To find the effective diameter of a given screw thread by two or three wire method.

8. **Measurements of surface roughness parameters using mechanical comparator** - To measure the various surface roughness parameters of the components using mechanical comparator (dial gauge indicator)
9. **Measurements of gear tooth profile using gear tooth Vernier caliper** - To Measure the tooth thickness of the given gear using Gear Tooth Vernier Caliper.

Text Books:

DSU Metrology Manual

B.VOC SECOND SEMESTER SYLLABUS

Course code: 17VT201 Total Hours: 30 Hrs	English-II	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to enable students : 5. To improve their lexical, grammatical competence. 6. To enhance their communicative skills. 7. To equip students with oral and appropriate written communication skills. 8. To inculcate students with employability and job search skills.				
Course Outcomes	Students after the completion of this course will be able to : 4. Achieve proficiency in English 5. Demonstrate good oral and written communication skills 6. Write resume with reasonable competence				

Module 1

Business correspondence 2: **Documents for internal communication**, internal note , Memorandum- Format Incident report (Theft, internal clash, facility problems) **5Hrs**

Module 2

Business correspondence 3: Technical writing: Importance and types of formal report. Layout of a technical report. Procedure of writing a report. Business correspondence 4, Meeting and its documentation, Notice and agenda, Minutes of meeting **06Hrs**

Module 3

Writing activity, Description: Physical description. writing a set of instructions: *for any of your labs/ work shop/ equipment/machines. * to ride a bike/to make a cup of tea/ an omelet/to bake a cake,etc. **06Hrs**

Module 4

Public Speaking, Shop talk. Oral presentation of technical information Stages: Topic selection planning- collection of information-outlining-developing the technical content-attaching introduction and conclusion –practice-rehearsal and feedback ,Presentation skills: Personal appearance- posture- gesture-voice speed – language- pauses- eye contact-visual aids- articulation time Management. **06Hrs**

Module 5

Recruitment Process , Resume and cover letter,Job interview-tips to face interviews successfully, Mock interview.Group discussion: Rules –do's and don'ts – qualities to be observed in candidates. GD- practice sessions **07Hrs**

Text Books:

1. Dhanavel.S.P. English and Communication Skills for Students of Science and Engineering**,** Orient Black swanLtd.,2009.
2. Meenakshi Raman and Sangeetha Sharma**.** Technical Communication-Principles and Practice, Oxford UniversityPress,2009.

Reference Books:

1. Day.RA., Scientific English: A Guide for Scientists and Other Professional, 2nd ed. Hyderabad: Universities Press,2000.
2. Intermediate English Practice - Pitt. S. Corden

Course code: 17VT202 Total Hours : 30	MATHEMATICS-II	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to make the students : 1. Exposed to fundamentals of Mathematics including fractions, Logarithms, Matrices & Determinants 2. Understand concepts of Complex Numbers & Trigonometry and their applications in engineering 3. Understand the basics of differentiation and differential calculus and solve application 4. Apply the concepts of mathematics to engineering problems.				
Course out comes	Upon successful completion of this course, the trainee will be able to: 1. Analyze and apply mathematical equations 2. Solve mathematically technical problems 3. Apply the concepts of mathematics to engineering problems.				

Module 1

PERCENTAGE, RATIOS AND PROPORTIONS, Simple Problems (like if percentage is given find the number and vice versa) **03Hrs**

Module 2:

ANALYTICAL GEOMETRY: Area and perimeter of triangle, Areas and perimeter of Rectangle.Area and perimeter of Square, Area and perimeter of Parallelogram,Area and perimeter of Rhombus, Area and perimeter of Trapezium, Area and perimeter of Circle, Length of an arc, Area of sector(Direct Problems),Cartesian Co-Ordinates, Equation of axis, Distance formula, Section formula & midpoint,(Direct Problems),Definition of Centroid of Triangle(Direct Problems). Slope : Definition, finding slope of straight line using (given two points, equation of a line and angle) , Condition for Perpendicularity and parallelism(Simple Problems). Equation of straight line: a) Y=mx+c, b)Point slope form c) Two point form d) Intercept form. Circle-Definition, Standard form (centre(h,k)and

radius r), General Equation of a circle (Simple problems) to find center and radius ,Basic concept of parabola, To find focus, vertex, directrix and axis of the parabola, Basic Concept of Ellipse, length of major and minor axis. Basic Concept of Hyperbola, length of transverse and conjugate axis. **10 Hrs**

Module 3:

3D Shapes: T.S.A, L.S.A and Volume of Cylinder , T.S.A, L.S.A and Volume of Cube, Cuboid, T.S.A, L.S.A and Volume of Cone, T.S.A, L.S.A and Volume of Sphere, T.S.A, L.S.A and Volume of Hemi-Sphere, T.S.A and Volume of Pipe **05Hrs**

Module 4:

Integral calculus and differential equations, Define Integrals of function and standard formulae of trigonometric functions, Problems using standard formulae. Integration by parts. Definite Integral and evaluation of definite integrals and simple problems. Area under plane curves – simple problems. Define differential equations with example. Define order and degree of differential equations. Solve differential equations of the type a) $ad^2y/dx^2 + b\,dy/dx + cy = 0$ b) $ad^2y/dx^2 + b\,dy/dx + cy = e^{mx}$ **07Hrs**

Module 5:

Statistics**,** Mean, Median and Mode (Raw Data), Rage and Standard Deviation. Problems on above methods. **05Hrs**

Text Books

3. Technical mathematics - Rice and Knight,Mc-Graw Hill Book he.
4. Applied mathematics for Polytechnics-H.K.Dass

Reference Books

3. Higher Engineering mathematics-B.S.Grewal
4. Higher Secondary Mathematics.

Course code: 17VT203 Total hours: 30	Production Technology – II	L	T	P	C
			--	--	2
Course objectives	The objective of this course is to make the students understand : 1. Manufacturing processes including casting, forging and rolling 2. Material removal processes including turning, drilling, milling & grinding 3. Non-conventional machining processes and their applications				
Course outcomes	After successful completion of the course, the students should be able to : 1. Comprehend the various machining processes such as turning, drilling, milling and grinding. 2. Understand the principle of non-traditional machining processes.				

Module 1

Lathe: Boring, Feed mechanism, feed gear box, Thread cutting mechanism and thread cutting operation, Taper and Taper turning, Taper turning method. **02 Hrs**

Module 2

Cutting Tool Material: Characteristics of ideal cutting tool material, cutting tool material. 02 **Hrs**

Module 3

Cutting fluids and lubricants: Properties of good cutting fluid, Types of cutting fluids, Properties of lubricants, Classification of lubricants. **02 Hrs**

Module 4

Milling: Classification of milling machines, Parts of milling machines, milling process, Milling cutters, Nomenclature of milling cutter, Cutting speed, feed and depth of cut, Work holding devices, cutter holding devices. **Grinding:** Grinding operations, Grinding machines, surface grinders, cylindrical grinders, Tool and cutter grinder.**Permanent fastening methods:** Welding, Soldering, Brazing, Rivet joints **06Hrs**

Module 5

Basic health and safety, Health and safety, Protective clothing/Equipment, Hazards, Safe working practices, Methods of accident prevention, Good housekeeping practices at various areas. Fire safety, Types of fires, Rescue techniques applied during fire hazard, Proper housekeeping in order to prevent fire hazards, Correct use of a fire extinguisher. Emergencies, rescue and first-aid procedures, Appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc, Organize loss minimization or rescue activity during an accident in real or simulated environments. Emergency procedures: raising alarm, safe/efficient, evacuation, correct means of escape, correct assembly point, roll call and correct return to work. Accident/incident report. (Incident Report includes details of: name, date/time of incident, date/time of report, location, environment conditions, persons involved, sequence of events, injuries sustained, damage sustained, actions taken, witnesses, supervisor/manager notified). Correct method to move injured people and others during an emergency**.** **08Hrs**

Module 6

Working Effectively with others at work, Accurately receive information and pass on information to authorized persons who require it and within agreed timescale and confirm its receipt, Display appropriate communication etiquette while working (Communication etiquette: do not use abusive language; use appropriate titles and terms of respect; do not eat or chew while talking (vice versa)etc.), Demonstrate responsible and disciplined behaviors at the workplace. (Disciplined behaviors: e.g. punctuality; completing tasks as per given time and standards; not gossiping and idling time; eliminating waste, honesty, etc), Escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict **06Hrs**

Module 7

Metal casting and forming processes: Sand Casting : Sand Mould – Type of patterns - Pattern Materials – Pattern allowances –Moulding sand Properties and testing – Cores –Types and applications – Moulding machines– Types and applications; Melting furnaces : Blast and Cupola Furnaces; Principle of special casting processes : Shell– Ceramic mould – Pressure die casting - Centrifugal Casting - CO2 process – Stir casting; Defects in Sand casting. Metal forming processes: Hot working and cold working of metals – Forging processes – Open, impression and closed die forging – forging operations. Rolling of metals– Types of Rolling – Flat strip rolling – shape rolling operations – Defects in rolled parts. Principle of rod and wire drawing . **04Hrs**

Text Books:

1. Kalpak Jain, Manufacturing Engineering & Technology, Addison Wesley,1997
2. Poul De Garmo, J.T.Black, R.A.Kosher, Materials and Processes in Manufacturing , Prentice Hall of India, 1997.
3. Production Technology - Jain , Agarwal

Reference Book:

1. R.K. Jain, Production Technology, Khanna Publishers, 2001
2. R.K. Gupta, Production Technology, Sathya Prakashan, 2010

Course code: 17VT204 Total Hours : 30 hrs	BASIC ELECTRICAL & ELECTRONICS	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to make the students understand : 1. The importance of basic principles of electrical electronics for industrial application. 2. Electrical and Electronic measuring instruments and their usage 3. Working principles of Electrical motors				
Course outcomes	Students after the completion of this course will be able to : 1. Learn basic concepts and working of electrical devices. 2. Apply the electronic and electrical measuring instruments for practical applications.				

Module 1

Electrical Safety -Electrical safety, Important of Earthing, Electric shock, First aid for electric shock, Precautions against shock, Cause of accidents and their preventive measures, Electronic Materials and Components- Conductors, Semiconductors and Insulators, Properties and Applications, Resistors, Capacitors, Inductors- Specifications and Applications, Diodes, Transistors and ICs- Specifications and applications. **06** H**rs**

Module 2

Cables and Wires- Types, Specifications and Applications, Care to be taken while connecting cables / wire to terminals of motors, switches, Color coding of cables and wires- Phase, Neutral, Earth. Measuring instruments- Ammeter, Voltmeter, CRO, Multimeter. **04 Hrs**

Module 3

DC & AC Circuits- Definitions- Electric current, Voltage and Resistance, Ohm's Law and Kirchoff's Laws, Resistance in series, parallel, Simple problems. Fundamental of AC Voltage and current, Peak, Average, RMS value, of sine wave, Frequency, Time period, Amplitude, Power, Power Factor, Single Phase / Three Phase connections, Delta, connections, Relationship between phase and line voltages, Current in star and Delta connections. Electrical Protective Devices- Different types of switches, Fuses and their applications, MCB – Specification, Application, ELCB / RCCB- specification, Applications. **06 Hrs**

Module 4

Rectifiers and Power supply- Rectifiers, Types and applications, Regulated Power supply. DISPLAY DEVICES- Application of LED, LCD. **07 Hrs**

Module 5

Sensors- Types, Applications.AC Machines- Transformer, Types of transformers (current and Voltage), Principle of operation of transformers, Applications of transformer,Single phase induction motor- Working principle, Applications, Three Phase induction motor, Working principle, Control Elements, Applications. DC Machines- DC Generator & DC Motor, Construction, Principle of operation, Types and Applications. **07 Hrs**

Text Books

1. Electrical Technology - B.L Theraja
2. Electrical Engineering Theory - K Mehta
3. Basic Electrical and Electronics - B L Theraja

Reference Books

1. Electrical Technology - H Cotton
2. Principles of Electrical & Electronics - V .K Metha

Course Code: 17VT205 Total Hours :30	MATERIAL TECHNOLOGY-I	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to make the students understand : 1. Mechanical behavior of engineering materials and their applications 2. Atomic and molecular structures of engineering materials 3. Mechanical properties of Ferrous & Non-Ferrous metals & alloys 4. Various destructive & non-destructive testing methods				
Course outcomes	Students after the completion of this course will be able to : 1. Understand basic structure and terminology associated with engineering materials 2. Perform calculations to qualify materials properties and characteristics. 3. Select the right materials for engineering process and application.				

Module 1

Scope of Material Technology- Historical perspective: Role of engineering material, Classification:- List and the different types of ferrous metals, pig iron, cast iron, wrought iron, steel. Metals and non-metals, Ferrous and non-ferrous, Properties of materials: Physical properties, Chemical properties, Magnetic properties, Mechanical properties. **05 Hrs**

Module 2

Ferrous metals- Introduction to manufacturing process, types, properties and application of the following- Pig iron, Wrought iron, Cast iron- grey, white, Steel-carbon steel, low, medium and high alloy steel.

Influence of following elements on the properties of steel- Carbon, Silicon, Phosphorous, Sulphur, Manganese. **05 Hrs**

Module 3

Alloy Steel- Introduction, Alloying elements and their effect on properties of steel, Chromium, Nickel, Vanadium, Tungsten, Molybdenum, Cobalt, Super alloys: Titanium based and Inconel. Materials used for manufacturing cutting tools, their properties and applications - Alloy steels, HSS, uncoated carbide, carbide, cermet, Ceramics, CBN(Cubic Boron Nitride) Poly Crystalline Diamond. **05 Hrs**

Module 4

Materials used in tooling- specification, composition, properties. Materials used in Jigs and fixtures, Press tools, Moulds, Die casting dies, Forging dies. Non Ferrous metals- Properties and application of: Copper and its alloys, Aluminum and its alloys, Zinc, Tin, Magnesium. **05 Hrs**

Module 5

Testing of Material: Introduction, Destructive and non-destructive tests, Destructive tests, Tensile test, Compressive test, Impact test, Nondestructive test- Visual, liquid penetration, magnetic particle, ultrasonic, radiographic Hardness testing- Rockwell, Brenell, Vickers. **05 Hrs**

Module 6 Non-metallic materials

Polymers – types of polymer, commodity and engineering polymers – Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET,PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes)- Engineering Ceramics – Properties and applications of Al2O3, SiC, Si3N4, PSZ and SIALON –Composites-Classifications- Metal Matrix and FRP - Applications of Composites. **05Hrs**

Text books

1.William D. Callister, Jr., "Materials Science and Engineering an Introduction", 2nd Edition, John Wiley & Sons, Inc., 2007.
2.V. Raghavan, "Materials Science and Engineering", Prentice – Hall of India Pvt. Ltd., 2007

Reference books

1.J.M. Shackelford, Introduction to Materials Science for Engineers, 5th Edition, Prentice-Hall, Inc. 2000.
2.Suryanarayana, A. V. K., "Testing of Metallic Materials", Prentice Hall India, New Delhi, 1979.
3.W. Bolton, "Engineering materials technology", 3rd Edition, Butterworth & Heinemann,

2001.
4.William F. Smith, “Structure and Properties of Engineering Alloys”, Mc-Graw-Hill Inc., U.S.A, 2nd edition, 1993.
5.Kingery, W. D., Bowen H. K. and Uhlmann, D. R., “Introduction to Ceramics”, 2nd Edition, John Wiley & Sons, New York, 1976.

Course code: 17VT206 Total hours: 30	QUALITY MANAGEMENT -II	L	T	P	C
			--	--	2

Course objectives	The objective of this course is to make the students : 1 Understand terminology in Metrology and usage of measurements in industry 2 Familiarize with different measuring instruments and their working principles 3 Familiarize about marking and marking tools 4. Understand bore/hole measurement techniques 5. Exposed to different types of gauges 6. Use of slip gauges and their applications
Course outcomes	Students after the completion of this course will be able to : 1. Understand the various terms and parameters used in measurements 2. Demonstrate knowledge on different measuring devices & instruments

Module 1

Limits, Fits and Engineering tolerances: Limit systems – advantages, Interchangeability, Elements of limit system: nominal size - basic size actual size - allowance - limits - upper - lower - tolerance - unilateral – bilateral ,Fit: hole and shaft: Types of Fits: clearance - interference – transition, I.S.919 - 25 Fundamental deviation - 8 Tolerance grades - symbols - numeral - letter - terminology - zero line - deviation - upper – lower, Symbols for tolerance deviation and fit - hole basis and shaft basis system - practice problems - guidelines for selection of fits. Selective assembly **08Hrs**

Module 2

Taper and angular measurement & measuring tools: Definition of taper - taper elements, Specification of taper – conicity, Standard tapers - morse – metric, Measurement of angle - universal bevel protractor - parts of bevel protractor - construction of vernier scale - least count.method of checking – problems, Sine plate - construction – use Sine centre – use ,Spirit level - principle - construction , Angle gauges - use - number of gauge blocks in standard set addition and subtraction of angles – problems

08Hrs

Module 3

Comparators: What is a comparator - classification based on method of magnification? Advantages and dis-advantages, Mechanical comparator – Dial type & universal- working.

04Hrs

Module 4:

Measuring machines: Toolmaker's Microscope – parts – protractor eye piece – radius measuring head – thread template unit – projection attachment – applications. Profile Projector. Co-ordinate Measuring Machine – XYZ co-ordinates. **05Hrs**

Module 5. Measurement of Power and Flow

Measurement of power, flow and temperature Force, torque, power - mechanical , Pneumatic, Hydraulic and Electrical type. Flow measurement: Venturimeter, Orifice meter, rotameter, pitot tube – Temperature: bimetallic strip, thermocouples, electrical resistance thermometer – Reliability and Calibration – Readability and Reliability. Vibrations measurement, frequency, displacement, velocity & acceleration, Modes of heat transfer, Fourier Law of heat conduction, thermal conductivity, temperature distribution in composite wall

05Hrs

Text Books:

1. Beckwith Marangoni and Lienhard, "Mechanical Measurements", Pearson Education, 6th Edition, 2006.
2. A. K Sawhney, "A course in Mechanical Measurements and Instrumentation", Dhanpat Rai Publications.

Reference books

1. Alan S. Morris, "The Essence of Measurement", Prentice Hall of India, 1997
2. Beckwith T.G, and N. Lewis Buck, "Mechanical Measurements", Addison Wesley, 1991
3. Ernest O. Doebelin, "Measurement Systems Applications and Design",5th Ed., McGraw Hill Book Co.
4. N. V. Raghavendra and Krishnamurthy, "Engineering Metrology and Measurement", Oxford University Press.

Course Code: 17VT207 Total Hours : 75 hrs	ENGINEERING DRAWING AND CAD-II	L	T	P	C
		-	-		5
Course objective	The objective of this course is to make students : 1. Understand the principles and requirements of machine & production drawings 2. Understand and interpret drawings of machine components so as to prepare assembly drawings using standard CAD packages 3. Develop the technical skills necessary to generate an engineering drawing and an engineering assembly using a modern CAD system 4. Learn how to assemble and disassemble important parts used in major mechanical engineering applications.				
Course outcome	Students after the completion of this course will be able to : 1. Create drawings of Bolted, Riveted & Welded joints and Couplings 2. 3D (Solid) models of engineering components, sub-assemblies & assemblies and generate detailed drawings using a CAD system				

Module 1: Dimensions and Tolerances

Classifications of dimensions- functional, nonfunctional, auxiliary, and features, IS specified tolerance. - Indian standard/ISO system of limits and fits (IS919, ISO 286), Fits.- clearance fit , transition and interference fit. General tolerance. – IS 2102{part1 and part2}. Exercise for general tolerance. **9Hrs**

Module 2: Sectioning and Surface structure

Introduction about sectioning, Classification of section views- Full section, half section, local section, revolved section, removed section, offset section, auxiliary section, and aligned section, General rules of sectioning. - hatching of single object, adjacent object, thin material, large area, rib & web section, Conventional representation for hatching, Cutting plane line, Exercise.Introduction, - Types of surface texture, nomenclature of surface texture, Indication of surface roughness, Symbols of specifying the direction of lay, Example. **12Hrs**

Module 3: Permanent Fastenings

Riveted Joints: Single and double riveted lap joints, butt joints with single/double cover straps (Chain and Zigzag, using snap head rivets) Common types of joints, terminology, proportions and representation; Welds: Types of welds and welded joints, edge preparation, specifications, and representation of welds on drawings **10Hrs**

Module 4: Screwed Fasteners

Introduction, Screw thread nomenclature. - Major dia, minor dia, pitch, lead, flank, crest, root, thread angle etc.… Forms of thread- metric thread, V thread, BSW thread, Buttress thread, Square thread, ACME thread, and worm thread, Single and multi-start thread, Thread specification, Conventional representation of threads, Different types of bolt and threads. – Bolt, nut, set screws, locking screws, lock nuts, Socket head cap screw and CSK screw and assembly. **16 Hrs**

Module 5: Geometrical Tolerance

Introduction about geometrical tolerance, Tolerance frame and features, Indication of features of control, Datum. - Primary, secondary and tertiary datum, Exercise **14 Hrs**

Module 6: Assembly and detailed drawing

Introduction about assembly and part drawing, Assembly drawing, Detailed drawing, Exercise. – tap wrench, U clamp with V block, assembly fit, C-clamp, Tool makers clamp &,Guide plate tool. **14 Hrs**

Text books

1.N.D. Bhat & V.M. Panchal 'Machine Drawing'

2.French, T. E., Vierch, C. J., and Foster, R. J., Engineering Drawing and Graphic Technology,14th Ed., McGraw-Hill, 1993

Reference books

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

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

3. Narayana K.L., Kannaiah, P., and Venkata Reddy K, Machine Drawing, 3rd Ed., New Age International Publishers, 2006.

4. Johan K. C., Text Book of Machine Drawing, PHI Learning Pvt., 2009

Course Code: 17VT208 Total Hours: 120	WORK SHOP - II	L	T	P	C
		-	-		8
Course objective	The objective of this course is to make the student aware of : 1. The basic fundamentals and mechanics of metal cutting, tool geometry, tool life and tool wear 2. Knowledge on tool materials, tool life, tool wear, effect of lubrications and coolant used in machining operation. 3. The basic knowledge of various machine tools, classification, specification, operations of each machining processes like turning, milling, shaping, final finishing operations.				
Course outcome	Students after the completion of this course will be able to : 1. Understand the mechanics of metal cutting operations, various tool materials, parameters affecting machining operations like feed, speed, coolant, tool life, tool wear, and temperature **2.** Apply knowledge of machining processes to select parameters and carry out machining for various practical applications				

LIST OF EXPERIMENTS

1. Introduction of General Purpose Machines.
2. Study of Single Point Cutting Tool and Multi Point Cutting Tool.
3. To Study of Mechanism in Lathe and Perform Various Operations on a Lathe Machine.
4. To Study Construction, Working and Performing Operations on a Drilling Machine
5. To Study Construction and Working of Milling Machine.
6. To Study Construction, Working and Perform Grinding Operation on a Grinding Machine.
7. Introduction of Computer Numerical Control Machines and Demonstration of Few Work Pieces Jobs.

8. Use of foundry tools and other equipment, preparation of moulds using two moulding boxes with or without patterns. (Split pattern, Match plate pattern and Core boxes).
9. Preparation of one casting (Aluminum or cast iron-demonstration only)
10. Forging Exercises

Self-study exercise.

Text Books:
DSU Manufacturing process lab manual

Course code: 17VT209 Total Hours: 30hrs	ELECTRICAL & ELECTRONICS LAB	L	T	P	C
		-	-		2
Course Objectives	The objective of this course is to make students : 1. Expose to overall exposure to basic Electrical & Electronics Components and Devices. 2. Analyze Ohm's, Kirchoff laws 3. Understand the different motor's operation and principle				
Course outcomes	Students shall be able to 1. Demonstrate the basic skill to operate electrical and electronic equipment's and devices. 2. To develop the knowledge on constructing basic electronic and electrical circuits.				

LIST OF EXPERIMENTS

1. Forming mesh and soldering exercises using 22SWG tin coated copper wire
3. Forming resistors and soldering them on to a groove board and PCB
4. Tinning multi strand copper wire, forming, assembling and soldering electronic components on PCB, and desoldering Practice
5. Extension of ammeter range
6. Conversion of DC ammeter to DC voltmeter
7. Charging and discharging curves of a capacitor
8. Introduction to lab safety,procedure,5S,rules and regulations
9. Familiarization of Tool kit, and basics of bread board connections, CRO, MULTIMETER, power supply
10. Ohm's law
11. Kirchoff s current and voltage law
12. VI characteristics of diode
13. Rectifier –Half wave and full wave rectifier.
14. Clipper and clamper circuits.
15. A C and D C Motors

Self-study exercise.

Text Books

4. Electrical Technology - B.L Theraja
5. Electrical Engineering Theory - K Mehta

6. Basic Electrical and Electronics - B L Theraja

Reference Books

3. Electrical Technology - H Cotton
4. Principles of Electrical & Electronics - V .K Metha

Course code17VT210 Total Hours: 45hrs	QUALITY MANAGEMENT LAB-II	L	T	P	C
			-		3

Course Objectives	Students after the completion of this course will be able to: 1. Introduce the students to the need, standards and principles of measurement. 2. Introduce the students to the principles of various mechanical elements – such as screws, threads and gears. 3. Provide the students the basics of measurements systems.
Course outcomes	Students after the completion of this course will be able to: 1. The purpose of this course is to provide the student with a basic understanding of the theory and practice of measurement and instrumentation. 2. Recognize the basic elements of common measurement systems. 3. Be able to estimate the accuracy of a measurement, identify possible sources of Measurement errors.

1. To study the vibration measurement, frequency, displacement, velocity & acceleration.
2. Calculation of the Rate of Flow Using Rotameter-To calibrate rotameter at different flow rates with actual discharge
3. Determination of flow rate through Orifice Meter –and also to determine the co-efficient of discharge for orifice meter at different flow rates.
4. Determination of flow rate through of the Given Venturimeter and also determine the coefficient of discharge for venturimeter at different flow rates.
5. Determination of thermal conductivity of metal rod
6. Determination of thermal conductivity of composite wall

Self-study exercise.

B.VOC THIRD SEMESTER SYLLABUS

Course code: 17VT301 Total Hours: 30 hrs	PRODUCTION TECHNOLOGY -III	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to enable students : 1. Awareness of advanced milling 2. Awareness of advanced grinding 3. Familiarization of broaching 4. Highlights of jig grinding and jig boring 5. Awareness of super-finishing process 6. Familiarization of electric discharge machining. 7. Awareness of manufacturing process.				
Course Outcomes	Students after the completion of this course will be able to : 1. Explain the various machining processes such as turning, drilling, milling and grinding. 2. Analyze the various manufacturing processes such as casting, hot working and cold working. 3. Explain the processing of different materials such as ceramics and glass.				

Module 1

Milling-Cutting speed-Feed- depth of cut- machining time calculation - machining time for Face milling and Peripheral milling. Indexing- Types of indexing head- direct indexing heads, principles of direct indexing, direct indexing mechanisms-simple indexing head, plain or simple indexing-Angular indexing. **Broaching-**The process of broaching: Different types of broaching machines and its working principle. Different types of broaching tools: Elements of broaching tool. **05Hrs**

Module 2

Grinding: Taper grinding - gear tooth grinding - wet and dry grinding. Grinding wheel: Specification of grinding wheels - abrasives - bond grain - grade - structure – different types of grinding wheels according to shape-standard marking system of grinding wheels. Dressing of wheel. Machining time calculation: In surface grinding – face grinding - circumferential grinding - cylindrical grinding. Tool and cutter grinder. calculation for regrinding of single point tools, milling cutters, reamer, drills, broaches. **05Hrs**

Module 3

Jig boring and Jig grinding-Jig boring: Different types of machines - parts of machine - function - different tools for jig boring Jig grinding: Different types of jig grinding machines -types of operations on jig grinding machine. **Super finishing process** -Honing: The purpose – process of honing – the honing machine – advantage and dis-advantage of honing. Lapping: The process - purpose - machine - lapping tool and medium - advantages and dis-advantages of lapping. **Electric discharge machining**: Principle of operation process of sparking – sparking machine – main parts of the machine – thread cutting on sparking machine. Electrode: The material for electrode -type of electrodes - roughing and finishing – allowances provided while designing. **06Hrs**

Module 4

Manufacturing processes-Casting: Process of casting - Advantages and disadvantages of casting- Explain types: Sand casting - Investment casting - Centrifugal casting - Die casting. Mechanical working of metals: Hot working - cold working - merits and demerits- Types of hot working: Rolling - Forging - Piercing-Drawing- Spinning- Extrusion- Types of cold work: Cold rolling - Cold drawing - Bending - Squeezing - Peening - Spinning. Powder metallurgy: Process - Manufacturing of powder: Character of powder - Safety in handling - Size of powder - Blending of powder - Compacting – Pre-sintering- sintering - secondary operation. Product produced- advantages - disadvantages – limitations.

07Hrs

Module 5

Processing of ceramics and glass-production of metal powders: Compaction – Sintering and Finishing – Design, Considerations for powder metallurgy and Process capability – Shaping of ceramics –Forming and shaping of glass – Design considerations for ceramics and glass – Processing of superconductors. **Thermal Spray and Laser Surface Modification**-Thermal spraying, techniques, advanced spraying techniques - plasma surfacing, detonation gun and high velocity oxy-fuel processes, laser surface alloying, laser cladding, specific industrial applications, tests for assessment of wear and corrosion. **Vapor**

Deposition Techniques-Definitions and concepts, physical vapour deposition (PVD), evaporation, sputtering, ion plating, plasma nitriding, process capabilities, chemical vapour deposition (CVD), metal organic CVD, plasma assisted CVD.

07Hrs

Text Books:

1. Sudarshan T S, Surface modification technologies - An Engineers Guide, Marcel Dekker, Newyork, 1989
2. Varghese C.D, Electroplating and other Surface Treatments - A Practical Guide", TMH, 1993.
3. Workshop Technology – Chapman

Reference Books:

1. Modern W/s Technology - Wright Baker
2. All about machine tools - H.Gerling
3. Machine Technology- P.M Johnston

4. Production Technology - Jain, Agarwal

Course code: 17VT302 Total Hours: 30 hours	MATERIAL TECHNOLOGY & HEAT TREATMENT	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to enable students : 1. Highlight the atomic bonds, in the structure of metal 2. Awareness of the crystalline structure, solid solutions, solid phase and phase diagram. 3. General awareness of solidification of metals 4. Awareness of general HT terms, process and charts, Heat Treatment Equipment, microscopic testing of material.				
Course outcomes	Students after the completion of this course will be able to : 1. Understand the Structure and Properties of various Materials and their importance in Modern Technology. 2. Identify the structure of materials - Unit cell, space lattice, BCC, FCC, & HCP structure, Atomic Packing factor. 3. Understand the various process of Heat Treatment 4. Know the Need and uses of non-ferrous metals and alloys in engineering application.				

Module 1

Atomic bonds - Explain the atomic bond, Classification of atomic bond: primary bond - secondary bond Primary Bond: Ionic bond – covalent bond - metallic bond, compare the different types of bond: Ionic and metallic - covalent and metallic. **Crystalline structure -** Introduction - Types of solids: crystalline solid – non crystalline solid -explanation of crystal and crystal structure, Space lattice - Explain unit cell and space lattice -Classify the space lattice: body centered cubic lattice - face centered cubic lattice-closed packed hexagonal lattice, Crystal imperfection-Explain crystal imperfection effect of crystal imperfection on the mechanical properties of metals- how defects happen- explain 4 types of point defects (Vacancies, interstitial , Frenkle , Substitution) , explain line defects , explain surface defects (grain and twin boundary) **06 Hrs**

Module 2

Solid solution - Solid solutions - classify – explain, Solid phases and its types – Explanation on what is solid solution, types of solid solution (interstitial solid solution and substitutional solid solution), Explanation on Basic phase diagram, explain alloy. **Solidification of metals -** Explain the solidification process -explain the structural changes in steel - Explain iron carbon diagram (more specific up to 2 % carbon&1200 degree centigrade). **Metallurgical microscope -** Metallurgical microscope – working principle, uses. Parts and function. Care to be taken while in use. Procedure of preparing the specimen for microscopic testing. **06 Hrs**

Module 3

Heat Treatment - Definition, scope and safety, Principle of Heat Treatment, interpretation of iron carbon diagram, TTT diagram, Microscopic Structure and Structural Transformation, Process and process variables – sequence of operation-heating, soaking and cooling, heating and cooling rate, Heat Treatment temperature and holding time, Types of Heat Treatment – stress relieving, annealing, normalizing Hardening and Tempering, Case hardening and surface hardening and special Heat Treatment process, Carburising – Pack carburising, vaccum carburising, nitriding, gas nitriding and plasma nitriding, Localised case hardening- induction hardening and flame hardening, Special Heat Treatment - Martempering and Austempering, Subzero treatment. **Heat Treating Equipment -** Heating media – Furnace – Fuel fired furnace, electrically heated furnace, bath furnace and vaccum furnace, Fuel used in furnace heating –Solid, liquid and gaseous fuel, Advantages and disadvantages of bath furnace and hearth furnace, Quenching media – water, oil, gas, aqueous solution and salt bath, Tempering measurement and control – thermometer, pyrometer, thermocouple, & segar cone.

06 Hrs

Module 4

Post Heat Treatment - Remove of scale – acid pickling and grit blasting – alkaline detergent cleaning and degreasing – straightening, Hydrogen de-embrittlement treatment. **Heat Treatment of different materials -** Heat Treatment of tools steels – Hot worked tool steel & cold worked tool steels, high speed steel, stainless steels and spring steels, Heat Treatment of non-ferrous material – aluminium and its alloys and copper and its alloys. **Possible defects and remedies in Heat Treatment -** Low hardness and strength after hardening, soft spots, oxidation and carburisation, overheating and burning, formation of cracks, - development of cracks- distortion and wrapping, Discus causes and remedies. **06 Hrs**

Module 5

Surface Treatment - Mechanical cleaning and finishing – vibratory finishing, belt standing, wire brushing, buffing and electro polishing, Chemical cleaning – vapor degreasing, solvent cleaning, alkaline cleaning. Ultrasonic cleaning and acid pickling, Burr removal – design to facilitate or eliminate burr removal, Coatings – painting, dipping spraying, powder coating – blackening – electroplating, Vaporised metal coating – vaccum metalizing, (sputtering) physical and chemical vapor deposition. **Planning for Heat Treatment and case study -** Preparation of the work piece – setting of furnace Case study and revision. **Modern Metallic and Non Metallic Materials -** Modern Metallic materials: Dual phase steels, Micro alloyed, High strength low alloy (HSLA) steel, Transformation induced plasticity (TRIP) steel, Maraging steel - Intermetallics, Ni and Ti aluminides - Smart materials, shape memory alloys - Metallic glass - Quasi crystal and nano crystalline materials, bio materials. Non Metallic Materials: Plastics, rubber, foams, adhesives and coatings - Structure, properties and applications of engineering polymers - Advanced structural ceramics, processing and applications

06 Hrs

Text Books

1. Thomas H. Courtney, Mechanical Behavior of Materials, McGraw-Hill, 2000.
2. Flinn, R.A. and Trojan, P.K., Engineering Materials and their Applications, (4th Edition),
   Jaico Publishing, 1999.
3. Gabor L. Hornyak, H.F. Tibbals, Joydeep Dutta and John J. Moore, Introduction to Nano
   Science and Nanotechnology, CRC Press, Boca Raton, 2009.

Reference Books:

1. Material Science & Process - Hajara Choudhari
2. Material and Metallurgy - V.K Manchanda
3. Material Science - R.S Khurmi
4. Material Science - O P Khanna
5. Materials for Engineering (Part 1&2) - P. S Houghton
6. Materials for Engineering (Vol 1&2) - P. S Houghton
7. Materials and processing in manufacturing – E. Paul DeGarmo,J.T. Black and Ronald A. Kohser
8. Heat Treatment Principle and techniques - T.V. Rajan, C.P. Sharma
9. Material Science and Process - G.B.S. Narang
10. Heat Treatment Handbook - Prabhu Dev
11. Heat Treatment Fundamentals -S Rolland Churchill

Course code :17VT303 Total Hours: 30 hours	STRENGTH OF MATERIALS-I	L	T	P	C
			-	-	2
Course objectives	The objective of this course is to enable students : 1. To understand the basic concepts and terms on materials. 2. To understand the stresses developed in bars, compounds bars, shafts, cylinders and spheres. 3. Understand the relationship of direct stresses 4. Understand the effect of direct shear stresses 5. Highlight the importance of thermal effect 6. Know the effect of load on struts and columns				
Course outcomes	Students after the completion of this course will be able to : 1. Apply concepts of strength of materials to obtain solutions to real time Engineering problems. 2. Students will analyze the terms involved and apply knowledge for deformation. 3. Understanding the mechanical terms and deformation behavior for different loads				

Module 1

Simple stresses and strain - Introduction - importance of studying strength of material in Tool making, Load - definition and explanation about tensile load and compressive load - effect of load in elastic material, Stress and strain, tensile stress, compressive stress and strain- plain rod in a state of compression – elasticity elastic limit and permanent set, Hooke's Law : Modules of elasticity – problems, Stress and strain produced in a bar by its own weight – problems, Elongation of bar of varying cross section - stresses in composite bars - problems, Elastic constants-Effect of axial load on lateral dimensions lateral strain-linear strain - Poisson's Ratio problems, Bulk modulus-Relation between Bulk modulus and Youngs' modulus, problems, Tensile test: - tensile test for mild steel - stress - strain curve for M.S. - stress strain curve for different materials, Compression test. **07 Hrs**

Module 2

Direct, shear stress - Shear force - shear stress - comparison of shear and normal stresses - deformation due to shear stress - shear strain - modules of rigidity - modules of rigidity of different materials - workshop related problems.

03 Hrs

Module 3

Thermal effect on stress and strain - Nature of stress developed by preventing expansion due to heat in machine members - equation for the stress due to change of temperature when the expansion is completely prevented - equation for the stress due to change of temperature when the expansion is partially prevented - practical examples of thermal stresses in Tool Engineering. **06 Hrs**

Module 4

Struts and Columns - Definition: Strut – Column, Effect of axial load on column-failure of a column or strut formula related with the compressive load - bucking load, Euler's Column theorem: Expression for buckling load assumption in Euler's column theory, Types of end conditions of columns - both the ends hinged -both ends fixed - one end fixed and other end hinged - one fixed and other end free – problems related with the end conditions - finding punch length in press tools.

07 Hrs

Module 5

Thin Cylinders, Spheres and Thick Cylinders - Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin and thick cylinders, spherical shells subjected to internal pressure, Deformation in spherical shells, Lame's theorem.

07 Hrs

Text books

1. S. S. Bhavikatti, "Strength of Materials", Vikas publications House-Pvt. Ltd., 2nd Edition, 2006
2. Hibbeler, R.C., "Mechanics of Materials", Pearson Education, 2007.

Reference books:

1. Strength of Material-Vol.I - Timoshenko
2. Strength of Material-Vol.II - Timoshenko
3. Strength of Material - RS Khurmi
4. Strength of Material - Ramamrutham
5. Strength of Material - Surendra Singh
6. Strength of Material - William A Nash
7. Strength of Material - L.B.Prasad
8. Machine Design -Pandya & Shah

Course code: 17VT304 Total Hours : 30 hrs	PRESS TOOL TECHNOLOGY-I	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to make the students : 1. Awareness of different types of sheet metal processing using press tools 2. Ability to determine cutting force & cutting clearance. 3. Awareness of basic design of press tools. 4. Familiarization of elements of guide plate tool. 5. Awareness of basic design of progressive tool. 6. Ability to design a strip lay out. 7. Familiarization of different types of punches & Die blocks. 8. Recognition of the function and design of strippers and stoppers. 9. Familiarization with the function and design of the pilots. 10. Recognition of the use of ejectors, shedders, fasteners and dowel in a press tool				
Course outcomes	Upon successful completion of this course, the trainee will be able to: 1. Explain the necessity of press tool for Manufacturing of Stage, Progressive, Bending and Compound tools. 2. Analyze the design constraints in the given problem. 3. Apply the design rule for designing and manufacturing of press tools. 4. Design and Drafting of press tools for considering real time issues of Manufacturing, Testing and Assembly.				

Module 1

Introduction to press tools- Different Press Tool operations, Awareness on different types of press tools. **Stock material**- Relationship of piece part and stock strip, Material- Stock materials used in press work -mechanical properties of different stock material -choosing material for the required press operation -preparation of stock material-Standards – types behaviour, Differentiate stock strip and unit stock. **Theory of Shearing**- Shearing theory description in press tool, Critical stage of shearing.

04 Hrs

Module 2

Cutting Force & Cutting clearance- Calculation of cutting force for press tool operation, Selection of suitable press, Methods for reducing cutting force, Cutting clearance: Explanation - Importance of cutting clearance, Typical appearance characteristics: Identify less or more clearance by visual inspection of the component, Relationship between piece part size to punch and die size, Determine punch and die dimension. **Basic design of Guide Plate tool**- Working principle of guide plate tool - when to adopt guide plate tool - Importance of each part of the tool -design of guide plate tool -Selecting material-Planning production.

05 Hrs

Module 3

Elements of guide plate tool- Punch – dies – Punch – Base plate – Guide block –Dowels – Fasteners – Clearance – Angular Clearance– Shank. **Land and Angular clearance**- Importance of angular clearance - methods used in providing angular clearance to be provided depending on stock material. **Basic design of Progressive tool**- Working principle of progressive action – Progressive Guide Plate tool, Compare between single station Guide plate tool and Progressive Guide Plate tool. **Strip lay out**- Importance of strip lay out, Different types of strip lay out: - narrow run - wide run- single row - two pass - double row lay out – gang dies - angular lay out - shape of the blank -production requirement grain direction - burr side -stock material, Strip lay out for blanking tool- Cut off-parting –notching - trimming-progressive tools, Strip lay out for blanking tool- Cut off-parting –notching - trimming-progressive tools. **05 Hrs**

Module 4

Die blocks & Punches- Die blocks, Types of dies – Solid dies – Split dies or sectional die block, Requirement of die blocks-different methods of construction of die blocks-selection of die blocks, Selection- Material for die blocks- Heat treatment, Punches, cutting punches- non cutting punches – hybrid punches, Types of punches, Selection of punches depending on the work- material of punch. **Strippers**- Function of a stripper, Types of stripper, Constructional details of stripper - Spring strippers -Clamping spring stripper - Non clamping spring stripper -

Piloting through spring stripper -Compensating washer - Spring around stripper bolts-Stripper bolt suspension, Stripping force- Stripping force for blanking and piercing. **Stoppers-** Basic stop principles - Stop position - Stop categories -Primary - secondary – final, Construction of different types of stoppers- plain pin stop - headed pin stop - disappearing pin stop – finger stop - operation - pusher stop - trigger stop.

08 Hrs

Module 5

Pilots- Purpose of pilots Differentiating between indirect piloting and direct piloting -Pilot size - Pilot length -Pilot opening in die - Pilot opening in die shoe, Types of pilots - Function of different types of pilots -retractable pilots - removable type pilots - pilot in. **Side cutters-** Function of side cutters, Advantages of side cutter. **Ejectors and shedders-** Ejector – Function of ejector, Shedder - Function of shedder - Types of shedders – Positive shedder -Compression shedder- Shedding pins, knock outs- Function-Distinguishing between direct knockout and indirect knock out. **Fasteners and dowels-** Dowels: Function-Types of Dowels used in tooling - precaution while dowelling, Fasteners: Screws - Function - Types of screws like – socket head screws - counter sunk screw head screw - cheese head screw -set screw- Non threaded. Fasteners-Rivets-cotter pins. **Shank-** Different types of shanks employed in a press tool, Location of shank –Importance for locating shank in correct position – Shank point location (Arithmetical method)-Shank point location (graphical method).

08 Hrs

Text Books

1. Tool Design – Donaldson
2. Die Design Fundamentals - Paquin

Reference Books

1. Basic Die Making - Ostergarrd
2. American Society of Metals - Hand Book 8th edition.Volume 4 forming.
3. Advanced Die Making - Ostergarrd
4. Fine blanking Seminar Notes - N T T F
5. Fundamentals of Tool Design - A.S.T.M.E
6. Tool Engineers hand book
7. Die Design Hand book
8. PSG Hand book
9. CMTI Hand book

Course code: 17VT305 Total Hours: 30 hrs	JIGS & FIXTURES	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to make the students understand : 1. Awareness of the difference between jig and fixture. 2. Highlight the types of jig and fixture. 3. General awareness of mounting jig and fixture on a machine tool. 4. Awareness of elements of jig and fixture. 5. Awareness of design of jigs, fixture. 6. General awareness of cutting forces acting on jig and fixture 7. Highlight the common failures and heat treatment of jig and fixture.				
Course Outcomes	After successful completion of the course, the students should be able to : 1. Categorize and justify the requirements of Jigs and Fixtures for Manufacturing, Testing and Assembly CO2 2. Describe and implement various indexing mechanics in manufacturing. 3. Analyze problems related to Jigs and fixtures in Manufacturing, Testing and Assembly.				

Module 1

Introduction to Jigs and fixture-Introduction – jig, fixture, Function of jig, fixture, Difference between jig and fixture, Economic use of jig and fixture. **Planes of movement-** Principle of location, Freedom of movement of an object.

06 Hrs

Module 2

Possible movements of work piece- Arresting the freedom of movement, Clamps, stoppers, in a jig fixture. **Location of work piece-** Purpose of location, Fool proofing of work, Body, feet of jig, fixture, chip control. **06 Hrs**

Module 3

Different types of jigs- Template jig, Table jig, Plate jig, Angle plate jig, Modified angle plate jig, Sandwich jig, Box jig, Channel jig, Leaf jig, Indexing jig. **06 Hrs**

Module 4

Different types of fixture- Plate fixture, Angle plate fixture, and Modified angle plate fixture, vice jaw fixture, Fixture and machine relation, Jig and machine relation. **06 Hrs**

Module 5

Elements of jig and fixture- Clamps, Stoppers, Supports, Plugs, Types of drill bushes. **Jig, fixture and cutting tool relation**- Types of tools, Cutting tool setting, Chip direction, Chip removal. **Design steps to be followed for Jigs and Fixtures**- Design principles - care – procedure. **Failure of jig and fixture**- Failure of elements, failure of clamping-Discuss the above with case study. **Effect of heat treatment on jig, fixture elements**- Cutter setting block, body, feet, Drill bushes. **06 Hrs**

Text Books:

1. Jigs and Fixtures - Hiran E Grant
2. Jigs and Fixtures Design - Franklin D Jones

Reference Books:

1. Jigs and Fixtures - Joshi
2. Jigs and Fixtures - Hiramegrant
3. Die Design Fundamentals - ASTME
4. P S G Hand

Course code :17VT306 Total Hours: 30 hours	QUALITY MANAGEMENT-III	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to enable students : 1. To understand the basic concepts on measurements and their terms. 2. To provide knowledge on various measurement equipment sand components. 3. To learn the procedure adopted to measure the dimension of the components				
Course outcomes	Students after the completion of this course will be able to : 1. Students will have thorough knowledge on different measurement components. 2. Understanding the terms and knowing the various parameters in measurements				

Module I

Hardness checking - Hardness – property, checking methods - Brinnel - indentor used - load – method, Rockwell principle - RA, RB and RC- indentor used lead for different scales, Vicker's hardness - indentor used – load, Shore scleroscope hardness test.

06 Hrs

Module II

Interferometry - Principles of Optical Interference Wave Length wave in phase – wave out of phase – formation of interference bands, Interferometry Applied to Flatness Testing – optical flat – material size – method of checking, Fringe Pattern Obtained On: flat surface – convex surface – concave surface – surface with high points – surface with low edges, Measurement of Slip Gauge Size – use of interferometer.

06 Hrs

Module III

Form and position features - Straightness – definition, Measurement of straightness, Flatness - definition - testing - surface plate – straight edge method -auto collimator method

- use of optical flats, Parallelism - dial indicator - use - types - plunger type working - working principle - precautions -universal dial indicator-working working principle – precautions, Parallelism of 2 axes- parallelism of 2 planes parallelism of axis to a plane, Squareness - trysquare - indicator method –auto collimator method, Measurement of circularity - ovality -lobbing- use of dial indicator and V block – Talyrond, Concentricity - checking using dial indicator, Run out – checking.

06 Hrs

Module IV

Miscellaneous measurement - Checking the angle of a piece tapered at one end, To check the angle of a tapered hole, Gear Tooth Vernier – tooth thickness measurement – gear tooth caliper, Plug method for checking Pitch Diameter and Tooth test.

06 Hrs

Module V

Surface texture measurement - Meaning of surface texture - difference between length measurement and surface texture measurement, Effective profile, Method of Measuring – inspection by comparisons - direct instrument measurement, Stylus probe instruments – essential parts, Profilometer, Tomlinson's surface meter, The Taylor Hobson Talysurf , The Sigma Micotest, The Ruler 'Mercin' Roughness Instrument, Talysurf (electronic surface indicator), Analysis of surface traces – Peek to valley height – Root Mean Square (RMS) Value – Centre line average method.

06 Hrs

Text Books

1. Beckwith Marangoni and Lienhard, "Mechanical Measurements", Pearson Education, 6th Edition, 2006.
2. A. K Sawhney, "A course in Mechanical Measurements and Instrumentation", Dhanpat Rai Publications.
3. Alan S. Morris, "The Essence of Measurement", Prentice Hall of India, 1997

Reference books:

1. Engineering Metrology - R.K Jain
2. Mechanical and Industrial measurements - R.K Jain
3. Dimensional Metrology - M.K Khare
4. Engineering Metrology - K.J Hume

Course code: 17VT307 Total Hours: 90 hrs	WORKSHOP-III	L	T	P	C
			-		6
Course Objectives	The objective of this course is to enable students : 1. Understanding the concepts of different operations such as Bench work, milling and Turning. 2. Understanding the concepts of different operations such as surface grinding and cylindrical grinding.				
Course outcomes	Students after the completion of this course will be able to: 1. Work independently on different operations such as Bench work, milling, Turning, surface grinding and cylindrical grinding.				

LIST OF EXPERIMENTS

1. **Manufacturing of elements of Progressive Tool-** Top Plate, Bush, Punch holder, Stripper plate, Die plate.
2. **Manufacturing of elements of Progressive Tool -** Bottom plate, Spacer, Extension table, Finger stopper.
3. **Manufacturing of elements of Progressive Tool -** Shank, Blanking punch, Piercing punch, Pilot, Thrust Plate.
4. **Types of fits on Progressive Tool-** Offset Fit, Universal Fit.

Course code:17VT308 Total Hours: 90 hrs	TOOL DESIGN DRAWING-I	L	T	P	C
			-		6
Course Objectives	1. The objective of this course is to enable students : 2. Understanding the basic principles and designing various types of fixtures. 3. Understanding the basic principles and designing various types of jigs. 4. Training in the ability to design different types of Guide Plate Tool. 5. Training in the ability to design different types of Blanking Tool with Die sets. 6. Training in the ability to design different types of Progressive tool.				
Course outcomes	Students after the completion of this course will be able to: 1. Design and drafting various Jigs and Fixtures using appropriate software package. 2. Design the Progressive tool and blanking tool.				

LIST OF EXPERIMENTS

1. **Design of Fixtures-** Design of Turning Fixture, Design of Milling Fixture and Design of Grinding Fixture.
2. **Design of Jigs-** Design of Plate Jig, Design of Box Jig, Design of Leaf jig and Design of Indexing Jig.
3. **Design of Guide plate tool-** Design a single stage guide plate tool and design of three stage guide plate tool.
4. **Blanking Tool with die set**
5. **Design of Progressive Tool-** Design of Progressive tool incorporating travelling

stripper and Design of Progressive tool incorporating one or more of the following features.

- Traveling Stripper with split dies
- Cut –off punches with side cutter
- Parting – off punches

Fixed stop / Trigger stop / Auxiliary

Course code: 17VT309 Total Hours: 60 hours	MATERIALS LABORATORY	L	T	P	C
			-		4
Course Objectives	The objective of this course is to enable students : 1. Introduction to basic characterization techniques for materials, such as Hardness testing, Tensile testing, Shear testing, Compression, Bending, Fracture testing, Fatigue testing & Impact testing. 2. To study the different methods to enhance the properties of materials from few mechanical & metallurgical processes like heat treatment.				
Course outcomes	Students after the completion of this course will be able to : 1. Students will be able to demonstrate the knowledge, skills to conduct & analyzing the results with different mechanical testing. 2. Identification of Metals & Microstructure examination.				

LIST OF EXPERIMENTS

1. **Tension Test**- To determine mechanical properties such as ultimate tensile strength, elastic modulus, proportionality limit, yield point, fracture stress, percentage elongation & reduction in area of metals & alloys and also study the behavior of material & characterize types of fracture under tensile load.

2. **Compression Test** -To conduct compression test on the given material and to determine properties such as compressive strength, modulus of elasticity, percentage constriction & percentage increase in area.

3. **Shear Test** - To determine ultimate shear stress of the given specimens in single and double shear.

4. **Bending Test** -To study the characteristics of materials under the gradually increasing

flexural loading and to determine Modulus of rupture, Modulus of elasticity, Maximum shear stress.

5. **Impact Test** - (Charpy and Izod) - To find out the impact strength of the given notched specimens.

6. **Brinell hardness Test** -To determine the Brinell Hardness Number (BHN) of the given specimens.

7. **Vicker's Hardness Test** - To determine Vickers Hardness Number for a given specimen.

8. **Wear Test** - To determine the wear rate of different materials by using pin and disc apparatus.

9. **Torsion Test -** To determine the torsional shear stress

Course code: 17VT310 Total Hours: 30 hours	QUALITY MANAGEMENT LAB-III	L	T	P	C
			-		2
Course Objectives	The objective of this course is to enable students : 1. Experimentally determine Ra, Ry, Rz values for different surfaces and surfaces. 2. To Conduct GD and T experiments				
Course outcomes	Students after the completion of this course will be able to 1. Demonstrate the skills to carry out and analyze surface roughness values. 2. Demonstrate the skills to conduct GD and T experiments				

List of Experiment:

1. To conduct surface roughness experiment on given specimen and to find out the roughness value.

2. Geometrical Dimensioning and Tolerance experiments (Fourteen Experiments)

Course code: 17VT311 Total Hours:	CONSTITUTION AND ETHICS	L	T	P	C
			-	-	-
Course Objectives	The objective of this course is to enable students : 1. To provide basic information about Indian constitution. 2. To identify individual role and ethical responsibility towards society. 3. To understand human rights and its implications				
Course Outcomes	Students after the completion of this course will be able to : 1. Have general knowledge and legal literacy and thereby to take up competitive Examinations 2. Understand state and central policies, fundamental duties 3. Understand Electoral Process, special provisions 4. Understand powers and functions of Municipalities, Panchayats and Co-operative Societies. 5. Understand Engineering ethics and responsibilities of Engineers. 6. Have awareness about basic human rights in India				

Module-1

Introduction to the Constitution of India, The Making of the Constitution and Sailent features of the Constitution, Preamble to the Indian Constitution Fundamental Rights & its limitations.

Module-2

Directive Principles of State Policy & Relevance of Directive Principles State Policy Fundamental Duties, Union Executives – President, Prime Minister Parliament Supreme Court of India.

Module-3

State Executives – Governor Chief Minister, State Legislature High Court of State, Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 76th, 86th &91st Amendments.

Module-4

Special Provision for SC & ST Special Provision for Women, Children & Backward Classes Emergency Provisions, Human Rights –Meaning and Definitions, Legislation Specific Themes in
Human Rights- Working of National Human Rights Commission in India, Powers and functions of Municipalities, Panchyats and Co - Operative Societies

Module-5

Scope & Aims of Engineering Ethics, Responsibility of Engineers Impediments to Responsibility,
Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering

Text Book

1. Durga Das Basu 'Introduction to the Constitution of India' (Students Edn.) Prentice Hall EEE – 2001

2. 'Engineering Ethics' by Charles E Haries, Michael. S Pritchard and Michael J Robins Thompson Asia, 2003

3. Constitution of India & Professional Ethics by Raman & Yaji

Reference Books

1. 'An Introduction to the Constitution of India' by M V Pylee, Vikas Publishing. 2002

2. Engineering Ethics _ by M Govindarajan, S Natarajan, V S Senthail Kumar, Prentice Hall of IndiaPvt Ltd. New Delhi, 2004

3. Brij Kishore Sharma,**"Introduction to the Constitution of India"**, PHI Learning Pvt. Ltd., New Delhi, 2011.

4. Latest Publications of Indian Institute of Human Rights, New Delhi.

B.VOC FOURTH SEMESTER SYLLABUS

Course code: 17VT401 Total Hours: 30 hrs	MOULD TECHNOLOGY	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to enable students : 1. Familiarization in the use of plastics in molding industry. 2. Familiarization of the working of injection moulding machine 3. Awareness of basic terminology of injection moulds and 4. Familiarization with mould material and their specification 5. Ability to determine the number of cavities and parting surface of an injection mold. 6. Highlight the importance of elements of feed system and ejection system in an injection mould. 7. Highlight the shrinkage on plastics and cavity/core calculations 8. Importance and need for controlling temperature of Injection mould and mould cycle. 9. Highlight the design of the moulds with split cavities, side cores and side cavities.				
Course Outcomes	Students after the completion of this course will be able to : 1. Explain the importance of elements of feed system and ejection system in an injection mold. 2. Explain the working of injection moulding machine. 3. Describe the design of the moulds with split cavities, side cores and side cavities.				

Module 1

Plastic in Moulding Industry- Introduction to polymerization, Thermoplastics and Thermoset plastics: Types -Property – Application, Fillers and Additives: Varieties - effect - Reinforcement of plastics, Identification of plastics: simple tests, Plastics for commercial products. **Injection Moulding Machine-** Different types of injection moulding machine -

Plunger injection cylinders - Pre-plasticizer, two stage, plunger injection cylinder, two stage screw injection cylinder - Reciprocating screw injection cylinder - Purging - Injection moulding machine basic arrangement - The screw - The nozzle, Machine specifications - Injection capacity or short capacity - Plasticizing capacity-Injection rate or injection velocity - Injection pressure - Clamping force - Maximum Daylight.

05Hrs

Module 2

Basic Terminology- Elements of mould - Function - Fixed half - moving half - Impression - cavity - core - sprue bush - register ring - runner - gate - guide pillars and bushes - heel blocks - rest button - sprue breaker - ejector - ejector retainer - push back pins, Moulds and moulding methods, Mould material specification – selection based on type of material being molded – effect of wear occurring during moulding. **Number of cavities calculation-**Shot weight calculation - Plasticizing capacity calculation -Cycle time calculation - Clamping force calculation - Determination of number of cavities - Determination by shot capacity - by plasticizing capacity- by clamping capacity. **Parting surface-** choosing parting surface for different components – relief of parting – reason for relief for parting surface, Venting: Functions of air vents – Position of air vents for different components.

06Hrs

Module 3

Feed system- Parts of feed system: Runner- Function-runner cross section shape - runner size - Gates - Function of gates - position of gates - balanced gates - types of gates - advantages of different types of gates - disadvantages of different types of gates, Runner diameter calculation – Gate calculation. **Ejection system-**Ejector grid: Types of ejector grid - Ejector plate assembly - Functioning -Ejector plate - retaining plate - guiding and supporting ejector plate assembly - ejector rod and ejector bush - Ejector plate assembly return system. Push back pin return system - spring return system - stop pins, Ejection methods - Pin ejection - D shaped ejector pins - sleeve ejection - blade ejection - valve ejection - air ejection - stripper bar ejection - stripper plate ejection - stripper ring ejection - Ejection from fixed half - Sprue pullers- Function and design of sprue puller. **Plastic Shrinkage-** Shrinkage - Explain shrinkage - Effect - Factors governing shrinkage - Values of shrinkage, Determine the core and cavity dimensions. **07 Hrs**

Module 4

Temperature controlling for moulds- Need of temperature controlling for moulds – methods, Cooling method -Cooling integer type mould plates - Cooling insert bolster assembly -Cooling bolster - cooling cavity inserts - cooling core inserts - Water connections Adapters -

position of water connection – plugs, Mould cooling calculation - Typical temperature - amount of water to be circulated per hour -solidifying time - length of cooling channel .examples - Estimation of cooling period. **Mould cycle**- Elements of mould cycle – Importance of mould cycle, Mould cycle diagram – Procedure – Preparation of mould cycle diagram during mold tryout.

05 Hrs

Module 5

Cavities- Selection of splits- Design of moulds with splits- External undercut components - Position of joint line, Splits - sliding splits - guiding and retention of splits - mould plate designs - split designs, Operation of Splits-Finger cam actuation -Dog leg actuation - Cam track actuation -Spring actuation -Hydraulic actuation, Split locking method - Open channel type - Closed channel type, Split safety arrangement - Spring detente method - spring loaded method. **Side core and side cavity**- Selection of side core and side cavity design for the required components - Integral side core or side cavity, Assembly details - Construction - guiding arrangement, Method of actuation - Methods used in actuating the side core and side cavity.

07Hrs

Text Books:

1. Introduction of injection mould design - Pye

Reference Books:

1. All about Plastics-NI George
2. Die Moulds and Jigs - V.Vladimir
3. Plastic material & Process - Schwartz

Course code: 17VT402 Total Hours: 30 hrs	PRODUCTION TECHNOLOGY - IV	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to enable students to have: 1. Knowledge in health, safety and security at the workplace. 2. Knowledge in Non-conventional machining. 3. Awareness about basic practices that improve effectiveness of working with others in an organizational set-up. 4. Awareness about the importance and levels of maintenance of Machine tool. 5. Awareness about the additive machining				
Course Outcomes	Students after the completion of this course will be able to: 1. Take the basic precautions and simple control measures that can be implemented to reduce the risk of fire in workplace. 2. Proper use of safety devices, practice of rescue and first aid procedures. 3. Proper maintenance of machine tools to prevent break down.				

Module 1

Health and safety – Protective clothing/Equipment, Hazards, Safe working practices, Methods of accident prevention, Good housekeeping practices at various areas. **Fire safety -** Types of fires, Rescue techniques applied during fire hazard, proper housekeeping in order to prevent fire hazards, correct use of a fire extinguisher. **Emergencies, rescue and first-aid procedures -** Appropriate first aid to victims were required e.g. in case of bleeding, burns, choking, electric shock, poisoning etc., organize loss minimization or rescue activity during an accident in real or simulated environments, Emergency procedures: raising alarm, safe/efficient, evacuation, correct means of escape, correct assembly point, roll call and correct return to work, Accident/incident report. (Incident Report includes details of: name, date/time of incident, date/time of report, location, environment conditions, persons involved, sequence of events, injuries sustained, damage sustained, actions taken, witnesses,

supervisor/manager notified), Correct method to move injured people and others during an emergency.

07 Hrs

Module 2

Non-conventional machining - Chemical machining: principle of operation-chemical milling - chemical blanking - chemical engraving, Ultrasonic machining: Working principle of the machine tool material and tool size - application of ultrasonic machining, Water jet Machining, Abrasive jet machining: Principle of operation - element and the influence of the process - application of the process, Laser beam machining: Principle of these machining –machining process – applications, Electron beam machining: Working principle of the EBM - process of the machining - application of the process, Plasma arc machining: Principle of plasma arc machining – different parts of the machine – application of the process, Ion Beam machining: Principle of the machining - different parts of the machine – applications. **06 Hrs**

Module 3

Working effectively with others at work - Accurately receive information and pass on information to authorized persons who require it and within agreed timescale and confirm its receipt, display appropriate communication etiquette while working (Communication etiquette: do not use abusive language; use appropriate titles and terms of respect; do not eat or chew while talking (vice versa) etc., Demonstrate responsible and disciplined behaviors at the workplace. (Disciplined behaviors: e.g. punctuality; completing tasks as per given time and standards; not gossiping and idling time; eliminating waste, honesty, etc.), Escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict.

07 Hrs

Module 4

Machine tool Maintenance - Importance of maintenance of machine tools, Types of maintenance - Preventive - Break down. **Additive manufacturing -** Introduction to additive manufacturing, Benefits of additive manufacturing, Functional principle of AM.

05 Hrs

Module 5

Micro and Nano Manufacturing - Introduction to Micro and Nano manufacturing technology, advantages and applications of nanotechnology, Overview of Nano Fabrication

Methods: Top-down and bottom-up approaches, lithography, deposition, Chemical Vapor Deposition, Physical Vapor Deposition, etching, and material modification methods, processes and equipment. **05 Hrs**

Text Books:

1. Kalpak Jain, Manufacturing Engineering & Technology, Addison Wesley,1997
2. Poul De Garmo, J.T.Black, R.A.Kosher, Materials and Processes in Manufacturing, Prentice Hall of India, 1997.
3. Gibson, I., Rosen, D.W. and Stucker, B., Additive Manufacturing Methodologies: Rapid Prototyping to Direct Digital Manufacturing, Springer, 2010.

Reference books:

1. Modern W/s Technology - Wright Baker
2. All about machine tools - H. Gerling
3. Workshop Technology (Part I - Part III) - Chapman
4. Machine Technology Vol.1 – Vol.4 - P.M Johnston
5. Production Technology - Jain, Agarwal

Course code: 17VT403 Total Hours: 30 hrs	STRENGTH OF MATERIALS-II	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to enable students : 1. To provide knowledge on bending stress and torsion on materials 2. To understand the stresses developed in bars, compounds bars, beams, shafts. 3. To analyze the stress and strain on mechanical components. 4. To identify and quantify failure modes for mechanical parts.				
Course Outcomes	Students after the completion of this course will be able to : 1. Apply concepts of strength of materials to obtain solutions to real time Engineering problems 2. Ability to understand different kinds of loading in mechanical engineering components. 3. Ability to apply the fundamentals of mechanics of solids, stress analysis, theories of failure and material science in the design of machine components.				

Module 1

Bending stress - Introduction: importance in tool engineering, Revision on Equilibrium of forces and moment of a force, Moment of inertia, Centre of gravity and centroid. Introduction to Beams, Types of beams and Loads acting on beams, Problems on cantilever and simply supported beams - theory of simple bending - bending stress - position of neutral axis - section modules - M/I= F/Y =E/R – Problems using bending equation.

06 Hrs

Module 2

Torsion of shaft - Shafts - function of shaft – Introduction to rigidity modulus, effect of torque on a shaft - twisting movement - Torsional stress, Torsional rigidity, strength of a

shaft - polar moment of inertia - power transmitted by a shaft - angle of twist – Torsional equation, Problems using torsional and power transmitted by shaft.

06 Hrs

Module 3

Torsion of Springs - Types of springs - bending spring - torsion spring, Forms of springs - leaf spring - helical springs - closely coiled helical spring- open coiled helical spring- compound spring - springs in series - springs in parallel, Closely coiled helical spring subjected on axial load - closely coiled helical spring subjected on axial twist - calculation of number of turns - open coiled helical, Spring subjected in axial load-open coiled helical spring subjected to axial twist - bending stress - deflection of spring Problems on helical springs.

06 Hrs

Module 4

Static Strength - Static loads and factor of safety. Theories of failure- maximum normal stress theory, maximum shear stress theory, maximum strain theory, strain energy theory, distortion energy theory. Failure of brittle and ductile materials, stress concentration, determination of stress concentration factor.

06 Hrs

Module 5

Fatigue Strength - Introduction, S-N Diagram, low cycle fatigue, high cycle fatigue, endurance limit, modifying factors: size effect, surface effect, stress concentration effects, fluctuating stresses, Goodman and Soderberg relationship, stresses due to combined loading, cumulative fatigue damage. **06Hrs**

Text Books:

1. Hibbeler, R.C., "Mechanics of Materials", Pearson Education, 2007.
2. Joseph E Shigley and Charles R. Mischke, Mechanical Engineering Design, McGraw Hill International edition, 6th Edition 2009.
3. V.B. Bhandari, Design of Machine Elements, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2nd Edition 2007.

Reference books:

1. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 2007. 2. S.S Rattan, “Strength of Materials”, Tata McGraw Hill, 2009.

Course code: 17VT404 Total Hours : 30 hrs	PRESS TOOL TECHNOLOGY-II	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to make the students : 1. Ability to design Progressive Tools. 2. Comparison between Progressive tool & compound tool. 3. Highlight the design aspect of bending tool.				
Course out comes	Upon successful completion of this course, the trainee will be able to: 1. Explain the elements of compound tool. 2. Compare between Progressive tool & compound tool. 3. Describe the design aspect of deep drawing.				

Module 1

Compound Tool- Function of elements – Design of compound tool, Comparison of Progressive tool & Compound tool. Bending- Principals of bending, Plastic deformation due to bending, Bending elements. **05 Hrs**

Module 2

Blank length – calculation of original length of strip required for bent component- formula for calculating- Developing the blank size, bending radius – calculation of maximum and minimum radius, bending force – bending force for "V" bending dies, bending force for "U" bending dies. **06 Hrs**

Module 3

Spring back – spring back in "**V**" bending dies. – Over bending- Corner setting- off set punch method angular punch relief, spring back in "**U**" bending dies- Remedies.

05 Hrs

Module 4

Stripping U bends – spring actuated plungers- hook strippers- positive knock off, Effects of grain direction on bending.- effects of burr side- bending in proximity to pierced holes, Materials for bending, Types of bending tools- elements- design- "V" bending dies- "U" bending dies- L bends on pressure pad dies- bending dies in press brakes- Rotary bending.

07 Hrs

Module 5

Deep drawing- Describe deep drawing- design of a draw tool, elements of draw tool, function of each element, Deep drawing of a cylindrical cup- explain, Force acting on a component while drawing, Metal flow during drawing a cylindrical cup, Wrinkling and Puckering- differentiate wrinkling and puckering.

07 Hrs

Text Books:

1. Tool Design – Donaldson
2. Die Design Fundamentals – Paquin

Reference Books:

1. Basic Die Making - Ostergarrd
2. Advanced Die Making – Ostergarrd
3. Tool Design - C.B Cole
4. Punches and Dies - Frank A Stanley
5. Fundamentals of Tool Design - A.S.T.M.E

Course code: 17VT405 Total Hours: 30 hrs	PNEUMATICS & HYDRAULICS	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to enable students : 1. Appreciate the fundamental principles of Fluid Mechanics 2. Study of working principle of various components used in hydraulic and pneumatic systems. 3. Select different components used in hydraulic and pneumatic systems. 4. Design of hydraulic and pneumatic circuits. Understand industrial applications of hydraulic and pneumatic circuits.				
Course Outcomes	Students after the completion of this course will be able to : 1. Understanding operating principles and constructional features of hydraulic and pneumatic systems. 2. Knowledge with selection of hydraulic / pneumatic components. 3. Understanding of designing and layout of Hydraulic Power package and trouble shooting.				

Module 1

Pneumatic power - application advantages & dis-advantages, Hydraulic power- mechanical power vs. fluid power in transmission – applications - advantages and disadvantages. Properties of fluid - Common properties of fluids: Density - specific volume - specific weight - relative density - pressure atmospheric, gauge, absolute pressure – viscosity, Hydrostatics: Determination of pressure at a depth below free surface of a liquid - Pascal's Law - definition - applications - hydrostatic paradox, Hydro Dynamics: Bernoulli's Equation - statement -practical -application Law of volume of flow (continuity equation), Gas Laws: Boyle's Law - Charle's Law - Gay-Lussac's Law - numerical problems applying Gas Laws. **06 Hrs**

Module 2

Production of Compressed air - Characteristics of compressed air: Positive characteristics - negative characteristics, Types of compressors: Positive displacement compressors - reciprocating piston compressor - diaphragm compressor - rotary piston compressor -two axle screw compressor – roots blower - Flow compressors: axial flow compressor - radial flow compressor, Terms associated with compressor: delivery volume-theoretical - effective-working pressure-operation, Drives for compressors: electrical motor - IC engine, Cooling of the compressors: need - methods - cooling fins - fans - fresh water cooling, Regulation of compressors: no load regulation - low speed regulation - on/off regulation, Compressed air receiver: necessary of compressed air receiver - selection of compressed air receiver - delivery volume - pressure -drive - cooling method- regulation - determination of air receiver size. **06 Hrs**

Module 3

Preparation & distribution of compressed air - Compressed Air Preparation: Necessary for the preparation of compressed air - functions of suction filter - functions of intercooler and recooler - necessity of drying compressed air -drying process -absorption drying - adsorption drying - low temperature drying-functions of air filter- requirements of air filter- functioning of pressure regulators- with vent hole - without vent hole - functions of compressed air lubricator - functions of service unit (FRL), Distribution of compressed air: system of distribution of compressed air - criteria for selecting pipe diameter - flow volume - pipe length - pressure drop - working pressure - number of restrictions in the pipe line - pipe diameter calculation- pipe material-types of line and tube connectors.

06 Hrs

Module 4

Pneumatic working elements - Pneumatic cylinders: constructional details and working of: SAC - diaphragm cylinder - rolling diaphragm cylinder- DAC - cylinders with end position cushioningcylinders with double sided piston rod-cylinders with double sided piston - tandem cylinder- multiposition cylinder - impact cylinder - rotary cylinder - constructional features of pneumatic, Cylinders - calculation for cylinders - piston force - air consumption, Pneumatic motors: characteristics of pneumatic motor - working of- sliding vane motor-gear motors- turbine motors, Pneumatic valves: constructional details and functioning of: directional valves-non- return valves- pressure control valves- shut off control valves-quick exhaust control valves - sequence control valves - time relay control valves - representation of pneumatic valves with symbols. Basic pneumatic circuits - Symbols used in pneumatics (ISO 1219/DIN 24300) - design of basic pneumatic circuits employing SAC - design of basic pneumatic circuits employing DAC - rigging up circuits.

06 Hrs

Module 5

Hydraulic working elements - Hydraulic pumps: Constructional details of gear pump - functions of gear pump, Hydraulic cylinders: constructional details and working of SAC-DAC with double piston rod- with end position cushioning - telescopic cylinders - tandem cylinder - determination of force developed by cylinders, Hydraulic motor: working of basic model of hydraulic motor - working of cam type axial piston motor, Hydraulic filters: functions of filter-air breather filter -suction line filter pressure line filter-return line filter, Hydraulic valves: construction and functions of: pressure relief valve - directional valve - flow control valve - representation of various hydraulic valves with symbols. Basic hydraulic circuits - Symbols used in hydraulics (ISO 1219/DIN 24300) - design of basic hydraulic circuits employing DAC - design of basic hydraulic circuits employing DAC - rigging up circuits. Hydro-pneumatic systems - Principles of hydro-pneumatic systems-advantages – pressure converter - pressure intensifier - functions of feed units - functioning of hydraulic accumulators - functioning of hydraulic intensifier, Electro-pneumatic system. - Principles – advantages. **06 Hrs**

Text Books:

1. Majumdar, S.R., "Oil Hydraulics Systems- Principles and Maintenance", Tata McGraw Hill,2001

2. Majumdar, S.R., "Pneumatic Systems – Principles and Maintenance", Tata McGraw Hill, 2007.

Reference books:

1. Anthony Esposito, "Fluid Power with Applications", Prentice Hall, 2009.
2. Shanmugasundaram.K, "Hydraulic and Pneumatic Controls", Chand & Co, 2006.
3. Dudelyt, A Pease and John J Pippenger, "Basic Fluid Power", Prentice Hall, 1987.
4. Srinivasan.R, "Hydraulic and Pneumatic Controls", Vijay Nicole Imprints, 2008.

Course code: 17VT406 Total Hours: 30 hrs	CNC TECHNOLOGY	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to make the students understand : 1. Familiarize with the technology of NC/CNC/DNC system. 2. Familiarize with the features of NC system. 3. Familiarize with the classification of NC system. 4. Awareness of the different elements of a numerically controlled machine tool. 5. Familiarize with NC/CNC machine tool.				
Course Outcomes	After successful completion of the course, the students should be able to: 1. Explain the technology of NC/CNC/DNC system. 2. Describe the features and classification of NC system. 3. Explain the different elements of a NC machine tool.				

Module 1

Familiarize with the technology of NC/CNC/DNC systems- History of NC, Growth of NC, NC / CNC / DNC: Introduction - Application - Advantages - Disadvantages - Development – Economy. **06 Hrs**

Module 2

Features of NC system- Classification of NC based on Feed Back control system. Open loop control system-Closed loop control system, Classification Based on Motion Control System, Point to Point - Straight cut –Contouring. **06 Hrs**

Module 3

Different elements of NC machine tool- Types of Spindle drive (AC & DC Servo Motor / Hydraulic) Special features of servomotor, Types of Axis Drive – stepper motor – servo motor, Features of stepper motor, Friction reducing elements, reciprocating ball bushes-Metallic and non-metallic guide ways-Spindle bearing-Ball lead screw, Feedback devices.

06 Hrs

Module 4

Automatic Tool Changer, Automatic Pallet Changer, Automatic swarf removal mechanism, Tool and Work holding devices. Tool and tool material used in CNC machine tools- HSS cutting tools, Carbide tools -Solid tool-Inserts, Other material.

06 Hrs

Module 5

CNC part programming in FANUC control system-Milling- Axis nomenclature, Different Coordinate systems, Preparatory and Miscellaneous function codes used in FANUC control –Milling, Exercises on part programming – milling. **06 Hrs**

Text Books:

1. Numerical machine tools- S.J Martin
2. Computers in manufacturing- George Schaffer

Reference Books:

1. The numerical controls of machine tool - Dr.Ing Wilhelm Simon
2. AM on Computers- American Machinist
3. Computer Technology- Eanle D Jones
4. CAD/CAM-Zimmers
5. Numerical controlled machines- Koram Kuren
6. NC Machines and Cam- Pressman Williams.

Course code: 17VT407 Total Hours: 90 hrs	WORKSHOP-IV	L	T	P	C
			-		8
Course Objectives	The objective of this course is to enable students : 1. Able to understand the building of a bench fixture. 2. Able to cut thread on engine lathe 3. Able to cut left hand and right-hand thread 4. Able to cut different forms of thread. 5. Able to grind the end mill cutter 6. Able to file a bevel edge. 7. Able to do Profile filing.				
Course outcomes	Students after the completion of this course will be able to: 1. Work independently on manufacturing of elements such as Bench fixture, Base Plate, Handle, Guide Plate, Cam, Cam Post and Bending Die. 2. Assembly of progressive tool.				

LIST OF EXPERIMENTS

1. **Manufacturing of elements-** Bench fixture, Base Plate, Handle, Guide Plate, Cam, Cam Post and Bending Die.
2. **Manufacturing of elements –** Spindle, Tool & Cutter, Try Square and Straight Edge.
3. **Manufacturing of elements of Progressive Tool-**Guide bush and guide pillar.
4. **Assembly of Progressive Tool**

Course code: 17VT408 Total Hours: 90 hrs	TOOL DESIGN DRAWING-II	L	T	P	C
			-		6
Course Objectives	Students after the completion of this course will be able to: 1. Training in the ability to design Progressive Tools. 2. Training in the ability to design different types of Compound Tools. 3. Training in the ability to design different types of bending tools. 4. Training in the ability to design a Drawing tool. 5. Training in the ability to design a Hand injection mould.				
Course outcomes	Students after the completion of this course will be able to: 1. Design the Progressive tool. 2. Design the Compound Tool, bending tool and drawing tool. 3. Design an Injection mold.				

LIST OF EXPERIMENTS:

1. **Design of Progressive Tools-** Design a progressive tool with travelling stripper, Design a progressive tool with side cutter and travelling stripper, Design a progressive tool incorporating parting off operation.
2. **Design of Compound Tools-** Design a compound tool with direct knock out mechanism, Design a compound tool with indirect knock out mechanism.
3. **Design of Bending Tool-** Design a 'V' bending tool, Design a 'L' bending tool, Design a 'U' bending tool, Design a 'Z' bending tool.
4. **Design of Drawing Tool-** Design a draw tool with mechanical blank holding, Design a draw and pinch trim combination tool.
5. **Design of Hand injection mould-** Design of a single cavity Hand Injection mould.

Course code: 17VT409 Total Hours: 90 hrs	PNEUMATICS & HYDRAULICS LAB	L	T	P	C
			-		6
Course Objectives	Students after the completion of this course will be able to: 1. Carry out experiments on single acting cylinders for pneumatic systems 2. Conduct experiments on control of double acting cylinders and study different control mechanisms for pneumatic systems 3. Conduct experiments on hydraulic switches 4. Carry out experiments on hydraulic accumulators 5. Conduct experiments to simulate pneumatic and hydraulic circuits using PLC				
Course outcomes	Students after the completion of this course will be able to: 1. Demonstrate the skills to conduct the experiments on hydraulic and pneumatic systems 2. Design and simulate the hydraulic and pneumatic circuits using PLC				

PNEUMATICS

LIST OF EXPERIMENTS:

Exercise 1: Direct and indirect control of a single-acting cylinder, extending

Exercise 2: Direct and indirect control of a double-acting cylinder with pushbutton

Exercise 3: Signal storage by means of contactor contacts

Exercise 4: Controlling a double- acting cylinder, impulse valve, 2 push-buttons

Exercise 5: Displacement dependent control of a double acting cylinder, impulse valve

Exercise 6: Pressure-dependent control of double-acting cylinder

Exercise 7: Time-dependent control of double-acting cylinder

Exercise 8: Holding-element control of a double-acting cylinder with impulse

Exercise 9: Displacement-dependent control of a double-acting cylinder, impulse valve, cylinder switch

Exercise 10: Sequential control of 2 double-acting cylinders with impulse valves and signal overlapping

Exercise 11: Sequential control of 2 double-acting cylinders with spring return valves and step sequence. **30 Hrs**

HYDRAULICS

LIST OF EXPERIMENTS:

Exercise 1: Extending a cylinder by operating a push button

Exercise 2: Signal storage by electrical self-locking, setting and resetting using a momentary-contact switch

Exercise 3: Mechanical locking by means of momentary-contact switch contacts

Exercise 4: Electrical locking by means of contactor contacts

Exercise 5: Signal storage by means of contactor contacts

ACCUMULATOR

Exercise 6: Accumulator applications

Exercise 7: Pressure switches and proximity switches

Exercise 8: Advance control with time-dependent intermediate stop

30 Hrs

PROGARAMMING LOGIC CONTROLLER

LIST OF EXPERIMENTS:

Exercise 1: Displacement control of Pneumatic cylinders by PLC logic

Exercise 3: Sequential Control of 2 cylinders by PLC logic

Exercise 4: Sequential Control of 2 cylinders by PLC logic

Exercise 5: Sequential Control of 3 cylinders by PLC logic

Exercise 6: Sequential Control of 2 cylinders with time delay by PLC logic

Exercise 7: Sequential Control of 2 cylinders with time delay and counter by PLC logic

Exercise 8: Sequential Control of 2 cylinders with time delay and counter by PLC logic

30 Hrs

B.VOC FIFTH SEMESTER SYLLABUS

Course code: 17VT501 Total Hours: 45hrs	PRESS TOOL TECHNOLOGY-III	L	T	P	C
			-	-	3
Course Objectives	The objective of this course is to enable students : 1. Familiarization with different forming operation 2. Knowledge in shaving operation 3. Highlight the design aspect of fine blanking. 4. Highlight the design aspect and use of unit tooling 5. Highlight the importance of transfer press in large scale manufacturing. 6. Awareness in the design of forging tool. 7. Understanding the different types of tooling materials and its application. 8. Recap the basic fundamentals of press tool building				
Course Outcomes	Students after the completion of this course will be able to : 1. Understand Forming and shaving 2. Explain Fine blanking and Unit Tooling 3. Understand the criterion in the selection of tool material				

Module 1

Forming and Shaving: Embossing - Describing embossing – need, Coining - Describe coining – need, Curling - Describe curling – need Curling - Describe curling – need, Flanging –Describe flanging –diameter of hole to be pierced for flanging – height of flange, Planishing –Describe planishing-need –method. Shaving process – purpose of shaving, shaving clearance-punch and die size of shaving. Shaving allowance –Calculate allowance for shaving, shaving direction – Decide the shaving direction – blank size before shaving

10Hrs

Module 2

Fine blanking and Unit Tooling-Explanation of term – Application of fine blanking Working principle – Explain working principle of fine blanking tool – Ring – Function of V – Ring – from die aperture, Strip width and margin-Importance of strip width and margin – calculation, Press Force-Calculation of press force for fine blanking. Unit Tooling: Angular piercing- working- application- function, Arial cam- working – application –function,

Combination tool- differentiate combination tool and compound tool **10Hrs**

Module 3

Forging and Extrusion- forging operation- billet preparation and heating- sizing of forging parts, Cold forging- coining-minting-elements-function. Extrusion Tool: Working – design – elements- function.

07Hrs

Module 4

Tooling Materials-Reason for case hard steel used for pillar and bush- Alloy materials (full hard) used as punches and dies- essential alloys required in steels used for cutting operation –Essential alloys required in steel used for forming and bending operation. **08Hrs**

Module 5

Press Tool building fundamentals-Recap of the shearing theory, cutting force, Punch and die clearance, punch and pilot height relation, stripper & pilot height relation, relationship of the part to the die and punch sizes, difference between Cut off & parting off operation, ball lock punch & ball lock punch holders, stripper windows and advantages, nitrogen gas springs and difference between a part produced from progressive and compound tool.

10Hrs

Text Books:

1. Tool Design – Donaldson
2. Die Design Fundamentals – Paquin

Reference Books:

1. Basic Die Making - Ostergarrd
2. Advanced Die Making – Ostergarrd
3. Tool Design - C.B Cole
4. Punches and Dies - Frank A Stanley
5. Fundamentals of Tool Design - A.S.T.M.E

Course code: 17VT502 Total Hours: 45hrs	MOULD TECHNOLOGY-II	L	T	P	C
			-	-	3
Course Objectives	The objective of this course is to enable students : 1. Highlight the design of molds having internal undercuts and threads. 2. Understand the design of multi daylight mold. 3. Familiarization in the design of runner less molds and hot runner mold. 4. Familiarization with the common injection molding defects. 5. Understand the design of compression mold and its parameters. 6. Understand the design of Transfer mold and its parameters 7. Familiarization of process description of die casting. 8. Familiarization with different plastic processing methods other than injection molding.				
Course outcomes	Students after the completion of this course will be able to : 1. Understand different molding methods used in internal undercuts 2. Compare between single daylight and multi daylight mold 3. Explain compression molding				

Module 1

Mould for internal under cuts and threads: Different methods used in moulding internal undercuts - form pin - straight action form pin - angled action form pins - split cores - split core with straight and angled action -side cores. Stripping internal under cuts, Mould for threaded components - Method used - Fixed thread core design. Stripping threaded components -Loose thread core-Unscrewing mould - rotating cavity -moulding for external threaded component.

10 Hrs

Module 2

Multi-daylight mould and Runner less mould- Differentiate between single daylight mould and multi-daylight mould. Underfeed moulds - Function of under-feed mould - basic underfeed mould – operation cycle Types of feed: Secondary sprue gate-Reverse taper secondary sprue -Undercut runner system -runner stripper plate design - design feature, Triple daylight mould - Identify triple daylight mould. Runner less mould-Describe Runner less mould - four types of nozzles used in Runner less mould. Hot runner mould - different types of hot runner units - Describe hot runner mould - different types of hot runner units. **10Hrs**

Module 3

Injection moulding defects and Compression moulding -shot fills, flow marks, silver streaking, poor weld lines, voids, sink marks, warpage. Compression moulding-Compression moulding process-compression moulding procedure-mould temperature press closing speed-degassing or breathing-final cure time Compression mould: vertical flash/horizontal flash designs. **09Hrs**

Module 4

Transfer moulding and Die casting- Transfer mould procedure-Advantages/disadvantages of it. Moulding cycle- tighter dimensional tolerances- insert moulding, Pot transfer mould- Plunger transfer mould-Runner-Gate- Vents.Die casting-Process description – hot chamber process- cold chamber process. Process other than injection moulding of thermoplastics-Blow Moulding-Thermoforming-Rotational Moulding-Extrusion-Calendaring. **09Hrs**

Module V

Additives for plastics-Fillers, Antioxidants, thermal stabilizers, lubricants, plasticizers, fire retardants, blowing agents, Impact modifiers, mixing and compounding equipment's. **07Hrs**

Reference books:

1 Introduction of injection mold design - Pye
2 All about Plastics- NI George
3 Die Molds and Jigs - V. Vladimir
4 Plastic material & Process – Schwartz

Course code: 17VT503 Total Hours: 30hrs	PRODUCTION MANAGEMENT CONTROL	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to enable students : 1. Understand the evolution and revolution of business and industry and their classification. 2. Highlight the factors to be considered in the site location and plant lay out 3. Highlight the importance of Production planning and control and its procedure. 4. Awareness on material management, purchase organization, store keeping and inventory control. 5. Familiarize the trainee with production, productivity and management techniques. 6. Awareness of lean manufacturing system.				
Course outcomes	Students after the completion of this course will be able to : 1. Understand Industry Nature and evolution of business development 2. Differentiate between different types of business organizations				

Module 1

Industry Nature and Evolution of Business Development of Commerce: household economy – primitive barter economy-the rise of trade- protected trade centres - town economy - international trade. Types of business organization. Private Sector: individual ownership - partnership - joint stock company - cooperative organizations. Public sector: departmental organizations - public corps or statutory cos. -government cos. Joint Sector: Ownership and control shared by private entrepreneur, state and Public Commercial business: Banking - transport - insurance - Trade: internal and international - warehousing - packing - advertising. Evolution of Industry: Historic background. **06Hrs**

Module 2

Industrial Revolution: Historic background - two major changes - six great changes or development - results of industrial revolution. Economic consequences / social and political consequences/machine age and the factory system / industrial change and business management/technology and industrial change. Classification of Industry**:** Broad classification: extractive industry –genetic industry - construction industry - manufacturing industry - on the basis of size and investment: large scale industries (heavy industry), medium scale industries(medium industries), small scale industries (light industries) - cottage industries- By the type of product : metallurgical /fuel/boilers/prime movers/electrical equipment's/telecom etc. Types of manufacturing industry: Continuous type: mass production - flow production Intermittent type: job order production - batch order production Examples for each/advantages and disadvantages

06Hrs

Module 3

Layout: Site selection of a factory: - introduction - factors to be considered in general location of the factory - factors to be considered in the selection of a particular site, Factory layout (plant buildings) : - introduction – major considerations which should be followed while making layout of any kind of factory. Plant Layout: - introduction - principles of plant layout - factors influencing plant, layout - methods of layout - line or product layout/functional or process layout, fixed position layout/combination layout - advantages and disadvantages, Flow pattern: Factors governing flow pattern-flow systems: horizontal flow lines (five basic types) - vertical flow lines (six basic types)

06Hrs

Module 4

production planning & control, Material management: Introduction – understanding PPC,Sales forecasting: Definition and concept Process planning: Definition and concept-information require to do processing planning- process planning procedure, Dispatching: Introduction dispatch procedure- centralized and decentralized dispatching, Routing: introduction – routing procedure materials, purchase, stores and inventory management. Material management: functions of material management- objectives of material Management Purchase organization: objectives of purchasing department- activities, duties and functions of purchasing department- purchase procedure .Stores and store keeping: : purpose of storekeeping, duties of store keeper- store location- methods of storing-protection of stores- stock stacking system. Inventory control: inventory classification-objectives and how to achieve them –function of inventories- economic order quantity- ABC analysis. Introduction, Characteristics of Game Theory, Two Person, Zero sum games, Pure

strategy. Dominance theory, Mixed strategies (2x2, mx2), Algebraic and graphical methods. CPM & PERT- project scheduling, critical path calculations, Crashing, job sequencing.

06Hrs

Module 5

production and productivity management techniques-Production and productivity: Understanding production and productivity- measures to increase productivity, Quality control: inspection and quality control- kinds of inspection- statistical quality control (SQC)- sampling inspection- control charts and their applications.
Quality circle (QC): what is quality circle- origin of quality circle- structure of quality circle. Operation of quality circle. "KAIZEN" – understanding "KAIZEN"- objectives of kaizen. ' KANBAN"- the" JUST IN TIME"; management system; introduction to kanban Introduction of TPM & TQM. LEAN MANUFACTURING SYSTEM Lean manufacturing concept to analyze different kind of waste in production system and give methods of minimize the waste and increase efficiency

06Hrs

Reference books:

1. Industrial organization and management- Sundaramurthy
2. Fundamentals of business organization - Y K Bushan
3. Store keeping - Ananthakrishnan
4. Plant layout and material handling - G Chandrasakaran
5. Factory organizations and principles of management – K Ahiya
6. Industrial engineering - M Ponnuswamy
7. Industrial engineering and management sciences - Banga, Agarwal

Course code: 17VT504 Total Hours: 30hrs	CNC TECHNOLOGY	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to make the students : 1. Understand the CNC codes and part Programming. 2. Awareness of FMS 3. Awareness of Robotics 4. Familiarize with digitizing. 5. Familiarize with laser machining.				
Course outcomes	Upon successful completion of this course, the trainee will be able to: 1. Able to generate CNC part programme 2. Understand the need for Flexible Manufacturing system 3. Operate CNC machines				

Module 1

CNC part programming– Lathe, Axis nomenclature, Terms in programming Tool, Speed, & Feed functions, Preparatory and Miscellaneous function codes used in lathe Exercise on part programming – without canned cycle, Canned cycle, Exercise on part programming – with canned cycles. **06Hrs**

Module 2

FMS-Introduction to FMS (flexible manufacturing system), introduction, sub systems of fms, scope of fms, benefits of fms.

06Hrs

Module 3

Robotics-Definition, Elements of robotic systems, need of using robotics, key features of robots **06Hrs**

Module 4

Digitizing-Introduction, key feature

06Hrs

Module 5
laser machining-Introduction, key features

06Hrs

Reference books:

1 Numerical machine tools - S.J Martin

2. The numerical controls of machine tool - Prof Dr.Ing wilhelm Simon

3. AM on Computers - American Machinist

4. Computers in manufacturing - George Schaffer

5. Computer Technology - Eanle D Jones

6. CAD/CAM - Zimmers

7. Numerical controlled machines - Koram Kuren

Course code: 17VT511 Total Hours: 30hrs	ADVANCED MOLD TECHNIQUES	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to enable students : Student should be able to 1. Understand the techniques for manufacturing of plastic components 2. Outline the significance of blow molding and RIM. 3. Analyze components of extrusion coating. 4. Understand the concept of PTFE molding.				
Course outcomes	Students after the completion of this course will be able to: 1. Understand Injection molding, Extrusion, Lamination, Blow molding and special molding techniques. 2. Analyze the plastic components and challenges in selection of feed system. 3. Apply the engineering knowledge for the selection of type of mound for plastic components. 4. Design and evaluate the effects of mold on the components.				

Module1

Future trends in injection molding-Molding of cellular product like EPS, steam chest molding, future trends in injection molding like external & internal inter locking alignment of large molds, processing of specialty polymers. **06Hrs**

Module 2

Blow Molding-Working principle of blow molding machine, injection stretch blow molding of PET, precut molding, multi-layer blow molding. **06Hrs**

Module3

Reaction Injection Molding and LSR molding-RIM of Polyurethane, material for RIM, liquid RIM & its advantages over conventional injection molding. LSR-process, equipment, characteristics of LSR, advantages of LSR. **06Hrs**

Module4

Lamination-Lamination by extrusion coating, twin screw extrusion, co-rotating & counter rotating, feeding mechanism in twin screw extruder, principles of compounding, mixing mechanism etc. **06Hrs**

Module 5

PTFE Molding-Processing techniques used for PTFE, Material consideration, sintering, Ram extrusion and Paste extrusion, advantages of PTFE processing. **06Hrs**

Text Books:

1. Injection Moulding, Theory and Practice by Irvin I. Rubin. Wiley-Interscience, ISBN-13: 978-0471744450
2. Extrusion Die Design, M. V. Joshi. PublisherMacmillan Publishers India LtdISBN-13: 9780333904497
3. Polymer Extrusion 5E, Rauwendaal, C. New York, Hanser Publications ISBN: 9781569905166
4. Blow Molding Handbook: Technology, Performance, Markets, Economics: The Complete Blow Molding Operation, Dominick V. Rosato, Hanser Gardner Publications (ISBN13: 9781569903438) 2003

Course code: 17VT512 Total Hours: 30hrs	ADDITIVE MANUFACTURING	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to enable students : Student should be able 1. To understand the fundamentals for additive manufacturing and how it is different and discuss about various types of liquid based, solid based and powder-based AM technologies. 2. To understand the various types of Pre-processing, processing, post-processing errors in AM. Also to know the various types of data formats and software's used in AM. 3. To know the various applications of AM in design analysis, aerospace, automotive, biomedical and other fields				
Course outcomes	Students after the completion of this course will be able to: 1. Understand the fundamentals for additive manufacturing 2. Understand the various types of Pre-processing, processing, post-processing errors in AM.				

Module 1

Introduction: Prototyping fundamentals: Need for time compression in product development, Need for Additive Manufacturing, Historical development, Fundamentals of Additive Manufacturing, AM Process Chain, Advantages and Limitations of AM, Commonly used Terms, Classification of AM process, Fundamental Automated Processes: Distinction between AM and CNC, other related technologies. **06Hrs**

Module 2

Liquid-based AM Systems: Stereo lithography Apparatus (SLA): Models and specifications, Process, working principle, photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Case studies. Solid ground curing (SGC): Models and specifications, Process, working principle,

Applications, Advantages and Disadvantages, Case studies. Polyjet: Process, Principle, working principle, Applications, Advantages and Disadvantages, Case studies. Microfabrication. **Solid-based AM Systems**: Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Multi-Jet Modelling (MJM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

06Hrs

Module 3

Powder Based AM Systems: Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Three-dimensional Printing (3DP): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Laser Engineered Net Shaping (LENS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Electron Beam Melting (EBM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Rapid **Tooling**: Introduction to Rapid Tooling (RT), Conventional Tooling Vs RT, Need for RT. Rapid Tooling Classification: Indirect Rapid Tooling Methods: Arc Spray Metal Deposition, Investment Casting, Sand Casting, 3D Keltool process. Direct Rapid Tooling: Direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP. **06Hrs**

Module 4

AM Data Formats: Reengineering for Digital Representation, STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solution, Other Translators, Newly Proposed Formats. Mesh Refining by Sub division Techniques. **AM Software's**: Need for AM software, Features of various AM software's like Magics, Mimics, Solid View, View Expert, 3 D View, Velocity 2, Rhino, STL View 3 Data Expert and 3 D doctor, SurgiGuide, 3-matic, Simplant, MeshLab.

06Hrs

Module 5

AM Applications: Application – Material Relationship, Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, GIS application, Arts and Architecture. RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customised Implants & Prosthesis, Design and Production of Medical Devices, Forensic Science and Anthropology, Visulization of Biomolecules. Web Based Rapid Prototyping **06Hrs**

Text Books:

1. Rapid prototyping: Principles and Applications - Chua C.K., Leong K.F. and LIM C.S, World Scientific publications , Third Edition, 2010.
2. Rapid Manufacturing – D.T. Pham and S.S. Dimov, Springer , 2001
3. Wholers Report 2000 – Terry Wohlers, Wohlers Associates, 2000
4. Rapid Prototyping & Engineering Applications – Frank W.Liou, CRC Press, Taylor & Francis Group, 2011.

Course code: 17VT506 Total Hours: 90 hrs	TOOL DESIGN DRAWING-III	L	T	P	C
			-		6
Course Objectives	The objective of this course is to make the students understand : 1. Ability to design injection molds 2. Ability to design injection molds with various types of Ejection mechanisms 3. Ability to design injection molds with split cavities. 4. Ability to design injection molds with delayed opening. 5. Ability to design a three-plate mold with simple mechanism				
Course Outcomes	After successful completion of the course, the students should be able to : 1. Design all the elements of injection mold 2. Design a two-plate injection mold with split cavity and side core				

LIST OF EXPERIMENTS

TOPICS
Design of injection mold base.
Design of 2 plate injection mold
Design of inj mold with sleeve ejection
Design of inj mold with stripper plate ejection.
Design of **split cavity** inj mold with sleeve ejection
Design of split cavity injection mold with **dog leg** cam.
Design of mold with **side core**
Design of mold with **split cores**
Design of molds having **threads**. – Collapsible core

Course code: 17VT507 Total Hours: 90 hrs	WORKSHOP-V	L	T	P	C
		-	-	-	6
Course Objectives	The objective of this course is to enable students : 1. Understanding the concepts of different operations such as Bench work, milling and Turning. 2. Understanding the concepts of different operations such as surface grinding and cylindrical grinding.				
Course Outcomes	Students after the completion of this course will be able to: 1. Work independently on different operations such as Bench work, milling, Turning, surface grinding and cylindrical grinding.				

LIST OF EXPERIMENTS

1. **Manufacturing of elements of Hand Injection Mould -** Top Plate, Cavity plate, guide pillar.
2. **Manufacturing of elements of Hand Injection Mould -** Bottom plate, core plate, actuating rod.
3. **Manufacturing of elements of Hand Injection Mould –** stripper plate, core and assembly

Course code: 17VT508 Total Hours: 90 hrs	INJECTION MOLD AND PRESS TOOL DESIGN USING CATIA	L	T	P	C
		-	-	-	6
Course Objectives	The objective of this course is to make the students understand : 1. Part modelling of Progressive Tool 2. Assembly of Progressive Tool 3. Part modelling of 2 plate injection mold 4. Assembly of 2 plate injection mold				
Course Outcomes	After successful completion of the course, the students should be able to : 1. 3D modelling and assembly of Progressive Tool and 2 plate injection mold.				

LIST OF EXPERIMENTS

PRESS TOOL DESIGN
Part modelling of Progressive Tool- Top plate, Bottom plate, Punch back plate, Punch holder, Punch.
Part modelling of Progressive Tool- Stripper plate, Stripper back plate, Die plate, Die back plate, Die.
Part modelling of Progressive Tool- Strip guide spacer, Strip guide holder, Guide pillar, Guide bush.
Assembly of Progressive Tool- Assembly of top half and bottom half.

INJECTION MOLD DESIGN
Part modelling of 2 plate injection mold - Top plate, Sprue bush, Cavity plate, Cavity insert, Locating ring, Guide pillar.
Part modelling of 2 plate injection mold – Bottom plate, Core plate, Core insert, Guide bush, Ejector plate, Ejector back plate, Spacer.
Assembly of 2 plate injection mold - Assembly of top half and bottom half.

Course code: 17VT509 Total Hours: 15 hrs	ENVIRONMENTAL STUDIES	L	T	P	C
		-	-	-	-
Course Objectives	The objective of this course is to enable students : 1. Recognize concepts in environmental sciences 2. Demonstrate the understanding of the environment. 3. Demonstrate the knowledge of social responsibility				
Course Outcomes	Students after the completion of this course will be able to: 1. Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale. 2. Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment. 3. Demonstrate ecology knowledge of a complex relationship between predators, prey, and the plant community. 4. Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.				

Module1:

Environment, Components of Environment Ecosystem- Types & Structure of Ecosystem, Balanced ecosystem Human Activities, Food, Shelter, and Economic and Social Security. Impacts of Agriculture and Housing Impacts of Industry, Mining and Transportation Environmental Impact assessment, Sustainable Development. **03Hrs**

Module2

Natural Resources, Water resources and Energy-Availability and Quality aspects, Water borne diseases and water induced diseases, Fluoride problem in drinking water Mineral resources, Forest Wealth Material Cycles, Carbon Cycle, Nitrogen Cycle and Sulphur

Cycle. Energy: Different types of energy, Conventional sources and Non-Conventional sources of energy, Solar energy, Hydro electric energy, Wind Energy, Nuclear energy, Biomass and Biogas Fossil Fuels, Hydrogen as an alternative energy. **03Hrs**

Module3

Environmental Pollution and Global Environmental Issues- Water Pollution, Noise pollution, Land Pollution, Public Health Aspects. Global Environmental Issues: Population Growth, Urbanization, Land Management, Water and Waste Water Management. **03Hrs**

Module4

Air Pollution, Automobile Pollution and Waste Management - Definition, Effects, Global Warming, Acid rain and Ozone layer depletion, controlling measures. Waste Management, E - Waste Management and Biomedical Waste Management, Sources, Characteristics and Disposal methods. **03Hrs**

Module5

GIS, Environmental Acts and Regulations-Introduction to GIS & Remote sensing, Applications of GIS and Remote Sensing in Environmental Engineering Practices. Environmental Acts and Regulations, Role of government, Legal aspects, Role of Non-governmental Organizations (NGOs), Environmental Education and Women Education. **03Hrs**

Text Books:

1. Benny Joseph, "Environmental Studies", Tata McGraw – Hill Publishing Company Limited, 2005.
2. R.J.Ranjit Daniels and Jagadish Krishnaswamy, (2009), "Environmental Studies", Wiley India Private Ltd., New Delhi.

Reference Books:

1. Raman Sivakumar, "Principals of Environmental Science and Engineering", Second Edition, Cengage learning Singapore, 2005.
2. R Rajagopalan, "Environmental Studies – From Crisis to Cure", Oxford University Press, 2005,
3. Aloka Debi, "Environmental Science and Engineering", Universities Press (India) Pvt. Ltd. 2012.

B.VOC SIXTH SEMESTER SYLLABUS

Course code: 17VT601 Total Hours: 45 hrs	PRESS TOOL TECHNOLOGY-IV	L	T	P	C
			-	-	3
Course Objectives	The objective of this course is to enable students : 1. Ability to design the punch considering the strength and stability required for cutting. 2. Knowledge in the development of blank sizes for drawing operation and the force required to draw. 3. Knowledge in the Statistical Process Control. 4. Knowledge in popular issues and remedy that occur in stamping operation. 5. Knowledge in the getting maximum life out of a Press Tool. 6. Knowledge in the Advanced multistage tooling involving multiple operations				
Course Outcomes	Students after the completion of this course will be able to : 1. Explain the design of punch considering the strength and stability required for cutting. 2. Analyze the development of blank sizes for drawing operation and the force required to draw. 3. Explain the Advanced multistage tooling involving multiple operations.				

Module 1

Buckling of punches and deep drawing- Buckling theorem – problems - types of loads acting on punches- determining the size of punches. Blank development of a cylindrical shells- necessity for determining the blank diameter for the cylindrical shells - development of blank using the algebraic method - using graphical method. Drawing Force- Explain drawing force – method for calculating drawing force for a cylindrical cup. Press capacity**.** Blank holding Force- calculation method for blank holding force. Clearance- importance of clearance- formula to calculate clearance for deep drawing-calculation. Die Punch radius- importance of die and punch radius. Draw beads- importance of draw beads- types of beads. Air vents- importance of air vents- methods of providing. **10Hrs**

Module 2

Deep drawing and its types- Number of draws- height of the cup at each stage. Diameter at each stage- Consideration of d/D ratio- consideration of percentage reduction. Drawing flanged components- determination of number of draws calculation. Metal flow in a rectangular shell - describe- blank development of rectangular shell using graphical method. Faults occurring deep drawing- faults on material, equipment and design of tools-faults in maintenance and setting tools- remedies- necessity of annealing in between draws (intermediate annealing). Reverse draw. Ironing. Eyelet drawing – describe eyelet drawing-calculation of number of draws.

10Hrs

Module 3

Acceptance of tools in process capability-Process capability of tools- chance cause and assignable cause. Tolerance on components- characteristic to consider during design-special characteristics - USL & LSL and USL & UCL. Production run of tools – uninterrupted production run- record results of identifying sp. Characteristic. Calculate process capability in terms of Cp & Cpk. **10Hrs**

Module 4

Tool failures- Determining factors of tool failures-slug jamming- press selection-knife edge error in designing die block and punch. Slug pulling and the remedies. Breakage of die plates and repair-welding, stitching, nesting etc.

08Hrs

Module 5

Factors Effecting Tool Life and advanced multistage tooling - Introduction. Elements of tool performance – wear of punch and die block- side wall finish- excessive wear-die block life calculation. Application and advantages in doing different types of operation in a single tool progressively.

07Hrs

Text Books:

1. Die Design Fundamentals - Paquin
2. Tool Design - Donaldson
3. Basic Die Making - Ostergarrd

Reference Books:

1. Advance Die making. - Ostergarrd
2. Tool Design - C.B Cole
3. Punches and Dies - Frank A Stanley
4. Fundamentals of Tool Design - A.S.T.M.E

Course code: 17VT602 Total Hours: 45 hrs	MOULD TECHNOLOGY-III	L	T	P	C
			-	-	3
Course Objectives	The objective of this course is to enable students : 1. Highlight the importance of mould Polishing. 2. Appreciation of the factors effecting mould service life and Mould Maintenance. 3. Familiarization in the design of injection moulding of Thermosets. 4. Awareness on different Surface treatment methods of Plastic. 5. Familiarization of the Die casting Die. 6. Familiarization of Flow systems of die casting. 7. Knowledge about the various Defects and remedies in die casting. 8. Familiarization of Product development. 9. Familiarization of Metal injection moulding.				
Course Outcomes	Students after the completion of this course will be able to : 1. Understand the importance of mould Polishing and factors effecting mould service life and Mould Maintenance. 2. Explain the design of injection moulding of Thermosets. 3. Explain the concept of Product development and Metal injection moulding.				

Module 1

Polishing and factors effecting mould service life-Importance of mould polishing. Importance of mould finishing – Chrome plating – advantages of chrome plating – practical hints – Sequence of lapping and polishing of mould parts. Mechanical design – grade of tool steel – Machining procedure – heat treatment – grinding – handling. Mould maintenance – break down maintenance – Mould history card – Preventive maintenance based on wear due to moulding. **09Hrs**

Module 2

Injection moulding of thermoset plastics and Surface Treatment of plastics- Injection moulding of thermosets – describe the working of injection moulding of thermosets – Advantages and disadvantages of direct screw transfer moulds. Mould design – process of injection moulding of thermosets – mould heating - sprue – runner – gate – venting – condition of injection moulding of thermosets – counter pressure – injection pressure – hold on pressure – curing time. Screen printing – hot stamping – heat transfer decoration – two color moulding – electroplating of plastics – vacuum metalizing of plastics. **09Hrs**

Module 3

Die casting Die and flow systems of die casting- Basic terminology- elements of mould – function – Fixed half – moving half – impression – cavity – core – ejector grid. Metal flow systems in die casting die – Machine suitability – the goose neck – the nozzle – the sprue – runner systems – shock absorber – gate – air vents – over flows. **07Hrs**

Module 4

Defects and remedies of die casting- Cold type defects – reasons for the occurrence of two type's cold defects- remedies for avoiding. Hot type defects – reasons for the occurrence of five type's hot defects on a die cast component. – Remedies for avoiding. Miscellaneous defect – suggesting reasons and remedies for the six types of defects on the die cast component. **07Hrs**

Module 5

Plastic Product design guide line and injection moulding of metals - Selection of product market need – prototype – confirm specification – consolidate design – manufacturing stage – quality parameters – validate the outcome – launch product. Introduction of MIM. MIM process. Applications of MIM parts. **07Hrs**

Module 6

Advancement in Other Processing Technique- New techniques like Resin transfer molding, Pultrusion. Filament winding, multi-layer rotation molding, Centrifugal casting. **06Hrs**

Text Books

1. Introduction of injection mould design -Pye
2. All about Plastics -NI George
3. Injection molding, Theory and practice -Irvin I Rubin

Reference Books:

1. Die Moulds and Jigs -V. Vladimir
2. Plastic material & Process- Schwartz

Course code: 17VT603 Total Hours: 30 hrs	ESTIMATION & COSTING	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to enable students : 1. Highlight the importance of Estimation**.** 2. Highlight the importance of costing and constituents of estimate. 3. Determine the selling price of a component. 4. Familiarizing with all the steps in finding the basic machine hour rate. 5. Highlight the methods of estimating the tooling. 6. Familiarization of estimation guide. 7. Familiarize with the standard estimation sheet for the press tools 8. Work out estimates for jigs, fixtures, moulds and dies. 9. Work out cost of components.				
Course Outcomes	Students after the completion of this course will be able to : 1. Understand the importance of Estimation and costing. 2. Apply the concept of selling price of a component. 3. Work out estimates for jigs, fixtures, moulds, dies and cost of components.				

Module 1

Importance of estimation and costing- Estimation – meaning-define, aims of estimating. Over and under estimation. Quality of an estimator. Source of errors in estimation. Meaning of costing. Aims of costing. Constituents of estimates: design time- drafting time- planning and production design and arrangements of special items- experimental work- material, labor – overheads. Time allowances: set up time- operation time- tear down time- miscellaneous allowances. **06Hrs**

Module 2

Selling price of a component and basic machine hour rate- Elements of cost: direct material-indirect materials- direct labor- indirect labor-direct expense- indirect expense. Components of cost: prime cost- factory cost- office cost- total cost- selling price. Numerical problems. Factors in finding basic machine hour rate- capital cost- depreciation-interest on capital cost- energy cost- space cost- maintenance and servicing cost- scrap value. Numerical calculations. **06Hrs**

Module 3

Methods of estimating the tool and estimation guide- Rough method of estimation-advantages and disadvantages. Estimation guide for press tool: time for round punches-blanking in single stage- embossing in single stage- round holes in progressive tools-notching in progressive tools- bending in progressive tool. **06Hrs**

Module 4

Standard estimation sheet for press tools, moulds and dies- Standard estimation sheet: basic die- basic tool-extra allowance-raw material cost- die set cost- design charges. Estimation of press tool: use of standard estimation sheet- arrive at a final cost- work out. Estimation for one jig and a Fixture. Injection mould estimate: simple single cavity injection mould- multi cavity injection mould- injection mould with side core. Compression mould estimation: single cavity – multi cavity. Transfer mould estimation. Pressure die casting estimation. **07Hrs**

Module 5

Cost of component- Sheet metal: raw (weight norm) material cost- labor cost – amortization cost- extra expenses. Molded components: Raw material cost- shot weight (including runner and sprue) - labor cost- extra expenses. Machined and casted component. **05Hrs**

Text books

1. Mechanical estimation and costing - T.R. Banga & S.C. Sharma
2. Principles and practices of Book - V.A.Patil & Keeping J.S. Korlahalli

Reference books:

1. Rahman's Cost and Management Accounting.
2. Nafees baig Problems of Management accounting.

Course code: 17VT604 Total Hours: 30 hrs	INDUSTRIAL MANAGEMENT	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to make the students 1. To know the definitions and levels of management. 2. To understand the meaning of productivity. 3. To study the importance of quality circle. 4. To highlight the modern production management system. 5. To know the definition of TQM/TPM. 6. To understand the industrial & factories act.				
Course Outcomes	Upon successful completion of this course, the trainee will be able to: 4. Explain the importance of quality circle and productivity. 5. Analyze the levels of management and TQM/TPM. 6. Explain the concept of industrial & factories act				

Module 1

Evolution and nature of management, inspection and quality control- Management Process and Functions. Levels of management, role and responsibility. Business Organizations & Plant Layout. Quality control-inspection. 7 QC tools. SQC and SPC. Quality circles Definition and origin. Structure and operation. Quality standards. QS 9000 Quality Standards. ISO 9000 Clauses. Steps to Implement. **06Hrs**

Module 2

Environmental pollution and industrial safety- Air, Water, Solid, Noise Pollution and Control Methods. Environment Management System - ISO 14001. Losses due to Industrial Accidents. Direct & Indirect Losses. Preventive Measures. Safety Committee & Safety Management System (OSHAS 18001). **06Hrs**

Module 3

Modern production management system and TQM / TPM- 5S. KAIZEN. KANNBAN. POKA – YOKE. TQM-overview. TQM contribution of quality gurus. Control-Steps to implement TQM. TPM-importance and implementation. Production and productivity. **06Hrs**

Module 4

Estimation and costing, human resources and management- Importance of estimation and costing. Sources of errors. Costing definition and importance. Estimation of cost. Components of cost. Estimation methods of complete projects-case studies. Recruitment Procedure. Training &Training Needs. Leadership. Team Building & Creativity **06Hrs**

Module 5

Industrial relations and legislations- employee's welfare facilities. Industrial relations-industrial disputes. Trade union act-rights and liabilities. Indian factories act. Payment of wages act. Workmen's compensation act. Esi, pf act. **06Hrs**

Text Books

1. Industrial Engineering and Management - O P Khanna.

Reference Books

1. Hi tech industrial management - B C Prabhakar.

Course code: 17VT611 Total Hours: 30 hrs	LEAN MANUFACTURING SYSTEMS	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to make the students The students shall be able to: 1. Understand the practices of lean manufacturing in Toyota production system. 2. Analyze the various processes in organizations. 3. Develop lean manufacturing strategies for improving various processes. 4. Implement lean manufacturing principles in different organizations.				
Course Outcomes	Upon successful completion of this course, the trainee will be able to: 1. Understand the concepts of lean manufacturing 2. Implement and analyze lean manufacturing principles				

Module 1

Introduction to Lean Manufacturing: Definition of Lean, Lean and Just-in-Time, Seven major types of non-value-adding wastes in manufacturing processes-Overproduction, queues, transportation, inventory, motion, over processing and defective product. **06Hrs**

Module 2

Toyota Production System (TPS): Origins, Underlying principles to TPS-Customer-supplier connection-product and service flows, results of Toyota Production System , Timeline. **06Hrs**

Module 3

Key Lean Manufacturing Techniques: 5S-examples-benefits and drawbacks, Single Minute Exchange of Dies(SMED)- examples and benefits, Kanban- examples and benefits, Cellular Manufacturing- examples and benefits. **06Hrs**

Module 4

Inventory and Variation: Background, Need of the Inventory, disadvantages of Inventory, Make-to-Stock versus Make-to-Order Production Systems, The Philosophy and Objectives, Foundation of Quality Control, Quantity Control case study. **06Hrs**

Module 5

Planning and Goals: Hoshin–Kanri Planning, importance of Goals and Goal Deployment, Policy Deployment, Leadership in Goal Development and Deployment

Sustaining the Gains: Importance of Sustaining the Gains, existence of Process gains and loss. **06Hrs**

Reference Books:

1. Lonnie Wilson, "How to Implement Lean Manufacturing", McGraw-Hill, 2009 Edition, ISBN: 978-0-07-162508-1,
2. Michael Hammer & James Champy, "Reengineering the Corporation, A Manifesto for Business Revolution", Harper Business Essentials, 2006 Edition, ISBN-978-0060559533
3. Jeffrey K. Liker, "The Toyota Way", The McGraw-Hill, 1st Edition, 2004, ISBN-13: 978- 0070587472.
4. M.G. Korgaonker, "Just In Time Manufacturing", Macmillan India Ltd., 2006 Edition, ISBN: 0333 926633.

Course code: 17VT612 Total Hours: 30 hrs	QUALITY AND RELIABILITY ENGINEERING	L	T	P	C
			-	-	2
Course Objectives	The objective of this course is to make the students The students shall be able to: 1. Describe the quality control techniques for a production systems 2. Explain the importance of value addition to products through analysis 3. Prepare QC, FMEA, VA, VSM charts 4. Analyze test data and predict reliability of components				
Course Outcomes	Upon successful completion of this course, the trainee will be able to: 1. Explain the importance of product value addition 2. Describe the QC techniques				

Module 1

Introduction

The seven traditional tools of quality – New management tools – Six - sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types. Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality Performance measures. **06Hrs**

Module 2

Quality Systems

Need for ISO 9000-ISO 9000-2000 Quality System –Elements, Documentation, Quality auditing- QS 9000 –ISO 14000 –Concepts, Requirements and Benefits –Case studies of TQM implementation in manufacturing and service sectors. **06Hrs**

Module 3

Quality and Reliability: Reliability improvements -techniques- use of Pareto analysis - design for reliability - redundancy unit and standby redundancy - Optimization in reliability - Product design - Product analysis - Product development - Product life cycles. **06Hrs**

Module 4

Failure Mode Effects Analysis

Review product or process, brainstorm failure modes and its effect, assign severity, occurrence detection ranking, calculate RPN, prioritize and initiate action **06Hrs**

Module 5

Control Charts

Statistical quality control, sample size, parameter selection, control charts for variables and control charts for attributes, process capability. **06Hrs**

Reference Books:

1. Juran J.M., Gryna.F.M., 'Quality Planning and Analysis', Tata Mcgraw Hill Publication, 2 Edn, 1982.
2. Balagurusamy, 'Reliability Engineering', TMH publications, 10th Edn., 1984,
3. ISBN:978007048339-2
4. R.K.Jain, 'Engineering Metrology', Khannan Publishers, 1997
5. Del Younker, 'Value Engineering-Analysis & Methodology', Marcel Dekker Inc., 2003, ISBN: 082470696

Course code: 17VT606 Total Hours: 90 hrs	TOOL DESIGN DRAWING-IV	L	T	P	C
			-	-	6
Course Objectives	The objective of this course is to make the students understand : 1. Training in the ability to design a Compression mold. 2. Training in the ability to design a Transfer mold. 3. Training in the ability to design a Multi stage mold with positive pull mechanism. 4. Training in the ability to design a Die casting Die. 5. Training in the ability to design multi-function Progressive Tool.				
Course Outcomes	After successful completion of the course, the students should be able to : 1. Design all the elements of compression mold and transfer mold. 2. Design a die casting die and multi-function Progressive Tool.				

LIST OF EXPERIMENTS

1. **Design of compression mold-** Design of compression mold showing horizontal flash. design of compression mold showing vertical flash.

2. **Design of Transfer mold**- Design of a plunger transfer mold. Design of a pot transfer mold.

3. **Design of a Multi-Day Light mold**- Design of a triple day light.

4. **Design of Die casting die-** Design of a die casting die for a cold chamber system. Design of a die casting die for a hot chamber system.

5. **Design of an Advanced Multi stage Tool**- Design of a progressive tool with multiple operation- cutting, bending, and side cam piercing and parting.

Course code: 17VT607 Total Hours: 60 hrs	WORKSHOP-VI	L	T	P	C
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Course Objectives	The objective of this course is to enable students : 1. Understanding the concepts of different operations such as Bench work, milling and Turning. 2. Understanding the concepts of different operations such as surface grinding and cylindrical grinding.				
Course Outcomes	Students after the completion of this course will be able to: 1. Work independently on different operations such as Bench work, milling, Turning, surface grinding and cylindrical grinding.				

LIST OF EXPERIMENTS

1. **Manufacturing of elements of DIE SET WITH SPIGOT PILLARS -** Top Plate, Cavity plate, guide pillar.
2. **Manufacturing of elements of DIE SET WITH SPIGOT PILLARS -** Bottom plate, core plate, actuating rod.
3. **Manufacturing of elements of DIE SET WITH SPIGOT PILLARS –** stripper plate, core and assembly.

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