Scheme

B.Voc. (Production-Tool & Die Manufacturing)

Industry Partner-JBM

Session (2020-2023) and onwards

Credit allocation;

Type	No. of hrs.	Credit
Theory	15	1
Practical	30	1
On-the-Job Training (OJT)	45	1

TEACHING SCHEME FOR FIRST SEMESTER

Category	Subject Code	Subject Name	Credits			Marks							Total hrs. per course		
						Theory			Practical			Total (T+P)			
			Th.	Pr.	To.	Int.	Ext.	To.	Int.	Ext.	To.		Th.	Pr.	To.
Skill Education Component (SEC)	ME-504L	Workshop Practice	-	4	4	-	-	-	70	30	100	100	-	120	120
	ME-502,	Workshop Technology	4	-	4	30	70	100	-	-	-	100	60		60
	ME-501L	Engineering Graphics and Drawing	-	4	4	-	-	-	70	30	100	100	-	120	120
	SEC Total		**4**	**8**	**12**	**30**	**70**	**100**	**140**	**60**	**200**	**300**	**60**	**240**	**300**
General Education Component (GEC)	ENG-501 ENG-501L	Communication Skills	3	1	4	15	35	50	35	15	50	100	45	30	75
	EE-501, EE-501L	Basics of Electrical & Electronics Engineering	3	1	4	15	35	50	35	15	50	100	45	30	75
	MTH-501	Applied Mathematics	4	-	4	30	70	100	-	-	-	100	60		60
	CSE-501, CSE-501L	Fundamental of Computer	3	1	4	15	35	50	35	15	50	100	45	30	75
	IMS-501, IMS-501L	Fundamental of Industrial Management and Safety	3	1	4	15	35	50	35	15	50	100	45	30	75
	GEC Total		**16**	**4**	**20**	**90**	**210**	**300**	**140**	**60**	**200**	**500**	**240**	**120**	**360**
	Grand Total		**20**	**12**	**32**	**120**	**280**	**400**	**280**	**120**	**400**	**800**	**300**	**360**	**660**

Semester-II

Category	Subject Code	Subject Name	Credits			Marks							Hrs		
						Theory			Practical			Total			
			T	P	TO	I	E	TO	I	E	TO	(T+P)	T	P	TO
General Education Component	MC-501	*MOOC/ Online Course-I (Fundamentals of welding sciences & technology)	2	-	2	30	70	100	-	-	-	100	30	-	30
	EM-501	Entrepreneurship Development (MOOC/ Online Course-II)	2	-	2	30	70	100	-	-	-	100	30	-	30
	Total		**4**	**-**	**4**	**60**	**140**	**200**	**-**	**-**	**-**	**200**	**60**	**-**	**60**
Skill Education Component	OJT-501	On Job Training (OJT)	-	24	24	-	-	-	245	105	350	350	-	1080	1080
	Total		**-**	**24**	**24**	-	-	-	**245**	**105**	**350**	**350**	**-**	**1080**	**1080**
	Grand Total		**4**	**24**	**28**	**60**	**140**	**200**	**245**	**105**	**350**	**550**	**60**	**1080**	**1140**

Note: * Relevant MOOC/Online course will be offered as per the availability.

Job Role: Level -4
Machining Technician/CNC Operator (ASC/Q3503)
Tool & Die maker (CSC/Q0104)

TEACHING SCHEME FOR THIRD SEMESTER															
Category	**Subject Code**	**Subject Name**	**Credits**			**Marks**							**Total hrs. per course**		
						Theory			**Practical**			**Total**			
			Th.	**Pr.**	**To.**	**Int.**	**Ext.**	**To.**	**Int.**	**Ext.**	**To.**	**(T+P)**	**Th.**	**Pr.**	**To.**
Skill Education Component (SEC)	ME-607L	CAD-II	-	4	4	-	-	-	70	30	100	100	-	120	120
	ME-502L	Fundamentals of CNC machines	-	4	4	-	-	-	70	30	100	100	-	120	120
	ME-606 ME-606L	Electrical Machines & Drives	3	1	4	15	35	50	35	15	50	100	45	30	75
	SEC Total		**3**	**9**	**12**	**15**	**35**	**50**	**175**	**75**	**250**	**300**	**45**	**270**	**315**
General Education Component (GEC)	ME-601 ME-601L	CAD-1	2	2	4	15	35	50	35	15	50	100	30	60	90
	MSE-701 MSE-701L	Material Science & Heat Treatment	3	1	4	15	35	50	35	15	50	100	45	30	75
	ME-602	Basics of Jigs & Fixtures	4	-	4	30	70	100	-	-	-	100	60	-	60
		Elective-1 :Advanced Press Tools & Dies (ME-603)/ Basics of Press Tools, Dies & Moulds (ME-604)	4	-	4	30	70	100	-	-	-	100	60	-	60
	ME-503 ME-503L	Measurement & Metrology	3	1	4	15	35	50	35	15	50	100	45	30	75
	GEC Total		**16**	**4**	**20**	**105**	**245**	**350**	**105**	**45**	**150**	**500**	**240**	**120**	**360**
	Grand Total		**19**	**13**	**32**	**120**	**280**	**400**	**210**	**90**	**300**	**700**	**285**	**390**	**675**

Semester-IV															
Category	**Subject Code**	**Subject Name**	**Credits**			**Marks**							**Hrs**		
						Theory			**Practical**			**Total**			
			T	**P**	**TO**	**I**	**E**	**TO**	**I**	**E**	**TO**	**(T+P)**	**T**	**P**	**TO**
General Education Component	OET-603	*MOOC/ Online Course-III (Design, Technology & Innovations)	2	-	2	30	70	100	-	-	-	100	30	-	30
	OAE-102	*MOOC/ Online Course-IV) Value education & Professional Ethics	2	-	2	30	70	100	-	-	-	100	30	-	30
	Total		**4**	**-**	**4**	**60**	**140**	**200**	**-**	**-**	**-**	**200**	**60**	**-**	**60**
Skill Education Component	OJT-601	On Job Training (OJT)	-	24	24	-	-	-	245	105	350	350	-	1080	1080
	Total		**-**	**24**	**24**	-	-	-	**245**	**105**	**350**	**350**	**-**	**1080**	**1080**
	Grand Total		**4**	**24**	**28**	**60**	**140**	**200**	**245**	**105**	**350**	**550**	**60**	**1080**	**1140**

Note: * Relevant MOOC/Online course will be offered as per the availability.

Job Role: Level-6
Machine shop master technician/Setter (ASC/Q3506)

TEACHING SCHEME FOR FIFTH SEMESTER															
Category	**Subject Code**	**Subject Name**	**Credits**			**Marks**							**Total hrs. per course**		
						Theory			**Practical**			**Total**			
			Th.	**Pr.**	**To.**	**Int.**	**Ext.**	**To.**	**Int.**	**Ext.**	**To.**	**(T+P)**	**Th.**	**Pr.**	**To.**
Skill Education Component (SEC)	ME-701L	Foreign Language , German	-	4	4	-	-	-	70	30	100	100	-	120	120
	ME-602L	CNC Machines Programming	-	4	4			-	70	30	100	100	-	120	120
	ME-703	Tool Maintenance	4	-	4	30	70	100	-	-	-	100	60	-	60
	SEC Total		**4**	**8**	**12**	**30**	**70**	**100**	**140**	**60**	**200**	**300**	**60**	**240**	**300**
General Education Component (GEC)	ME-704 ME-704L	Statistical Quality Control	2	2	4	15	35	50	35	15	50	100	30	60	90
	ME-605 ME-605L	Hydraulics & Pneumatics	3	1	4	15	35	50	35	15	50	100	45	30	75
	ME-705	Industrial Best Practices	4	-	4	30	70	100	-	-	-	100	60	-	60
		Elective-1I	4	-	4	30	70	100	-	-	-	100	60	-	60
	ME-702 ME-702L	Computer Integrated Manufacturing Systems	3	1	4	15	35	50	35	15	50	100	45	30	75
	GEC Total		**16**	**4**	**20**	**105**	**245**	**350**	**105**	**45**	**150**	**500**	**240**	**120**	**360**
	Grand Total		**20**	**12**	**32**	**135**	**315**	**450**	**245**	**105**	**350**	**800**	**300**	**360**	**660**

Elective –II (Choose any one): Quality Control & Reliability Engg. (IMS-601)

OR

Production & Maintenance Mgmt. (ME-704)

Semester-VI															
Category	**Subject Code**	**Subject Name**	**Credits**			**Marks**							**Hrs**		
						Theory			**Practical**			**Total**			
			T	**P**	**TO**	**I**	**E**	**TO**	**I**	**E**	**TO**	**(T+P)**	**T**	**P**	**TO**
General Education Component	OET-701 OR OET-702	* MOOC/ Online Course-V (Fundamentals of Artificial Intelligence) * MOOC/ Online Course-V Cyber Security Tools Techniques and Counter Measures)	2	-	2	30	70	100	-	-	-	100	30	-	30
	OAE-103	*Consumer Affairs (MOOC/ Online Course-VI)	2	-	2	30	70	100	-	-	-	100	30	-	30
	Total		**4**	**-**	**4**	**60**	**140**	**200**	**-**	**-**	**-**	**200**	**60**	**-**	**60**
Skill Education Component	OJT-701	On Job Training (OJT)	-	24	24	-	-	-	245	105	350	350	-	1080	1080
	Total		**-**	**24**	**24**	-	-	-	**245**	**105**	**350**	**350**	**-**	**1080**	**1080**
	Grand Total		**4**	**24**	**28**	**60**	**140**	**200**	**245**	**105**	**350**	**550**	**60**	**1080**	**1140**

Note: * Relevant MOOC/Online course will be offered as per the availability.

Job Role: Level-7
Manager/ Supervisor Manufacturing and R & D Quality Level (ASC/Q6306)

Syllabus

for

B.Voc. (Production- Tool & Die Manufacturing)

Industry Partner-JBM

Session (2020-2023) and Onwards

SEMESTER-1

Subject: Workshop Practice Lab
Subject code: ME-504L

Credit	Hours	Marks		
4	120	I	E	To
		70	30	100

List of Experiments

1. Prepare job on drilling machine
2. To prepare job on surface grinder
3. To prepare job on milling machine
4. To prepare jobs in fitting shop
5. To prepare jobs on Lathe machine
6. To prepare job using TIG and MIG welding

Subject: Workshop Technology
Subject Code:: ME-502

Credit	Hours	Marks		
4	60	I	E	To
		15	35	50

Objectives: The course inculcate students machining / welding processes used in industry to shape the part or component finally in industry.

Learning Outcomes: The students will be able to understand

(a) Exposure to mechanical workshop layout and safety aspects.
(b) Understand the functions of various machines and cutting tools used in machine shop
(c) Practical real time job preparation using various operations related to machine shop such as filing, drilling, milling, turning, grinding, welding etc.
(d) Practice job preparation on welding shop.
(e) Practice job preparation in fitting shop.

Unit-1: Introduction to Manufacturing and Metal cutting

Introduction to Manufacturing; Definition of manufacturing process, its classification types, primary and secondary manufacturing processes, types of production. Machine Tools; Definition, its functions and classification, introduction to machining operations and common features of metal cutting.

Metal Cutting: Definition and working principle of single point cutting tool, geometry of single point cutting tool, tool signature, orthogonal and oblique cutting, chips formation, types of chips, Cutting parameters-Cutting speed, feed and depth of cut.

Unit-2: Cutting Tool Materials and Introduction to welding processes

Cutting Tool Materials: Properties and uses of cutting tool material viz; High-speed steel, tungsten carbide, cobalt steel cemented carbides, ceramics and diamond.

Welding Processes: Electric arc welding: working principle, use of AC and DC current in welding, TIG welding, MIG welding, Introduction to gas welding.

Unit-3: Lathe and Grinding machines

Lathe Machine; Introduction, working principle, its construction and specifications.

Lathe classification; Bench, Tool room, Capstan and Turret, Automatic and Special purpose lathes.

Lathe Operations: Plain and step turning, Taper turning; taper calculations, methods of taper turning, parting off, drilling, boring, knurling. Cutting parameters- Speed, feed and depth of cut.

Lathe Accessories: Centres; live and dead centre, Chucks; three jaw universal chuck, four jaw independent chuck, magnetic chuck, air or hydraulic chuck, Lathe carriers or dogs, Driving plate, Face plate, angle plate, mandrels, rests; steady and follower.

Grinding Machine: Introduction- Abrasive tools, grinding wheels– materials, specifications, selection of grinding wheels, Trucing and dressing of grinding wheels, abrasives-natural and artificial, speed, feed and depth of cut, use of coolants.

Types of grinding machines; cylindrical grinders, surface grinders, centreless grinders.

Unit-4: Drilling, Reaming and Boring machines

Drilling Machine; Introduction, tools for drilling, its classification, twist drills, twist drill parts and terminology, some important drill dimensions and important angles of drill, drill size and specifications, straight flute drills,

Drilling machine types; Portable, Bench, Radial, Universal, Multiple spindle, Gange, Horizontal and automatic drilling machines.

Drilling machine operation; Drilling, Spot facing, Reaming, Boring, Counter boring, Counter Sinking, tap drill size

Reaming Machine; Introduction, Reamer terminology, Types of reamers-hand reamers, machine reamers, adjustable and taper reamers.

Boring Machines: Introduction, Horizontal boring machines, Vertical boring machines

Unit-5: Milling machines

Milling machines; Introduction, working principle, principal parts, Size and specification, up milling and down milling,

Milling machine types: Column and Knee type-hand, plain or horizontal, vertical, universal, Universal milling machine, Planer type milling machine or plan mill.

Milling cutters: Plain, Side, End, Face, Metal slitting, Angle milling, Form milling, Woodruff-Key and T-slot milling cutters, Materials for milling cutters, cutting speed and feed.

Milling operations; Plain or Slab, Face, Angle, Form, Straddle and Gang, Slot and Groove, Keyway, Side, End, Profile, Gear milling operations.

Text Books:

1. Comprehensive Workshop Technology (Manufacturing Processes), by S. K. Garg, Laxmi Publication
2. Elements of Workshop Technology, S. K. Hajra Choudhury, Hajra Choudhury A K

Reference Book:

1. Production Technology by R. K. Jain, Khanna Publishers

Subject: Engg. Graphics & Drawing
Subject Code: ME-501L

Credit	Hours	Marks		
4	120	I	E	To
		70	30	100

Objectives: The course inculcates the students the importance and basic principles of Technical/Engineering Drawing and different steps in producing drawings according to BIS conventions

Learning Outcomes: The students will be able to understand

(a) The fundamentals of engineering design. Understanding the concept generation, design optimization and evaluation.
(b) Designing various engineering components and make process plan for the production.

CONTENTS

1. **Introduction to drawing, lines and lettering:**
   - **1.1.** Definition and classification of drawing
   - **1.2.** Drawing instruments such as; drawing board, drawing sheets, drafter.
   - **1.3.** Types of pencils, sheets, eraser etc.
   - **1.4.** Different types of lines (Straight line, inclined line and curved lines)
   - **1.5.** Practice engineering style for letters and numbers as BIS: SP:46-2003

   Hands on training:
   - Prepare drawing sheet by using different types of lines
   - Prepare drawing sheet by Bisection of line, angle, arc.

2. **Dimensioning and scale:**
   - **2.1.** Importance of dimensioning
   - **2.2.** Types (i.e. chain, parallel and progressive etc.) and methods of placing dimensioning (i.e. aligned and unidirectional)
   - **2.3.** Principles of dimensioning and practice dimensioning technique as BIS: SP: 46-2003.
   - **2.4.** Free hand sketching of straight lines, circle, square, Polygons

   Hands on training:
   - To divide line of length 120mm into 9equal parts
   - Divide a circle into 12 equal parts by using engineering compass

3. **Introduction to Projection:**
   - **3.1.** Introduction to first and third angle projection

3.2. Introduction to projection of point, line and plane

3.3. Sectioning of solids

Hands on training:

- Practice for projection of point
- Practice for projection of line
- Practice for projection plane

4. Isometric and Orthographic projection

1.1 Isometric drawing of simple geometric solids

1.2 Orthographic projection of simple geometric solids.

Hands on training:

- Prepare drawing sheet of orthographic projection
- Prepare drawing sheet of isometric projection.

5. Geometric and dimensioning Tolerance

5.1 Component Drawing and interpretation

5.2 Geometric dimension and Tolerance

5.3 Introduction to software used in drawing

Text Books

1. Enginering Drawing Plane and Solid Geometry : N.D. Bhatt and V.M. Panchal, Forty-
2. Fourth Edition 2002, Charotar Publishing House.
3. Engineering Drawing : Laxmi Narayan and Vaishwanar, Charotar Publishing House.

Reference Books

- Engineering Graphics and Drafting : P.S. Gill, Milenium Edition, S.K. Kataria and Sons.
- Engineering Graphics using AUTOCAD 2007 : T. Jeyapoovan,m First Edition 2002, Vikas Publishing House.

Subject : Communication Skills
Subject Code: ENG-501

Credit	Hours	Marks		
3	45	I	E	To
		15	35	50

Objectives: To inculcate in students professional and ethical attitude, effective communication skills, teamwork, skills, multidisciplinary approach, written ability skills and an ability to understand engineer's social responsibilities.

Learning Outcomes: The students will be able to understand

(a) To inculcate in students professional and ethical attitude, effective communication skills, teamwork, skills, multidisciplinary approach and an ability to understand engineer's social responsibilities.

(b) To inculcate in students written communication skills.

Unit-1

Communication: Meaning of Communication, Importance of Communication, Types of communication. Process of communication, Communication network in an organization, Barriers to communication, Essentials of good communication.

Unit-II

(a) Remedial English Grammar: Articles, agreement between verb and subject, uses of tenses, Modal and their uses, Prepositions.

(b) Understanding and applying Vocabulary: One word substitutes, Synonyms and Antonyms Word formation:-Prefixes, Bases and Suffixes.

Unit-III

Listening Skills: The process of listening, Types of listening, Benefits of effective listening, Barriers to listening, listening to announcements at work place.

Unit-IV

Reading Skills: Process and methodologies of reading, Skimming and scanning, Levels of reading, Proofreading, Summarizing, Precise writing, Unseen comprehension passage, Note taking and reviewing, convert the given information into charts and graphs.

Unit-V

Writing Skills: Main Forms of Written Communication: Notices, Drafting an E-mail. Correspondence: Personal and Official, Notices, Technical Report Writing, Preparing agenda and minutes of meetings

Books Recommended

Text Books

- Sethi, J & et al. A Practice Course in English Pronunciation, Prentice Hall of India, New Delhi.
- Sen, Leena. Communication Skills, Prentice Hall of India, New Delhi.
- Prasad, P. Communication Skills, S.K. Kataria& Sons.
- Bansal, R.K. and J.B. Harrison. Spoken English, Orient Language.

Reference Books

- Roach Peter. English Phonetics and Phonology.
- Prasad, P. The Functional Aspects of Communication Skills, Delhi.
- McCarthy, Michael. English Vocabulary in Use, Cambridge University Press.
- Rajinder Pal and PremLata. English Grammar and Composition, Sultan Chand Publication.
- Idioms & Phrases (English-Hindi), Arihant Publication (India) Pvt. Ltd.
- One Word Substitution, Dr. Ashok Kumar Singh, Arihant Publications (India) Pvt,Ltd

Subject : Communication Skills Lab
Subject Code: ENG-501L

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

List of Experiments:

1. Greeting and starting of conversation.
2. Nonverbal communication techniques during conversation.
3. Verbal communication techniques during conversation.
4. Group discussion.
5. Extempore public speaking.
6. Reading activity
7. Situational dialogues /Role play.
8. PPT presentation technique.

Subject:: Basics of Electrical & Electronics Engg.
Subject Code:EE-501

Credit	Hours	Marks		
3	45	I	E	To
		15	35	50

Objectives: The course inculcates students the applications of the basic principles of electrical and electronics during operation/ maintenance of machinery.

Learning Outcomes: The students will be able to understand

(a) Able to understand the concept of Current, Voltage and Power.

(b) Able to understand the concept of Transformers and Motor.

(c) Able to understand the concept of Relay and Circuit Breaker.

(d) Able to understand the concept of Semiconductor diodes &Bipolar Junction Transistor.

Unit-I

D.C Circuits: Definition of Voltage, Current, Power, Resistance, Inductance and Capacitance with their units, Ohm's law, kirchoff's Law, Series -Parallel Circuit, Conversion of Current and Voltage Source.

Unit-II

Three Phase A.C Circuits: Generation of 3 phase E.M.F, Difference between three-phase and single-phase supply,Star connection, Delta Connection and its Conversion.

Unit-III

Electrical Machines: Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Transformer, Induction Motor, Servo & Stepper motors.

Unit-IV

Protective Devices & Safety Precautions: Introduction to PPE (Personal Protective Equipment) & Safety Precautions, Introduction of Relays,Contactors,MCBs,ELCBs,Fuses, Concept of Neutral and Earthing.

Unit-V

Semiconductor Devices & its Applications: Basic idea of semiconductors – P and N type; diodes, zener diodes and their applications, transistor – PNP and NPN, symbols, identification of terminals of transistor, current flowing in a transistor, its characteristics and uses. Characteristics and applications of a thyristor.

Text Books

- Basic of Electrical and Electronics Engineering by S.kSahdev, Dhanpatrai Publications,2013.
- Text Book of Electrical Technology by B.LTheraja, S.Chand Publications,2014

Reference Books

- A Course in Electrical Technology by J.B Gupta, Katson Publications,2013
- Electrical Technology by J.S Katre, Techmax Publications, 2016

Subject:: Basics of Electrical & Electronics Engg. Lab
Subject Code: EE-501L

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

List of Experiments

1. Introduction of tools, symbols and abbreviations.
2. To verify kirchoff's current & voltage law.
3. Construction & Working of DOL starter.
4. Construction & Working of Star-Delta starter.
5. Construction & Working of Distribution Board and Extension Board.
6. To perform open circuit test and short circuit test of a single-phase transformer.
7. Draw V-I characteristics of P-N junction diode.
8. Draw input and output characters of a transistor.
9. Draw reverse break down characteristics of a zener diode.

Construction & Working of Half Wave & Full Wave rectifier on bread board.

Subject: Applied Mathematics

Subject Code: MTH-501

Credit	Hours	Marks		
4	60	I	E	To
		30	70	100

Objectives: The course inculcates the students the application of mathematical concepts used in engineering applications in industry.

Learning Outcomes: The students will be able to understand

(a) The graduates will become familiar with fundamentals of various Mathematical concepts.

(b) Students will be able to set up and solve linear systems/linear inequalities graphically/geometrically and algebraically

(c) Students will be able to formulate problems in the language of sets and perform set operations, and will be able apply the Fundamental Principle of Counting, Multiplication Principle.

(d) Solve equations and inequalities, both algebraically and graphically, and Solving and model applied problems.

CONTENT

1. **Algebra:**
   - **1.1.** Set theory
   - **1.2.** Permutation and Combination
   - **1.3.** Binomial theorem (expansion without proof)
   - **1.4.** Types of functions – linear, quadratic, polynomial, exponential and logarithmic

2. **Trigonometric functions**:
   - **2.1.** Review of ratio of some standard angles (0, 30, 45, 60, 90 degrees)
   - **2.2.** Addition, subtraction and product formulae
   - **2.3.** Multiple and submultiples angles (2A, 3A, A/2)
   - **2.4.** Height and distance

3. **Determinants and matrix:**
   - **3.1.** Introduction to Determinant and matrices
   - **3.2.** Algebra of matrices (up to third order)
   - **3.3.** Inverse of matrix by Adjoint method (up to second order)
   - **3.4.** Solution of system of linear equations by Cramer's rule

4. **Differential calculus:**
   - **4.1.** Rules of differentiation – simple standard forms (involving one variable)
   - **4.2.** Derivatives of algebraic and trigonometric functions

4.3. Differentiation of function of a function

4.4. Chain rule

5. Integral calculus:

5.1. Integral of standard forms

5.2. Simple integration by substitution

5.3. Integration by parts and by fractions (for linear factor only)

5.4. Evaluation of definite integrals

Text Books

- NCERT- 11^{th} and 12^{th} Mathematics.
- Higher Engineering Mathematics, B.S. Grewal, Khanna Publications

Reference Books

1. Advanced Engineering Mathematics, E. Kresyzig, John Wiley and Sons. (latest edition).

2. Advanced Engineering Mathematics, R.A Jain and S.R.K Iyengar. Narosa Publications.

3. Engineering Mathematics, N.P Bali, Laxmi Publications.

Subject: Fundamentals of Computer
Subject Code: CSE-501

Credit	Hours	Marks		
3	15	I	E	To
		15	35	50

Objectives: The course inculcates the students the basic information and communication technology and proper paradigms that need to be implemented to develop any kind of computer applications. The course will help in developing the basic technical skills by hands on experience.

Learning Outcome: The students will be able to understand

(a) Students will be able to the use the computer for basic purposes of preparing personnel/business letters, viewing information on Internet, sending mails, using internet banking services etc.

(b) Understand basic computer operations and ICT applications.

(c) Understand Network troubleshooting.

(d) Undertake data entry services

Unit I – Introduction to Computer System:

1.1 What is Computer, Basic Applications of Computer; Block Diagram of Computer System

1.2 Input / Output Devices, Computer Memory, Concepts of Hardware and Software, Data and Information; Applications of IECT.

1.3 Computer Virus: Definition, Types of viruses, Characteristics of viruses, Anti-virus software,

1.4 Introduction to number system.

Unit II - Operating System: Overview of operating system: Definition, Functions of operating system, Need and its services, Types of operating system, Batch Processing, Spooling, Multiprocessing, Multiprogramming, Time-Sharing, On-Line Processing, Real-Time Processing Basics of window operating system, Comparison between DOS and windows, Switching between DOS and windows, Comparison between Unix and Windows.

Unit III - Understanding Office Applications: Introduction to MS Word, Introduction to MS Excel and its applications, Introduction to MS PowerPoint, Menus, Shortcuts, Document types, Formatting

documents, spread sheet and presentations, working with Spreadsheets, Different templates, Macros, Mail merge.

Unit IV- Networking: Network Technologies, Introduction to Internet and protocols: TCP/ IP, Network connecting devices, Topologies, HTTP, HTTPS DNS, Hub, Switches, Router, Repeater, Firewalls, Digital Signature.

Unit V: Introduction to World Wide Web: WWW and Web Browsers Introduction, Objectives, Concept of internet, Overview of search engines, popular search engines in use, Surfing the web and websites, Hosting your websites, Planning and Developing the websites, Internet service provider.

Books Recommended

Text Books

1. Computers and Beginners by Jain, V.K.;
2. Computer Fundamentals by Anita Goel, Pearson.

Reference Books

1. Introduction to Information Technology, Leon Tech World by Leon and Leon
2. Foundations of Computing, BPB Publiction by Sinha, Kr. Pradeep and Preeti Sinha;
3. Word Processing and Typing by Sharon Spencer, Heinemann.
4. MS Office by S.S. Srivastava, Firewall Media.
5. Microsoft Office 2010 by Bittu Kumar, V & S Publications
6. Data Communication and Networking by Behrouz.A. Forouzan, McGraw Hill

Subject: Fundamentals of Computer Lab
Subject Code: CSE-501L

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

List of Experiments

1. Troubleshooting
2. Practical based on to be exposed/shown various components and supposed how to switch on a computer.
3. Handling Boot Setup, Installation of Operating System, Connecting your client to server, User and Workgroup Handling, General Operating system handling and related topics.
4. WordPad, Notepad, Sticky Note, Snipping tool, Paint
5. M.S. Word
6. MS-Excel- Creating charts, Creating tables
7. MS-PowerPoint
8. MS-Outlook
9. Case study on Operating systems (Windows/ Ubantu/ Android/IoS)
10. Networking
11. Software: Preparatory and open domain

Subject: Fundamentals of Industrial Mgmt & Safety
Subject Code: IMS-501

Credit	Hours	Marks		
3	45	I	E	To
		15	35	50

Objectives: The course inculcates students the qualitative and quantitate tools used to maintain the qualities in the products for an industry.

Learning Objectives: The students will be able to understand

(a) Understanding the knowledge of Quality Control, inspection and quality assurance management used in the organization.

(b) Develop the skill for using tool and techniques for quality in Industry

(c) Apply elementary knowledge of quality concepts for quality assurance.

Unit-1

Concept of Quality:

1.1Quality: Definition, History, Importance

1.2 Approaches to define Quality, Cost of Quality, Hierarchy of Quality Management

1.3 Introduction to Quality Control.

Unit-II

Organizational Aspects of Quality Assurance:

2.1 Quality Assurance (QA): Introduction, Definition, QA in different stages, Quality Planning.

2.2 ISO: Introduction, ISO 9000 series of standard, Benefits of ISO.

2.3 ISO 9001, Benefits of ISO 9001.

2.4Quality survey: Scope, Types of audit, inspection methods, Quality budget

Unit-III

Problem solving tools and techniques:

3.1Definition of a problem

3.2 Type of problems, classification of problems

3.3 What is problem solving, barriers to problem solving

3.4 Problem solving tools: Introduction to Cause and effect diagram, Histogram, flow chart, Check sheets, Histogram, Pareto charts, Control charts, Scatter Diagram

Unit-IV

Total Quality Management:

4.1 Basic concept of TQM, features of TQM

4.2 principles of TQM

4.3 leadership concepts

4.4 Quality statements

4.5 Barriers to TQM implementation

4.6 Concept of TPM

4.6 Quality allied concept: KAIZEN, Poke yoke, JIT, KAPA

Unit-V

5 S and Safety:

5.1 Detailed concept of 5S and safety used in Industries

5.2 Integrated Management system

Text Book

- Total quality Management by L.Sganthi & Anand A. Samuel, PHI Publication.

Reference Book

- Total quality Management by Poornima M Charantimath, Pearson Publication.

www.slideshare.net/MALLURSB/unit-1-quality-total-quality-tqm

http://smallbusiness.chron.com/quality-important-business-57470.htm

https://totalqualitymanagement.wordpress.com/2008/09/12/cost-of-quality

https://accountlearning.com/approaches-to-total-quality-management/

https://prezi.com/a8qypxkz5uee/hierarchy-of-quality-management

www.asiainspection.com/quality-control-services/product-and-manufacturing-inspections

http://whatis.techtarget.com/definition/quality-control-QC

http://searchsoftwarequality.techtarget.com/definition/quality-assurance

www.slideshare.net/Genesys.../the-8-principles-of-quality-assurance-trainin

http://electronicstechnician.tpub.com/14085/css/Qa-Forms-And-Records-113.htm

http://www.businessdictionary.com/definition/quality-planning.html

http://smallbusiness.chron.com/build-quality-assurance-program-12955.html

http://asq.org/learn-about-quality/iso-9000/overview/overview.html

https://www.isoqsltd.com/about-us/what-is-iso

https://www.iso.org/iso-9001-quality-management.htm)

Subject: Fundamentals of Industrial Mgmt & Safety Lab

Subject Code: IMS-501L

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

List of Experiments

1. Draw and Demonstrate the process flow diagram

2. Draw and demonstrate problem statement, target /Goal Setting

3. Draw and demonstrate Pareto diagram

4. Draw and Demonstrate cause and effect diagram

5. Data validation and why –why Analysis

SEMESTER-II

MOOC Courses Syllabus

Subject: Fundamental of Welding Sciences & Technology

Subject Code: MC-501

Credit	Hours	Marks		
2	30	I	E	To
		30	70	100

Objectives: The course inculcate students different welding methods to join the parts

Learning Outcomes: The students will be able to understand

(a) Concept of welding, welding joints and its applications

(b) Types of welding joints & symbols

(c) Types of power sources and their characteristics

(d) Characteristics of heat sources

(e) Oxyfuel welding

Unit-1: Introduction to welding

Definition and introduction to welding, classification of welding processes, types of welding joints, common welding base materials, types of edge preparation, advantages and disadvantages of welding, practical applications of welding,

Unit-2: Nomenclature and welding joints symbols

Types of welding, edge preparation and different types of Welding joints, parts of a weld and welding symbols.

Unit-3: Power sources of welding

Classification of power sources characteristics, arc characteristics, constant current power supply, constant voltage power supply, combined characteristics power source,

Unit-4: Physics of welding

General characteristics of heat sources, Welding arc, arc structure and mechanism, arc initiation, types of welding arc

Unit-5: Oxyfuel welding

Working principle of Oxyfuel gas welding, setup of oxyfuel welding; gas torch & regulator, gases, flame adjustment, types of Oxy-Acetylene flames, fluxes requirement, classification of oxyfuel welding technique

Text Books

- Dr. O. P. Khanna, Welding Technology, Reprint: 2002.

Reference Book:

- V. M. Radhakrishnan, Welding Technology and Design, New age. 2002.
- J. A. Goldak, Computational Welding Mechanics, Springer 2005.
- O. Grong, Metallurgical Modelling of Welding,2nd Ed. IOM publication , 1997.
- L-E Lindgren, Computational Welding Mechanics, Woodhead Publishing Limited,2007.
- J. F. Lancaster (Ed), The Physics of welding, Pergamon, 1986.
- R.W. Messler, Principles of Welding, John Wiley and Sons,1999.

Subject: Entrepreneurship Development

Subject Code: EM-501

Credit	Hours	Marks		
2	30	I	E	To
		30	70	100

Objectives: The course introduces the students about the concept, role and significance of entrepreneurship for the development in society.

Learning Outcomes: The students will be able to understand

- The course will create awareness among the students about the entrepreneurship and factors that will help in facilitating the entrepreneurial development with a focus on new ventures/ start-ups.

Unit	Topic	Key Learning
I	Entrepreneurship	• Entrepreneurship- Meaning, Nature and Scope Characteristics and Qualities of a Successful Entrepreneur • Relationship between Entrepreneurship Development and Economic Development.
II	Overview of business and its functioning	• Entrepreneurship and Society • New Venture Development- Meaning and Stages • Sources of Financing Entrepreneurship, Managerial Vs Entrepreneurial Approach.
III	Foundation of New Venture Finance	• EDP Programmes, Concept of Economic Freedom, Financial Markets and Entrepreneurship • Venture Capital; Angel Capital, Project Report Preparation, Balance Sheet, Cash Statement, Asset Vs Liability Gamification.
IV	Concept related to planning and efficiency	• Entrepreneurial Strategies and Business Plan, Presenting Business Plans to the Investors • Future of Entrepreneurship in India.
V	Women Entrepreneurship and Marketing Strategy	• Concept, Factors governing women entrepreneurship, Schemes for women entrepreneurship • Rural Entrepreneurship, Concept, advantage and challenges, Introduction to Market Forecasting.

Text Books

- Gupta, C.B. and Srinivasan, P., Entrepreneurship Development, Sultan Chand & Sons.
- Charanthimath, P.M., Entrepreneurship Development and Small Business Enterprise, Pearson Education.

Reference Books

- Dollinger, MJ, Entrepreneurship- Strategies and Resources, Pearson Education.
- Desai,Vasant, Entrepreneurship Development, Himalaya Publishing House.
- Havinal, Veerbhadrappa, Management and Entrepreneurship, 1st Edition, New Age International Publishers, 2008.

SEMESTER-III

Subject: CAD-II
Subject Code: ME-607L

Credit	Hours	Marks		
4	120	I	E	To
		70	30	100

List of Experiments

1. Introduction to NX7: Introduction to Nx7, use interface overview, file operations, sketcher task environment, WCS, creating a sketch.
2. Constraining sketches: Sketch options, geometric constrains, dimensional constraints
3. Solid Modeling I : Sketch operations, Editing sketches, extrude, revolve, hide/show
4. Datums : Datum planes, datum axes, datum coordinate systems
5. Solid Modeling II: Holes Pre-NXS, holes the new way, grooves, slots, chamfers, edge blends
6. Object Replication: Instance features, mirror features, mirror body, sweep along guide, tube, threads
7. Swept features: Swept features, helical gear project, mouse cover project, gasket project
8. Solid Modeling III: Editing features, editing position, boss, pocket, pad, draft

Subject: Fundamentals of CNC Machines Lab

Subject Code: ME-502L

Credit	Hours	Marks		
4	120	I	E	To
		70	30	100

Objectives

To make students in depth knowledge about CNC Machines, Machine setting , Tools used , tool offset and setting of CNC Machines.

Learning Outcomes

1.To be able to differentiate between conventional & CNC Machine in respect to working, components, operation.

2. To understand setting up of tooling for CNC. One should have knowledge of types of cutting tools & tool material used.

3. To understand tool & work holding devices used & locating principle

4. To take tool offsets and work-offset on CNC machine.

List of Experiments

1. Introduction to CNC and Understanding of Panel board.
2. Types of programs like Fanuc, Siemens, Mitsubishi, Allen Bradley etc.
3. Movement of Axis, tool change, use of hands wheel, Jog and manual data input.
4. Study of ATC with demonstration and Setting and adding new tool in ATC.
5. Practically finding out tool parameters on tool presetter machine.
6. Finding out coordinates for work and tool.
7. Performing tool offset for milling machine.
8. Performing Work offset for milling machine
9. Performing tool offset for Lathe machine.
10. Performing Work offset for Lathe machine.

Process

1. Interpretation and understanding of the component Drawing

2. To conceptualize the process based on location points, resting points and clamping points. Which surfaces and operations (drilling, milling, tapping, boring, reaming, to be done.

3. Writing down detail process operation by operation using different jigs and fixtures as conceptualized.

4. Organising fixtures tools, toolings, material for machining the component.

Preparing machine for production

1. Select or write the program for machining the component.

2. Arranging the tools and setting them on presenters.

3. Loading the tools on Auto tool changer as per the program

4. Load the fixture

Subject: Electrical Machines & Drives
Subject Code: ME-606

Credit	Hours	Marks		
3	45	I	E	To
		15	35	50

Objectives: The course inculcates students the applications of the basic principles of electrical and electronics during operation/ maintenance of machinery.

Learning Outcomes

1. Demonstrate knowledge of transformer theory

2. Demonstrate knowledge of D.C. motor and generator operation.

3. The skill to analyze the response of any electrical machine.

4. The ability to troubleshoot the operation of an electrical machine.

5. The ability to troubleshoot the operation of dc motor

Unit-1

Transformer: Principle of transformer, construction and working, Methods of connection in 3 phase transformers, auto transformer and its uses, voltage regulation and its significance, principles of isolation transformer, specifications of all types of transformers. Losses in a transformer

Unit-2

DC Motor: Principle, significance of back emf, types of motors and their construction, motor characteristics for shunt and series, speed control of DC motors and factors controlling the speed. Starting methods, construction and working of 3 point starter, applications

Unit-3

Three Phase Induction Motors: Principle, construction, concept of slip, torque and characteristics, effect of motor resistance on torque (running and starting), rotor current, output power, different methods of speed control. Starting methods and constructional and working of 3 point starter, applications (simple problems)

Unit-4

Special Motors: Single Phase Motors Principle, construction, working,and applications of the following motors: Induction motor Universal motor Stepper Motor and Servo Motor Types, construction, working and their applications

Unit-5

DC Drives: Basic characteristics of DC motor – Operating modes – quadrant operation of chopper – Closed loop control of DC drives

Text Books: -

- Electric Machines, by Ashfaq Husain (Author), Harroon Ashfaq, DhanpatRai Pub., 2016
- Electrical Machines by Kothari &Nagrath, TMH, 2010

Reference Book:-

- Electric Machines and Drive- First Course by Ned Mohan, John Wiley & Sons

Subject: Electrical machines & Drives Lab
Subject Code: ME-606L

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

List of Experiments

1. Load test on dc shunt motor to draw speed – torque and horse power – efficiency characteristics.

2. Field Test on dc series machines.

3. Speed control of dc shunt motor by armature and field control.

4. Swinburne's Test on dc motor.

5. Retardation test on dc shunt motor.

6. Regenerative test on dc shunt machines.

7. Load test on three phase induction motor.

8. No load and Blocked rotor test on three phase induction motor to draw (i) equivalent circuit and (ii) circle diagram. Determination of performance parameters at different load conditions from (i) and (ii).

9. Load test on induction generator.

10. Load test on single phase induction motor to draw output versus torque, current, power and efficiency characteristics.

11. Conduct suitable tests to draw the equivalent circuit of single phase induction motor and determine performance parameters.

12. Conduct an experiment to draw V and Λ curves of synchronous motor at no load and load conditions.

Subject: CAD-1
Subject Code: ME-601

Credit	Hours	Marks		
2	30	I	E	To
		15	35	50

Outcomes: The course inculcates students part modelling and assembly of components through software.

Learning Outcomes: The students will be able to understand

1. Design a part or assembly of parts using Computer-Aided Design software.
2. Use parametric modelling techniques to reflect engineering requirements.
3. Apply top-down design principles to model a design.
4. Use motion and interference checking to ensure that parts will not interfere throughout their complete range of motion.
5. Use CAD software collaboratively when designing on a team.

Unit-1

Introduction: Graphics Displays, Refresh display, DVST, Raster display, pixel value and lookup table, estimation of graphical memory. Concept of Coordinate Systems: Working Coordinate System, Model Coordinate System, Screen Coordinate System.

Unit-2

Transformation: Output primitives (points, lines, curves, etc.), 2D & 3D transformation(Translation, Scaling & rotation). Projections: orthographic & Isometric

Unit-3

Curves: Introduction, Analytic curves-line, circle, ellipse, parabola, hyperbola. Synthetic curves: Hermite cubic spline, biezer curve, B- spline curve

Unit-4

Surface Modelling: Introduction, Surface representation, Analytic surface, synthetic surfaces-hermite bi cubic surface, biezer surface, b- spline surface

Unit-5

Solid Modelling: Introduction, Geometry & topology, solid representation, boundary representation, sweep representation.

Text Books:-

1. Computer Aided Design by Sadhu Singh, S.K Kataria& Sons
2. Mastering Cad/Cam, by IbhrahimZeid,TMH, 2007

Reference:-

Computer Aided Engineering Design, by AnupamSaxena, BirendraSahay, Springer

Subject: CAD-1 Lab
Subject Code: ME-601L

Credit	Hours	Marks		
2	60	I	E	To
		35	15	50

List of experiments
Exp.-1

Basic drawing commands: Line/Point/Circle/Arc/Trace/Text/Dtext/Redraw/Zoom Pan/Ortho/Coordinates/Grid/Snap/Ellipse/Polygon

Exp-2

Editing Drawings: Select/Erase/Oops/Move/Copy/Break/Fillet/Measure Divide/Explode/Undo/Redo/Trim/Extend/Rotate/Scale, Offset/Mirror/Stretch/Chamfer/Array

Exp-3

Inquiry Commands & Intermediate Drawing Commands: ID/List/DBlist/Status/Time/Color/Area/Files. Layers/Change/Rege/Fill/Solid/Hatch/Block/Insert /WBlock

Exp-4

Dimensioning: Associative, Base-line, Linear, Angular, CenterMark, Diameter, Leader, Radius, Setting Dimensioning Variables, Text Fonts and Styles

Exp-5

Advanced Drafting Commands: Spline/Fit/Osnap, 3-Dimensioning Drafting, Iso commands, 3D Shapes, User Coordinate System, Elevation, Thickness, Viewpoint, Viewports, 3D Polylines, 3D Face, 3D Surfaces of Revolution,

Subject: Material Science & Heat Treatment
Subject Code: MSE-701

Credit	Hours	Marks		
3	45	I	E	To
		15	35	50

Objectives: The course inculcates students the structure and properties of materials and heat treatment of materials to modify the properties of materials.

Learning Outcomes: The students will be understand To learn about basic principles of different engineering materials and applications.

(a) To understand Crystallography
(b) To learn about the difference materials
(c) To learn about the Miscellaneous materials
(d) To learn about the heat treatment

Unit-1

Introduction: Overview of different engineering materials and applications. Thermal, Chemical, Electrical, Mechanical properties of various materials. Overview semi- conducting material

Unit-2

Crystallography: Unit Cell, Arrangement of atoms in Simple Cubic Crystals, BCC, FCC and HCP Crystals, Number of atoms per unit Cell, Atomic Packing Factor. Behaviour of material under load and stress-strain. Overview of failure modes, fracture, fatigue and creep.

Unit-3

Metals and Alloys: Classification of iron and steel, Cast Iron: Different types of Cast Iron, and their usage. Steels: Steels and alloy steel, Classification of plain carbon steels, Properties and usage of different types of Plain Carbon Steels, Effect of various alloys on properties of steel, Uses of alloy steels (high speed steel, stainless steel, spring steel, silicon steel) Non Ferrous Materials, their alloys, properties and uses of White Metals and their alloys.

Unit-4

Miscellaneous Materials: Classification-thermoplastic and thermo set and their uses, Various Trade names of engg. Plastics, Ceramics-Classification, properties, applications, uses of Asbestos, Glass

wool, thermocole, cork, mica, Composite materials-Introduction & properties, Overview of nano materials, carbon, tool & die materials, introduction to PTFE, carbon fibre materials.

Unit-5

Heat Treatment: Purpose of heat treatment, various heat treatment processes- hardening, tempering, annealing, normalizing, Case hardening and surface hardening-carburizing, nitriding, flame hardening,

Text Book: -

1. Introduction to Engineering Materials by B. K. Agrawal, TMH,2007
2. Engg Materials And Mettalurgy, by R Srinivasan, TMH, 2nd Editio

Reference Book:-

1. Engineering Materials & Metallurgy, R. K. Rajput, S. Chand Limited, 2006.

Subject: Material Science & Heat Treatment Lab

Subject Code: MSE-701L

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

List of Experiments:

1. To study crystal structures of a given specimen.
2. To study crystal imperfections in a given specimen.
3. To study Bravais lattices with the help of models.
4. To prepare solidification curve for a given specimen.
5. To study heat treatment processes (hardening and tempering) of steel specimen.
6. To study microstructures of metals/ alloys.
7. To study thermo-setting of plastics.
8. To study the creep behaviour of a given specimen.
9. To study the mechanism of chemical corrosion and its protection.
10. To study microstructure of heat-treated steel.
11. To study the properties of various types of plastics.
12. To study crystal structures and crystals imperfections using ball models

Subject: Basics of Jigs & Fixtures
Subject Code: ME-602

Credit	Hours	Marks		
4	60	I	E	To
		15	35	50

Outcomes: The course inculcates the uses of jigs, fixtures and gauges for production of parts in industry.

Learning Outcomes

(a) To learn about basic principles and applications of Jigs and Fixtures
(b) To understand different types of jigs operation
(c) To learn about the principles of boring, lathe, milling fixture
(d) To learn about Clamping Devices
(e) To learn about the locating method

Unit-1

Introduction-Materials used in Jigs and Fixtures. Mechanical actuation-pneumatic and hydraulic actuation, clamping force.

Unit-2

JIGS-Drill bushes -different types of jigs-plate latch, channel, box, post, angle plate, angular post, turnover.

Unit-3

FIXTURES-General principles of boring, lathe, milling and broaching fixtures, Grinding, planning and shaping fixtures, assembly, Inspection and welding fixtures

Unit-4

Clamping Devices: Basic principles, cutting forces, Rigid clamping, wedge clamping, Cam clamping, quick action clamps, Toggle clamps, simultaneously acting clamps. Guiding Elements: Jig bushes

Unit-5

Locating Methods- principles of location, locating methods and devices, redundant location.

Text Books :

- P H Joshi, "Jigs and Fixture", Tata McGraw Hill, 2006.
- P.C. Sharma, "A Text Book of Production Technology", S. Chand, 2007

Reference Books:

- Kempster, "Introduction to Jigs & Tool Design", Viva Books Pvt. Ltd,1998

Subject: Advanced Press Tools & Dies
Subject Code: ME-603

Credit	Hours	Marks		
4	60	I	E	To
		15	35	50

Outcomes: The course inculcates students presses and dies used to give final shape to the parts bing produced in industry.

Learning Outcomes

(a) To learn about basic principles and applications of presses

(b) To understand the design consideration for blanking and piercing Dies

(c) To understand the design consideration for bending Dies

(d) To understand the designing of shearing tools

Unit-1: Presses, Compound Dies & Inverted Dies: Press Working Terminologies, construction and types of presses-mechanical & automatic, Computation of press capacity, Introduction to Inverted Dies, construction and function of various parts of Inverted dies, Compound dies, function of various parts of Compound dies, Design of compound and Inverted Dies.

UNIT II: Principles of Blanking and Piercing Dies: Basic Blanking or piercing operation, Shearing Theory, calculation of cutting force and stripping force, importance of cutting force, calculation of press tonnage, calculation of cutting clearance, importance of cutting clearance. Method of reducing the cutting force.

UNIT III: Introduction to various parts of Blanking and Piercing Dies: Function, types and construction of Punches, Punch Plate, Die Plate, stripper plate, Top Plate, Shank, Guide pillar, Guide Bushes, gages, Stock guides, Die stops, Nest Gages and Pushers, Stock material utilization and strip layouts. types of Die Sets,

UNIT IV: Designing of Shearing Tools: Design of blanking, Piercing Dies, Clearance and corner radii.

UNIT V: Introduction and Design of Bending Dies: Basic of Bending, bending stress, bend allowance curve, estimating Flat Blank lengths, Introduction to Bending Dies to produce V,L and U

shaped Bend components, Grain direction, Spring back effect, calculation of bending force and pad force, Design of Bending Dies.

Text Books:

1. Cyril Donaldson and V. C. Goold, "Tool Design", TMH
2. Ostergaard, "Advance Die Making", MGH, New York, 1993.
3. P.H. Joshi, "Press Tool Design and Construction", Wheeler Publishing, Delhi, 2000

Reference Books:-

Vukota Boljanovic,"Sheet Metal Stamping Dies: Die Design and Die-Making Practice", Industrial Press, Inc. New York, NY, USA

Subject: Basics of press Tools, Dies & Moulds

Subject Code: ME-604

Credit	Hours	Marks		
4	60	I	E	To
		15	35	50

Outcomes: The course inculcates the fabrication and uses of jigs, fixtures and gauges for production of parts in industry.

Learning Outcomes

(a) To learn about basic principles of jigs and fixture
(b) To understand General considerations in design drill jigs
(c) To learn about the Vice fixtures, milling fixtures , Boring fixtures
(d) Describe the advantages, role, principles and differences of jigs / fixtures.
(e) To learn about basic principles of Gauge design

Unit-1

Introduction to locating and clamping devices: difference between jigs and fixture, advantages of jigs and fixture, materials used in jigs and fixture, locating principle, locating methods and devices, standard parts, clamping – analysis of clamping forces, tolerance and error analysis. Consideration of Safety factor while designing of Jig Fixture and Gauge.

Unit-2

Jigs: Introduction to drill jigs, Economics of drill jig, General considerations in design drill jigs , types of drill jigs , Drill bushings, Method of constructions , clearance – handling clearance, swarf and cutting fluid clearances, burr grooves Methods of inserting bushes, Design Drill jigs for given components, Drill jigs and modern manufacturing.

Unit-3

Introduction to fixtures, Economics of fixtures, Types of fixtures & Application – overview, Vice fixtures, milling fixtures , Boring fixtures, broaching fixtures , Lathe fixtures, grinding fixtures, welding fixture , indexing fixture, Design of fixtures for the given components.

Unit-4

PRINCIPLE OF FIXTURE DESIGN: principles of fixture design – element of fixtures – design consideration of locators and clamps for fixtures, design of turning fixtures, boring fixtures, milling fixtures, grinding fixtures, surface grinding and, welding fixtures

Unit-5

Gauge design: introduction, Types of gauges, gauges tolerance, selection of materials for gauges. Taylor's principle, ideal gauge. Design of Positional gauges, Indicator, Flush pin and Receiver gauges. Case studies of gauges for selected components

Text Books :

- P H Joshi, "Jigs and Fixture", Tata McGraw Hill, 2006.
- P.C. Sharma, "A Text Book of Production Technology", S. Chand, 2007

Reference Books:

- Kempster, "Introduction to Jigs & Tool Design", Viva Books Pvt. Ltd,1998

Subject: Measurement & Metrology
Subject Code: ME-503

Credit	Hours	Marks		
3	45	I	E	To
		15	35	50

Objectives: The course inculcates student lenear and angular measurements of components produced in the industry.

Learning Outcomes: The students will be able to understand

1. To learn about metrology
2. To learn about the liner and angular measurement
3. To learn about the Limits fits and tolerances
4. To learn about the surface roughness parameters
5. To learn about the Screw thread metrology.

Unit-1

Introduction to metrology: Definition, types, need of inspection, terminologies, and methods of measurement, selection of instruments, measurement errors, units, Measurement standards, calibration.

Unit-2

Linear and Angular metrology: Steel rule, calipers, Vernier caliper, vernier height gauge, vernier depth gauge, micrometers, universal caliper.

Unit-3

Limits fits and tolerances: Interchange ability, selective assembly, limits, fit and tolerances, limit gauging, Measurement of straightness, flatness, squareness, parallelism, roundness and cylindricity, non-contact profiling systems.

Unit-4

Measurement of surface finish: Introduction, terminology, specifying roughness on drawings, surface roughness parameters, factors affecting surface roughness, ideal surface roughness, roughness measurement methods, precautions in measurement, surface microscopy

Unit-5

Screw thread metrology: Introduction, screw thread terminology, screw thread measurement.

Text Books:

1. R.K. Jain, "Engineering Metrology", Khanna Publishers, Delhi
2. I.C. Gupta, "Engineering Metrology", Dhanpat Rai Publications, Delhi

Reference Book: -

Anand K Bewoor, Vinay A Kulkarni "Metrology and Measurement", TMH

Subject: Measurement & Metrology Lab
Subject Code: ME-503L

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

LIST OF EXPERIMENTS :

1 To measure the angle of given specimen by using sine bar.

2 To measure the angle of given specimen by vernier bevel protractor

3 To perform true running of centre alignment test on lathe.

4 To perform true running of spindle alignment test on lathe

5 To perform True running of the spindle alignment test on milling.

6 To perform parallelism between the table and the spindle axis alignment test on milling.

7 To perform Perpendicularity between the spindle and the base plate alignment test on drilling machine.

Semester-IV

Design, Technology and Innovation (MOOC/Online Course-III)

Subject Code: OET-603

Credit	Hours	Marks		
02	30	I	E	To
		30	70	100

Course Objectives:

The course on Design Technology and Innovation portrays innovation as it weaves together a multitude of domains like design, technology, humanities and management through the narrated stories/experiences of professionals how the research to innovation has been carried for the benefit of the community at large.

Learning Outcomes

Students will able to

- Define and describe the domains like design, technology, humanities and management.
- Learn and understand the pitfalls of innovation.
- Learn and understand the stages of transformation of research into innovation.
- Learn to collaborate with different people of different disciplines.
- Take up innovation in student areas of work.

Books and References

Unit	Topic	Key Learning
I	Jaipur Foot and User Centred Helmet Design	Jaipur Foot - A classic innovation by Prof. B.K. Chakravarthy, User Centred Helmet Design by Prof. B. K. Chakravarthy, Challenges of Reaching a Million Users by Prof. Chetan Solanki and Prof Jayendran V
II	Collaborative Innovation	Technology to Solution by Prof. Ramesh Singh, A Collaborative Excellence by Prof. B. Ravi & Prof. B. K. Chakravarthy, Collaborative Innovation Methods by Prof B. K. Chakravarthy
III	Grassroot Innovation	Learnings from Grassroot Innovation by Prof. Anil Gupta
IV	Biomed Innovation	Systemic Approach to Biomed Innovations by Prof. B. Ravi
V	Research to Innovation	Research to Innovation by Prof. Amaresh Chakrabarti, Smartcane for the Blind- A Success Story by Prof. P. V. Madhusudhan Rao

References: 1. https://nptel.ac.in/courses/107/101/107101088/

SUBJECT: Value Education and Professional Ethics (MOOC/Online Course-IV)
Subject Code: OAE-102
CATEGORY: General Education Component

Credit	Hours	Marks		
2	30	I	E	To
		30	70	100

Objectives

At the end of course students will attain

- Understanding of Human values for self (NiYama), and for interaction with outer world (Yama).
- Ability to exhibit Professional Ethics in performing a professional task with excellence – योग : . कमसु कौशलम्
- Understanding of Professional Ethics that demands to see the unseen with emphasis on Sustainable development / eco-friendly implementation of the task.
- Ability to work in team with human values and professional ethics

Learning Outcomes

Unit	Topic	Key Learning
I	**Human Values-1**	• Morals, Values (Niyam): -Understanding values, Types of values, Role of tracking values for individual & social wellbeing. And Ethics (Yama) : Integrity:- Understanding integrity and role of integrity in social harmony –Trustworthiness • Work Ethics – Service-Learning – Civic Virtue – Respect for others – Living Peacefully –Caring – Sharing. • Honesty: -Understanding honesty and its role in personal and social –Courage – Value Time. • Co-operation:-Understanding cooperation and significance of cooperation its family, work team and social cohesiveness, wellbeing and development – Commitment. • Tutorial Module :Rational Behavior versus Ethical Behavior:Case Studies (from Yoga-Sutra, Bhagwat Geeta, Panchatantra, Autobiography of Mahatma Gandhi) or any other literatures.
II	**Human Values-2**	• Empathy: Basic Concept on Empathy– Self-confidence – Spirituality- Character. Truthfulness: -

		Understanding truthfulness, need for truthfulness and role of truthfulness in relationship, social interaction, integrity, faiths & dependence – Customs and Traditions -Value Education – Human Dignity – Human Rights – Fundamental Duties – Aspirations and Harmony (I, We & Nature) – Gender Bias – Emotional Intelligence– Emotional Competencies – Conscientiousness. • Being, body, brain & mind: - Effective & efficient use of body, brain and mind is personal and social wellbeing. • Value Judgments, Facts & Values, how values are justified, Aesthetics, Selection of Values, Universal Values, Human Values, Value Education. • Tutorial Module :Empathy and its types:Case Studies from Yoga-Sutra, Bhagwat Geeta, Panchatantra, Autobiography of Mahatma Gandhi or any other literature.
III	**Professional Ethics aiming at excellence and Harmony**	• Value Based Life and Profession, Professional Ethics and Right Understanding, Competence in Professional Ethics, Issues in Professional Ethics – The Current scenario. • Positive and constructive dynamism of power, politics and leadership. • Tutorial Module: Ethical decision making:Case Studies (from Yoga-Sutra, Bhagwat Geeta, Panchatantra, Autobiography of Mahatma Gandhi or any other literature).
IV	**Professional Ethics: Global Prospective**	• Globalization and MNCs –Cross Culture Issues – Business Ethics – Media Ethics – Environmental Ethics – Endangering Lives – Bio Ethics – Computer Ethics – War Ethics • Tutorial Module: Ethics and Social Networks:Case Studies (from Yoga-Sutra, Bhagwat Geeta, Panchatantra, Autobiography of Mahatma Gandhi or any other literature)
V	**Duties and Rights in Profession**	• Concept of Duty – Professional Duties – Collegiality – Techniques for Achieving Collegiality – Senses of Loyalty – Consensus and Controversy – Professional and Individual Rights – Confidential and Proprietary Information – Conflict of Interest-Ethical egoism – Collective Bargaining –

		Confidentiality – Gifts and Bribes, Plagiarism. • Tutorial Module :Ethics in Corporate: Case Studies (from Yoga-Sutra, Bhagwat Geeta, Panchatantra, Autobiography of Mahatma Gandhi or any other literature)

REFERENCES:

1. New Approaches in Ethics for the Caring Professions: Taking Account of Change for Caring Professions 2005 Edition, by Richard Hugman Publisher: Red Globe Press; 2005 edition (9 July 2018)
2. Rethinking Values and Ethics in Social Work 1st ed. 2017 Edition, Kindle Edition by Richard Hugman (Author), Jan Carter (Author) Publisher: Red Globe Press; 1st ed. 2017 edition (16 September 2017)
3. Professional Ethics and Human Values Paperback – 2015 by A. Alavudeen (Author), R. Kalil Rahman (Author), M. Jayakumaran (Author) Publisher: Laxmi Publications; First edition (2015)
4. A Foundation Course in Human Values and Professional Ethics Paperback – 30 Apr 2010 by R.R. Gaur (Author), R. Sangal (Author), G.P. Bagaria (Author) Publisher: Excel Books (30 April 2010)
5. Living Issues in Philosophy (9th Edition) (1995) By : Titus, Smith and Nolan Publisher: Oxford University Press, New York
6. Foundation of Ethics and Management By : B P Banerjee Publisher: Excel Books, 2005

Suggested reading:

1. Case Study: https://whitneyhess.com/blog/2012/08/21/on-empathy-andapathy-two-case-studies/Book: De Gruyter - Speaking of Emotions: Conceptualisation and Expression (edited by Angeliki Athanasiadou, Elzbieta Tabakowska)
2. Book: To Kill a Mockingbird - Lee Harper
3. Book: Take A Walk In Someone Else's Shoes by Bethany Morlan
4. A paper on 'University Students' Value Priorities and Emotional Empathy': file:///C:/Users/Dell/Desktop/University_Students_Value_Priorities_and_Emoti ona.pdf
5. Research paper on 'Empathy as Added Value in Predicting Donation Behavior': file:///C:/Users/Dell/Desktop/wp_10_692.pdf
6. Decety J and Jackson PL. 2004. The functional architecture of human empathy. Behavioral and cognitive neuroscience reviews 3(2):71-100.
7. Klimecki OM1, Leiberg S2, Ricard M2, Singer T3. Differential pattern of functional brain plasticity after compassion and empathy training. Soc Cogn Affect Neurosci. 2014 Jun; 9 (6): 873-9.
8. A paper on 'The Science of Empathy' - https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5513638/
9. A paper on 'The Psychology of Emotional and Cognitive Empathy' - https://lesley.edu/article/the-psychology-of-emotional-and-cognitiveempathy
10.Links on the latest research and reviews on articles related to empathy - https://www.nature.com/subjects/empathy

Suggested videos/movies (English/Hindi)

1. The Boy in the Striped Pyjamas (an English movie based on the novel by the same name by John Boyne)

2. Chhapaak (an Indian movie about how a young woman tries to rebuild her life after a man throws acid in her face on a public street in New Delhi in 2005) 3. George Lucas Educational Foundation – Edutopia – 3 videos on the importance of empathy - https://www.edutopia.org/blog/3-videosimportance-empathy 4. The actor, Mark Ruffalo, and Murray (from Sesame Street) talk about the word "Empathy" - https://www.youtube.com/watch?v=9_1Rt1R4xbM
5. http://theconversation.com/understanding-others-feelings-what-is-empathyand-why-do-we-need-it-68494
6. https://www.verywellmind.com/what-is-empathy-2795562
7. "The Present" is a thesis short from the Institute of Animation, Visual Effects and Digital Postproduction at the Filmakademie BadenWuerttemberg in Ludwigsburg, Germany. - https://www.youtube.com/watch?v=96kI8Mp1uOU

Semester-V

Subject: Foreign Language (German) Lab

CODE: ME-701L

Credit	Hours	Marks		
4	120	I	E	To
		35	15	50

Unit 1**:** Listening**:** Understanding, Reacting

Unit 2: Speaking: Communicating, Use of language, Pronunciation and information

Unit 3: Reading: Reading and understanding

Unit 4: Writing: Text writing, Text formatting, Use of language

Unit 5: Language Reflection: Building up the Language, Language Comparison

Subject: CNC Machines Programming Lab

Subject Code: ME-602L

Credit	Hours	Marks		
04	120	I	E	To
		70	30	100

Programming by using NC Editor:

1. Introduction to CNC and Understanding of Panel board.
2. Types of programs like Fanuc, Siemens, Mitsubishi, Allen Bradley etc.
3. Movement of Axis, tool change, use of hands wheel, Jog and manual data input.
4. Finding out coordinates for work and tool
5. Programming by using simulator: Path simulation and solid simulation

List of Experiments

Exp.-1: To study G codes and M codes.

Exp.-2: To study and navigate process of NC/CNC machine tools.

Exp.-3: To familiarize with different coordinate systems.

Exp.-4: To perform setting and off-setting the component.

Exp.-5: To learn and execute programming technique such as interpolation, helical, compensation and their application.

Exp.-6: CNC Part programming, sub programming and execution of an operation on milling machine.

Exp.-7: CNC Part programming, sub programming and execution of an operation on drilling machine.

Exp.-8: CNC Part programming, sub programming and execution of an operation on Lathe Machine.

Exp.-9: CNC Part programming by using Canned Cycles and execution of an operation on VMC machine.

Exp.-10: CNC Part programming by using turning cycles and execution of an operation on HMC machine.

Exp.-11: CNC Part programming for threading operation and execution of an operation on VMC machine.

Exp.-12: CNC Part programming for threading operation and execution of an operation on HMC machine.

Exp.-13: CNC Part programming and execution for different types of pockets.

Exp.-14.: Write and execute a program for CNC Machines for a process of a complex drawing part.

Exp.-15: Understand Automatic tool changer and its relationship with program and putting the tool into ATC.

Subject: Tool Maintenance
CODE: ME-703

Credit	Hours	Marks		
4	60	I	E	To
		30	70	100

Unit-1

Introduction to cutting tool maintenance: Introduction to various maintenance practices such as preventive maintenance, predictive maintenance, breakdown maintenance

Regrinding methods of cutting tool, Levelling, alignment specifications & Balancing of cutting tool, mounting & clamping of cutting tools, various vibrations control & resharpening method of cutting tools, insert or insert seat replacement

Unit-2

Press Tool Maintenance: Cleaning and Inspection die and punch, Fitting and joining of die in striper plate, pad, and spring, , die plate, and Die spring, rubber keeper, stripper bolt, solid stripper, difference welding operation in die maintenance, Dismantling and assembling press tool, stroke & shut height adjustment of press tool

Unit-3

Holding, clamping, and locating Jig and fixture maintenance: method of Jig and fixture, surfaces, Maintenances and alignment of J*ig* and fixture, difference locating & clamping device, Fitting and joining of J*ig* and fixture, difference welding operation in J*ig* and fixture maintenance, Dismantling and assembling of J*ig* and fixture,

Unit-4

Mould maintenance: Surface treatment of mould materials, Basic moulds–Cavity–Basic functional components Special functions etc. Introduction Mould Repair and maintenance–scheduling mould maintenance– advantages – storage – corrosion protection – wear and lubrication

Unit-5

Die maintenance: Repairing Damaged Die feeling materials, Steels and Castings rework, Die Materials and heat-Treatments Repair, Reworks and Maintenance, Die Maintenance Scheduling & Troubleshooting, alignment Dowel pin, screw, key, stroke, Fitting and joining of die in striper plate, pad, and spring, , die plate

Learning Outcomes

1. Working principle of Regrinding methods of cutting tool
2. To learn about various *Press Tool Maintenance*
3. To learn about basic Jig and fixture maintenance
4. To understand surface treatment of mould materials,
5. To learn about the die maintenance

Text book-

1. Handbook of Mould, Tool and Die Repair Welding , Woodhead Publishing, by S. Thompson

REFERENCE BOOK-

Die Maintenance Handbook Author(s)/Editor(s): David A Smith LSME, Published By: SME

Subject:: Statistical Quality Control

Subject Code: ME-704

Credit	Hours	Marks		
2	30	I	E	To
		15	35	50

Unit-1

Introduction

Basic statistical concepts, empirical distribution and histograms, frequency, mean mode, standard deviation, normal distribution, binomial and Poisson, Simple examples, Statistical Methods for Quality Control and Improvement

Unit-2

Basic Concept of Quality

Quality Characteristics, Definition of quality and its meaning and importance in industry, Control and Quality control, Quality Tasks, Quality functions, Quality systems, quality assurance and ISO 9000 quality system standards,.

Unit-3

Methods and Philosophy of Statistical Process Control

Chance and assignable causes, Statistical Basis of the Control Charts (basic principles, choices of control limits, significance of control limits, sample size and sampling frequency, rational subgroups, analysis of pattern on control charts, warning limits, Average Run Length-ARL)

Unit-4

Control Charts for Attributes

Binomial distribution, Poisson distribution (from the point of view of Quality control) Control Chart for Fraction Nonconforming, Control Chart for number Nonconforming, Control Charts for Nonconformities or Defects, Control Chart for Number of non-conformities per unit.

Unit-5

Lot-By-Lot Acceptance Sampling for Attributes: -

The acceptance sampling problem, single sampling plan for attributes, Double, Multiple, and Sequential sampling, AOQL, LTPD, and OC curves.

Learning Outcomes

- Understand the philosophy and basic concepts of quality improvement.
- Describe the DMAIC process (defines, measure, analyse, improve, and control).
- Demonstrate the ability to use the methods of statistical process control.
- Demonstrate the ability to design, use, and interpret control charts for variables.
- Demonstrate the ability to design, use, and interpret control charts for attributes.

Text Books: -

1. Statistical Quality Control by M.Mahajan; DhanpatRai and Sons,
2. Statistical Quality control by E.L. Grant

REFERENCE BOOKS

1. Production Planning Control and Management by KC Jain &Aggarwal; Khanna Publishers, New Delhi.

2. Quality control and Industrial Statistics, by A.J. Duncan

Subject: Statistical Quality Control Lab
Subject Code: ME-704L

Credit	Hours	Marks		
2	60	I	E	To
		35	15	50

List of Experiments

1. With the help of given data, plot X-bar charts
2. With the help of given data, plot R charts
3. With the help of given data, plot P charts
4. With the help of given data, plot C charts

Subject: Hydraulics & Pneumatics

Subject Code: ME-605

Credit	Hours	Marks		
3	45	I	E	To
		15	35	50

Unit-1

Introduction: Need and importance of hydraulic and pneumatic, Hydrostatic and hydrodynamic definitions, properties of fluid, Pascal's law, Continuity equation and Bernoulli's equation. Advantages and limitations of hydraulic and pneumatic systems

Unit-2

Hydraulic Pump- Type, construction, working applications and selection criteria. Other Elements such as filters, manifold, receivers, coolers and connecters. Hydraulic Actuators- Type, working and applications. Control Valves- Type, designation, symbols, working and applications, Hydraulic Pipes- Type, materials, designations, pressure ratings and selection criteria. Piping Layout, Concept, rules/norms.

Unit-3

Fundamentals of Pneumatics Compressible fluid flow, mass flow rate, compressible fluid- Type, properties and applications

Unit-4

Pneumatic Element: Pipes- Type, applications and properties. Air Compressor- Type (Reciprocating and rotary), working and selection. Pneumatic Cylinders- Type, symbol, cushion, assemblies, mounting and, Pneumatic Valves- Type, symbols, working, applications and selection. Air Motors- Type, working and applications. Other Elements - Air receivers, filters, pressure regulator, lubricator.

Unit-5

Hydraulic and Pneumatic Circuits Concept, Meaning and ISO symbols. Brief on designing of hydraulic and pneumatic circuits. Applications

Learning Outcomes

1. Working principle of various components used in hydraulic & pneumatic systems.
2. To learn about various components such as hydraulic Pumps systems ,Hydraulic Actuators and Valve
3. To learn about basic principles of Pneumatics
4. To understand pneumatic elements, their working, uses.
5. To learn about the hydraulic & pneumatic circuits

Text Books: -

1. Hydraulic and Pneumatic Systems by S. R Majumdar; TMH Publishers
2. Hydraulics and Pneumatics (A Technician and Engineer Guide) by Andrew Parr; Butterworth Publishers

Reference:-

Hydraulic and Pneumatic Power and control Design, Performance and Application by Yeaple; McGraw hill.

Subject: Industrial Best Practices

Subject Code: ME-705

Credit	Hours	Marks		
4	60	I	E	To
		30	70	100

Unit-1: Lean Manufacturing

Objectives of lean manufacturing-key principles and implications of lean manufacturing Traditional Vs lean manufacturing, Lean benefits ,Value creation and waste elimination.

Unit-2: Eagile manufacturing

Types of Production, The Agile Production Paradigm, History of Agile Manufacturing, Agile Manufacturing Vs Mass Manufacturing, Agile Manufacturing Vs Mass Customization.

Unit-3: Supply chain management

Concept of supply management and SCM, Importance of supply chain flows, Value chain, Elements of supply chain efficiency, Key issues in SCM, Decision phases, Supply chain integration, Uncertainties in supply chain

Unit-4: Types of Maintenance

Planned & unplanned maintenance, Break down maintenance, Corrective maintenance, Routine maintenance, Preventive maintenance, Predictive maintenance, condition based maintenance system & Design-out maintenance.

Unit-5: Condition Monitoring

Primary & Secondary signals, on-line & Off-line monitoring, Visual & Temperature monitoring, leakage monitoring, lubricant monitoring, corrosion monitoring, noise/ sound monitoring. Smell/ odour monitoring.

Text /Reference Books

1. Industrial maintenance management by S.K. Srivastava, S. Chand & Company, New Delhi-55

2. Supply Chain Management: Strategy, Planning & Operations, Chopra, S. and Meindl, P. Second Edition, Pearson Education (Singapore) Pte. Ltd. 2004.

3. Goldman S L, Nagal R N and Preiss K, “Agile Competitors and Virtual Organizations”, Van Nostrand Reinhold, 1995.

4. Brian H Maskell, "Software and the Agile Manufacturer, Computer Systems and World Class Manufacturing, Productivity Press, 1993

Learning Outcomes

- Understand the benefits of lean manufacturing.
- Understand the benefits of eagile manufacturing
- Understand the application and benefits of supply chain management.
- Understand the various condition monitoring techniques
- Student will able to know about some common operations used in tool & die making.

Subject:: Production & Maintenance Mgmt.

Subject Code: ME-704

Credit	Hours	Marks		
4	60	I	E	To
		30	70	100

Unit 1

Introduction to Production Management: Introduction; History of Production and Operations Management; Definitions of Production Management; Production Process; Production: The Heart of an Organization; Objectives of Production Management; Scope of Production Management; Importance of Technology in Production

Unit 2

Materials Management: Overview of Materials Management: Definition of Materials Management, Functions of Materials Management, Importance of Materials Management; Concept of Purchase Management: The Objectives of Purchasing, The Functions of a Purchase Department, The Methods of Purchasing, Types of Contracts and tenders, Seasonal Purchasing, Subcontract Purchasing, Central Purchase Organization, Purchasing Procedure; Concept of Stores Management: The Functions of Stores Management, Types of Stores; Inventory Management and Coding

Unit 3

Operations Technology*:* Importance of Operations Technology: Types of Operations Technology; Manufacturing Systems or Production Systems: Continuous Production System (CPS), Characteristics of Continuous Production System, Intermittent Production System; Automation: Meaning, Importance and Elements: Computer-Aided Design (CAD), Computer-Aided Manufacturing (CAM), Flexible Manufacturing System (FMS), Computer-Integrated Manufacturing System (CIMS), Automatic Identification Systems (AIS); Enterprise Resource Planning (ERP): Need for Enterprise Resource Planning: Why ERP?

Unit 4

Maintenance Management*:* Maintenance Management: Definition of Maintenance Management, Need for Maintenance, Objectives of Maintenance Management, Types of Maintenance Systems, Activities in Maintenance Management

Unit 5

Project Analysis: Definition of Project and Project Management: Characteristics of a Project, Life Cycle of a Project, Types of Projects, Scope of Project Management, Project Planning Process; Programme Evaluation Research Task (PERT) and Critical Path Method (CPM): Principles of Network Construction, Time Aspect of Projects, Crashing of a Project, Limitations of CPM and PERT

Learning Outcomes

- Understand types of Engineering Materials.
- Understand metrology aspects & basic measuring instruments used.
- Able to know about different machine tools and Functional operations.
- Able to understand reason of using jigs & fixtures.
- Student will know about drilling and related operations.
- Student will able to know about some common operations used in tool & die making.

Text Book:

1. Production & Operation Mgmt by Saxena, TMH
2. Theory and Problems in Production and Operations Management, By S. N. Chary, TMH

Reference:

Industrial Engineering and Production Management, by Martand Telsang (Author), S. Chand

Subject: Quality Control and Reliability Engineering

Subject Code: IMS-601

Credit	Hours	Marks		
4	60	I	E	To
		30	70	100

Learning Outcomes:

1. Students will be able to know the concept of Statistical process control.
2. Able to know the concept of Acceptance sampling
3. Able to know concept of Reliability engineering.

Unit 1:

Quality Concepts: Quality-Factors influencing quality, quality costs, economics of quality, quality assurance statistical tools used in quality in SQC, Quality planning, Organization for quality. Bureau of Indian standards, ISO 9000-quality circles KAIZEN-TQM concepts-Quality audit.

Unit 2:

Statistical Process Control: Variation in processes, Factors, Process capability, Analysis of process capability, control charts, variables, Attributes, Establishing and interpreting control charts, X,R, chart for variables, defects, P chart, C-chart and U chart-Con-troll charts for defective quality rating

Unit 3:

Acceptance Sampling: Lot-by-lot sampling, types probability of acceptance in single double, multiple sampling techniques-O.C. curves procedure's Risk and consumers Risk AQL, LTPD, AOQL concepts-standard sampling plans for AQL AND LTPD- uses of standard sampling plans.

Unit 4:

Life Testing-Reliability-Systems Approach: Life testing-objectives-classification-failure characteristics-failure data analysis-mean time to failure-maintainability and availability-reliability-system reliability-series and parallel systems-systems reliability in terms of probability of failure-MTBF-Acceptance sampling based on reliability test OC curves.

Unit 5: Quality and Reliability: Reliability improvement-techniques, use of pareto analysis - Design for reliability, Redundancy, standby redundancy, failsafe systems-optimization in reliability, product design, product analysis, product development product cycle.

References:

1. Betster field D.H. Quality Control-Prentice Hall Pub (1993) (Revised Edn.)
2. Sharma S.C. Inspection Quality Control and Reliability –Khanna Publishers New Delhi (1998)
3. John Bank, The Essence of Total Quality Management, Prentice Hall of India P Ltd New Delhi 1995.
4. Danny Samson, Manufacturing & Operations strategy. Prentice Hall New York (1991)
5. Ganapathy K. Subramaniam B. Narayana V-Quality Circle concepts and implementation – QCFI. Secondrabad 919940.
6. Tapan P. Bagchi ISO9000. Concepts methods and implementation – Wheeler Publisher Allahbad (1994) Automobile Engineering Syllabus 17

Subject: Computer Integrated Manufacturing Systems

Subject Code: ME-702

Credit	Hours	Marks		
03	45	I	E	To
		15	35	50

Objectives:

- To understand the application of computers in various aspects of Manufacturing viz., Design, Proper planning, Manufacturing cost, Layout & Material Handling system.

Learning Outcomes: The learner will be able to

- Working principle of type of manufacturing system
- To learn about various Tool Monitoring System
- To learn about basic principles of Pneumatics
- To understand Cellular Manufacturing
- To learn about the Integration of robotics in CIM system

Unit-I

Introduction: Brief introduction to CAD and CAM – Manufacturing Planning, Manufacturing control- Introduction to CAD/CAM – Concurrent Engineering-CIM concepts – Computerised elements of CIM system –Types of production – Manufacturing models and Metrics – Mathematical models of Production Performance – Simple problems – Manufacturing Control – Simple Problems – Basic Elements of an Automated system – Levels of Automation – Lean Production and Just-In-Time Production.

Unit-II

Production planning and control and computerised process planning: Process planning – Computer Aided Process Planning (CAPP) – Logical steps in Computer Aided Process Planning – Aggregate Production Planning and the Master Production Schedule – Material Requirement planning – Capacity Planning- Control Systems-Shop Floor Control-Inventory Control – Brief on Manufacturing Resource Planning-II (MRP-II) & Enterprise Resource Planning (ERP) – Simple Problems.

Unit-III

Cellular Manufacturing: • Group Technology(GT), Part Families – Parts Classification and coding – Simple Problems in Opitz Part Coding system – Production flow Analysis – Cellular Manufacturing – Composite part concept – Machine cell design and layout – Quantitative analysis in Cellular Manufacturing – Rank Order Clustering Method – Arranging Machines in a GT cell – Hollier Method – Simple Problems.

Unit-IV

FMS: Types of Flexibility – FMS – FMS Components – FMS Application & Benefits – FMS Planning and Control– Quantitative analysis in FMS – Simple Problems. Automated Guided Vehicle

System (AGVS) – AGVS Application – Vehicle Guidance technology – Vehicle Management & Safety.

Unit-V

Robotics in CIM: Robot Anatomy and Related Attributes – Classification of Robots- Robot Control systems – End Effectors – Sensors in Robotics – Robot Accuracy and Repeatability – Industrial Robot Applications – Robot Part Programming – Robot Accuracy and Repeatability – Simple Problems.

Suggested Readings:

- CAD/CAM: Computer-Aided Design and Manufacturing, by Groover& CAD/CAM/CIM by P. Radhakrishnan, V. Raju
- Automation, Production Systems, and Computer-Integrated Manufacturing by Mikell P. Groover.
- Groover, M. P., Automation, Production systems and Computer Integrated Manufacturing, Pearson Education Asia (2009).
- Vajpayee, K.S., Principles of Computer Integrated Manufacturing, Prentice Hall (2006).
- Rao, P. N., Tewari, N. K. and Kundra, T. K., Computer Integrated Manufacturing, McGraw Hill (1998).

Reference Books:

- Kant Vajpayee S, "Principles of Computer Integrated Manufacturing", Prentice Hall India, 2003.

Subject: Computer Integrated Manufacturing Systems Lab

Subject Code: ME-702L

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

List of Experiments

1. FMS (Flexible Manufacturing System): Programming of Automatic storage and Retrieval system (AS/RS) and linear shuttle conveyor Interfacing CNC lathe, milling with loading unloading arm and ASRS to be carried out on simple components.(Only Demo/Viva)

2. Robot programming: Using Teach Pendent & Offline programming to perform pick and place, stacking of objects (2 programs). (Only Demo/Viva)

3. Pneumatics and Hydraulics, Electro-Pneumatics: 3 typical experiments on Basics of these topics to be conducted.

Subject: Consumer Affairs (MOOC/ Online Course-VI)

Subject Code: OAE-103

Credit	Hours	Marks		
2	15	I	E	To
		30	70	100

Objectives.

- This paper seeks to familiarize the students with their rights and responsibilities as a consumer, the social framework of consumer rights and legal framework of protecting consumer rights. It also provides an understanding of the procedure of redress of consumer complaints, and the role of different agencies in establishing product and service standards.
- The student should be able to comprehend the business firms' interface with consumers and the consumer related regulatory and business environment.

Learning Outcomes

- Able to understand the conceptual framework of consumer affair
- Able to explain the consumer protection law in India
- Able to explain the Grievance Redressal Mechanism under the Indian Consumer Protection Law
- Able to explain the Role of Industry Regulators in Consumer Protection

- Able to explain the Contemporary Issues in Consumer Affairs

Unit-1 (Conceptual Framework)

Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labelling and packaging along with relevant laws, Legal Metrology.

Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000 suite.

Unit-2 (The Consumer Protection Law in India)

Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice and restrictive trade practice.
Organizational set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions and National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

Unit-3 (Grievance Redressal Mechanism under the Indian Consumer Protection Law)

Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties.
Leading Cases decided under Consumer Protection law by Supreme Court/National Commission: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

Unit-4 (Role of Industry Regulators in Consumer Protection)

Banking: RBI and Banking Ombudsman

Insurance: IRDA and Insurance Ombudsman

Telecommunication: TRAI

Food Products: FSSAI

Electricity Supply: Electricity Regulatory Commission

Real Estate Regulatory Authority

Unit-5 (Contemporary Issues in Consumer Affairs)

Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings.

Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview

Note: Unit 2 and 3 refers to the Consumer Protection Act, 1986. Any change in law would be added appropriately after the new law is notified.

Text Books:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. Consumer Affairs" (2007) Delhi University Publication; pp. 334/
2. Aggarwal, V. K. (2003). Consumer Protection: Law and Practice. 5th Ed. Bharat Law House, Delhi, or latest edition.
3. Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.
4. Nader, Ralph (1973). The Consumer and Corporate Accountability. USA, Harcourt Brace Jovanovich, Inc.

Reference Books:

1. Sharma, Deepa (2011). Consumer Protection and Grievance-Redress in India: A Study of Insurance Industry (LAP LAMBERT Academic Publishing GmbH & Co.KG, Saarbrucken, Germany; pp.263 pp.
2. Empowering Consumers e-book, www.consumeraffairs.nic.in
3. EBook www.bis.org
4. The Consumer Protection Act, 1986.

Semester: 6th

Subject: Fundamentals of Artificial Intelligence (MOOC/Online Course-V)

Subject Code: OET-701

Credit	Hours	Marks		
02	30	I	E	To
		30	70	100

Course Objectives:

The objective of this course is to present an overview of the principles and practices of AI to address complex real-world problems. The course is designed to develop a basic understanding of problem solving, knowledge representation, reasoning and learning methods of artificial intelligence (AI).

Learning Outcomes

Students will able to

- learn and understand the principles and practices of AI, various searching techniques, constraint satisfaction problem, example problems- game playing techniques
- Acquire the knowledge of real-world knowledge representation
- Apply these techniques in applications which involve perception, reasoning and learning.
- learn and develop a basic understanding of planning and complex problem solving
- investigate applications of AI techniques in machine learning models.

Text Books and References

1. Patrick Henry Winston, Artificial Intelligence, Third Edition, Addison-Wesley Publishing Company, 2004.
2. Nils J Nilsson, Principles of Artificial Intelligence, Illustrated Reprint Edition, Springer Heidelberg, 2014.
3. https://onlinecourses.nptel.ac.in/noc21_ge20/preview

Reference Books:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 3rd Edition, PHI 2009.
2. Nils J. Nilsson, Quest for Artificial Intelligence, First Edition, Cambridge University Press, 2010.
3. Dan W Patterson, Artificial Intelligent, Prentice Hall of India

Subject: MOOC/Online Course-V (Cyber Security Tools Techniques and Counter Measures)

Unit	Topic	Key Learning
I	AI and Problem Solving	Introduction to AI, Problem Solving as State Space Search, Uninformed Search, Problem Solving by Search: Heuristic Search, Informed Search, Constraint Satisfaction Problems, Searching AND/OR Graphs, Game Playing
II	Knowledge Representation	Knowledge Representation and Reasoning, Introduction to Knowledge Representation, Propositional Logic, First Order Logic and its inference, Answer Extraction, Procedural Control of Reasoning
III	Reasoning	Reasoning under Uncertainty, Bayesian Network, Decision Network
IV	Planning	Introduction to Planning, Plan Space Planning, Planning Graph and Graph Plan, Planning and Decision Making: Practical Planning and Acting, Sequential Decision Problems, Making Complex Decisions
V	Machine Learning	Introduction to Machine Learning, Learning Decision Trees, Linear Regression, Support Vector Machines, Unsupervised Learning, Reinforcement Learning, Learning in Neural Networks, Deep Learning

Subject Code: OET-702

Credit	Hours	Marks		
02	30	I	E	To
		30	70	100

Course Objectives:

The course Cyber Security, Tools, Techniques and Countermeasures aims to provide a foundational platform for Cyber Security Aspirants by providing Cyber Security Awareness and Training that heighten the chances of catching a scam or attack before it is fully enacted, minimizing damage to the resources and ensuring the protection of information technology assets.

Learning Outcomes

- Students will able be to acquire the knowledge of both the fundamentals of information systems as well as advanced topics in areas such as network security, cryptography, risk management, security governance, business continuity, security, architecture, physical security and critical infrastructures.

Text Books and References

1. Principles of Cyber Security Course Code: PGDCS-101 Published by Dr. Babasaheb Ambedkar Open University
2. Cyber Security Techniques: PGDCS-103 Published by Dr. Babasaheb Ambedkar Open University
3. https://onlinecourses.swayam2.ac.in/nou21_ge40/preview

Reference Books:

1. Cyber Security – Understanding Cyber Crimes, Computer Forensics and Legal Perspectives Author: Nina Godbole, Sunit Belapure, Publisher: Wiley India
2. Information Systems Security – Security Management, Metrics, Frameworks and Best Practices Author: Nina Godbole, Publisher: Wiley India

Unit	Topic	Key Learning
I	Introduction	Cyber Security Essentials, Attack Vectors, Threat, Risk and Vulnerability, Advanced Persistent Threat and Cyber Kill Chain, Cyber Security Framework
II	Firewall and Attacks on Wireless Networks	Firewall and Packet Filters, Introduction to Windows and Linux Firewall, Attacks on Wireless Networks, Scanning For Web Vulnerabilities Tools and HTTP Utilities
III	Inspection Tools and Security Policy	Application Inspection Tools, Password Cracking and Brute-Force Tools, Web Attack, Information Security Basics to Policy
IV	Detection System and Security Assurance	Intrusion Detection System, IT Assets and Wireless Security, Cyber Security Assurance Framework, Desktop Security and Malware
V	Social Engineering and IPR	E-Commerce and Web-Application Security, Social Engineering, Internet Crime and Act, Intellectual Property in the Cyber world