SCHEME OF EXAMINATION

and

SYLLABUS

for

Bachelors in Vocation (B. Voc.)

in

MANUFACTURING

Offered by

Community college of skill development

J C Bose University of Science & Technology YMCA Sector-6, Mathura Road, Faridabad,

Haryana, India

2023-24

ABOUT THE PROGRAM

The B.Voc. Degree in manufacturing runs with a mission to impart knowledge, technical skills & hands-on training in production, focusing on manufacturing, quality control, CNC technology and machine maintenance. This program is an outcome of industry and student demand. Only Degree program in manufacturing with more than 80% Practical to make you more employable and outshine your career. This program is designed to introduce the students to the elements of engineering and management sciences and production technology consists of elements of operations research, production planning, materials management etc. Students under this program will use application of engineering and management techniques to simplify the production process. The main aim of production technology is to solve problems and challenges arising in the field of production/manufacturing. Vocational training programs have been created with the aim of imparting industry-specific skills in students. These programs are crafted in such a way that the students acquire skills, which will lead them to employment in the respective sector.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO-1: To train students with practical skills and experimental practices related to core and applied areas of Manufacturing Technology to expand their knowledge horizon beyond books and make them industry ready.

PEO-2: To enable students to design and manufacture mechanical equipment which are useful for the industries.

PEO-3: To improve team building, team working and leadership skills of the students with high regard for ethical values and social responsibilities.

PEO- 4: To enable students to communicate effectively and efficiently.

PROGRAMME OUTCOMES (POs)

After completion of the program, the student will:

1) Be trained to NSQF level 5.5 in at least one job/profile in the field of automotive manufacturing skills.

2) Be trained for multiple skill sets under the domain of manufacturing.

3) Be able to supervise the various workshop floors for mechanical shop, welding and quality control.

4) Be trained & equipped with knowledge and understanding to start his/her own enterprise in manufacturing.

5) Be able to develop skills in management of customer issues, analysis and evaluation of

mechanical, electrical and electronics faults.

6) Be able to supervise the various manufacturing workshop floors for mechanical shops.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

To apply practical skills, vocational training and knowledge of Manufacturing fundamentals to industries. The student will be ready and skilled to take-up a career or to pursue higher studies with high regard to ethical values and social responsibilities.

SCHEME OF EXAMINATION

FIRST SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
BSC-105 EL	English Literacy	3-0-0	3	25	75	BSC
BSC-107	Engineering Calculations	3-0-0	3	25	75	BSC
AM-101	Quality Control and Safety	3-0-0	3	25	75	PCC
AM-102	Engineering Science	3-0-0	3	25	75	PCC
MNF-101	Manufacturing Process - I	3-0-0	3	25	75	PCC
MNF-103	Manufacturing Workshop - I	0-0-10	5	30	70	SDP
Total		**15-0-10**	**20**	**155**	**445**	

SECOND SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
BSC-204-BS	Behavioral Skills	3-0-0	3	25	75	BSC
BSC-205T	Typography and Computer Application	3-0-0	3	25	75	BSC
AM-201	Applied Science	3-0-0	3	25	75	PCC
MNF-201	Manufacturing Process-II	3-0-0	3	25	75	PCC
MNF-202	Manufacturing Workshop - II	0-0-10	5	30	70	SDP
MAC-201 to 203	Mandatory Audit Course	3-0-0	3	25	75	MAC
Total		**15-0-10**	**20**	**155**	**445**	

THIRD SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
BSC-302ES	Employability Skills	3-0-0	3	25	75	BSC
AM-301	Metrology	3-0-0	3	25	75	SDP
AM-302	CAD & CAM	3-0-0	3	25	75	BSC
MF-301	Material Science	3-0-0	3	25	75	PCC
MF-302	Machining	3-0-0	3	25	75	PCC
MF-303	Manufacturing Workshop - III	0-0-10	5	30	70	SDP
Total		**15-0-10**	**20**	**155**	**445**	

FOURTH SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
MF-401	Quality Control Techniques	3-0-0	3	25	75	PCC
AM-401	Industrial Management	3-0-0	3	25	75	PCC
MF-402	Manufacturing Workshop - IV	0-0-10	5	30	70	SDP
BSC-401	Project	3-0-0	3	25	75	SDP
OEC-401 to 403	Open Elective Course	3-0-0	3	25	75	OEC
PEC-MF-401 to 403	Program Elective Course	3-0-0	3	25	75	PEC
Total		**15-0-10**	**20**	**155**	**445**	

FIFTH SEMESTER

Subject Code	Subject Name	Credits	Marks Weightage		Course Type
			Internal	External	
MF-501	On Job Training (OJT)/ Internship	20	350	150	OJT
	Total	**20**	**350**	**150**	

SIXTH SEMESTER

Subject Code	Subject Name	Credits	Marks Weightage		Course Type
			Internal	External	
MF-601	On Job Training (OJT)/ Internship	20	350	150	OJT
	Total	**20**	**350**	**150**	

LIST OF MANDATORY AUDIT COURSE

Course Code	Course Name
MAC-201	Human Value And Professional Ethics
MAC-202	Balance Diet And Nutrition
MAC-203	Environmental Science
MAC-204	Srimad Bhagavad Geeta

LIST OF OPEN ELECTIVE COURSE

Course Code	Course Name
OEC-401	Entrepreneurship
OEC-402	Trends in Technology
OEC-403	Waste Management
OEC-404	Industry 4.0

LIST OF PROGRAM ELECTIVE COURSE

Course Code	Course Name
PEC-MF-401	Reliability, Maintenance & safety engineering
PEC-MF-402	Plant Layout & Product handling
PEC-MF-403	Autotronics

SCHEME OF EXAMINATION

FIRST SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
BSC-105	English Literacy	3-0-0	3	25	75	BSC-105
BSC-107	Engineering Calculations	3-0-0	3	25	75	BSC-107
AM-101	Quality Control and Safety	3-0-0	3	25	75	AM-101
AM-102	Engineering Science	3-0-0	3	25	75	AM-102
MF-101	Manufacturing Process - I	3-0-0	3	25	75	AU-101
MF-102	Manufacturing Workshop - I	0-0-10	5	30	70	AU-102
Total		**15-0-10**	**20**	**155**	**445**	

BSC-105 EL : ENGLISH LITERACY

B. Voc. (Manufacturing) I Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Spoken English skills

Successive: Basics Communication Skills

Course Objectives: The objective of studying this course is to acquire knowledge on the Basic English grammar starting from speeches to synaptic category going forward with tenses and its types. To comprehend voices, narration and sentence making.

Course Outcomes: At the end of the course, the student shall be able to:

CO1 To learn about Parts of Speech.

CO2 To learn about Syntactic Category.

CO3 To know more about the Tenses.

CO4 To acquire knowledge on Voices and Sentence Making.

Course Contents:

Unit 1: Parts of Speech
Noun, Pronoun, Verb, Adverb, Adjective.

Unit 2: Literacy Skills
Preposition, Conjunction, Interjection, pronunciation of words.

Unit 3: Fragment of Tenses
Present tense, Past Tense, Future Tense, Oral Drilling of simple commands and statements, Developing LSRW, Developing LSRW(Listening, Speaking, Reading, Writing)skills.

Unit 4: Sentence Formation
Active and Passive voice, Direct and Indirect Narration, Simple Sentences, Compound Sentences, Complex Sentences, Compound-Complex Sentences, Use of phonetics to aid in identifying speech sounds.

Text Books/ Reference Books:

1. Wren and Martin. High School English Grammar and Composition. New Delhi: RRP, 2007.
2. Murphy, Raymond. Essential English Grammar. New Delhi: Cambridge, 2017.

BSC-107: ENGINEERING CALCULATIONS

B. Voc. (Manufacturing) I Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Basic mathematics

Successive: Concepts of trigonometry, differentiation and integration.

Course Objectives: The objective of studying this course is to Familiarize the prospective graduates with the basics of mathematics. To Provide knowledge on the application of trigonometry, integration and differentiation. Understand the use of matrices, trigonometry, integration and differentiation to solve formulated mathematical problems.

Course Outcomes: At the end of the course, the student shall be able to:

- CO1 Use trigonometry functions, ratios and their applications in real world scenarios.
- CO2 Use trigonometric identities to solve mathematical problems.
- CO3 Understand and use matrices to solve mathematical problems.
- CO4 Deal with differential and integral problems.

Course Contents:

Unit 1: Quantitative Aptitude
Percentage, HCF & LCM, Simple interest and Compound interest, Profit & loss, Time, speed & distance, A.P & G.P series, Mean, Median, Mode, Standard deviation.

Unit 2: Trigonometry
Introduction to trigonometric functions: Radian and degree measure, right triangle trigonometry, trigonometric functions of any angle, applications using right triangles; Graphs of sine and cosine functions, transformation of graphs of the sine and cosine functions, Trigonometric Identities, Quadrant Rule, Sum and difference identities for cosine, sine, and tangent, Double-angle identities, half-angle identities, Verifying trigonometric identities, Ratios of Complementary Angles.

Unit 3: Matrices and Determinants
Definition and Properties of Determinants, Definition and Types of Matrices, Transpose of a Matrix, Symmetric, Skew Symmetric Matrices, Orthogonal matrices, Hermitian and Skew

Hermitian, Minors and Cofactors, Adjoint and Inverse of a Matrix, Cramer's Rule, Solution of Simultaneous Linear Equations by Inverse Matrix Method.

Unit 4: Differentiation and Integration

Introduction to Derivatives, Product Rule, Quotient Rule, Chain Rule, Derivatives of Algebraic Function, Derivative of trigonometric functions, Derivative of inverse trigonometric functions, evaluation of simple differentials. Concepts of integration, integration of trigonometric functions, exponential and logarithmic functions, integration by parts, evaluation of simple integrals.

Text Books/ Reference Books:

1. G.B. Thomas and R.L. Finney, “Calculus and Analytic geometry”, Pearson, 2002.
2. Advanced Engineering Mathematics by R.K. Jain.
3. A Basic course in Mathematics by Nabjyoti Dutta.
4. Skills in mathematics by Amit M Aggarwal.
5. Applied Mathematics for Polytechnics by H.K. Dass.
6. N.P. Bali and Manish Goyal, “A textbook of Engineering Mathematics”, Laxmi Publications, Reprint, 2010.

AM-101: QUALITY CONTROL AND SAFETY

B. Voc. (Manufacturing) I Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course objectives: To understand the importance of safety, health and environment and to classify different types of accidents.To study different types of hazards and 5S at the workplace.

Course Outcomes: At the end of the course, the student shall be able to:

CO1 Students will be aware about safety and health.

CO2 Students will be able to differentiate different types of accidents.

CO3 Students will be able to differentiate different types of risks.

CO4 Students will learn about 5S at the workplace.

Course Contents:

Unit 1: Importance of Safety, health and environment

Safety, Health and Environment, cleaning of work area, tools, equipment and materials, Importance of safety, objectives of safety management, personal protective equipment like safety gloves, safety glasses, safety shoes and safety helmet, contents of the first aid kit, instructions of equipment manual.

Unit 2: **Accidents**

Classification of accidents, causes of accidents, accident investigations/reporting, approaches to prevent accidents, Fire fighting.

Unit 3: **Safety in hazardous area**

Hazards and risks, difference between hazard and risk, Hazard in industrial zones, physical, chemical, environmental, biological, ergonomics and psycho- social hazards, Introduction to OSHMS, OHSAS 18001 and OSHA.

Unit 4: 5S in safety

The basic principles of 5 S in manufacturing and workplace – Cleaning, sorting etc. sorting of materials, tools and equipments and spare parts, standards, procedures and policies related to 5S,

importance of waste disposal, segregation of waste into Hazardous and Non Hazardous waste, disposal the waste as per SOP, labeling procedures, storage procedures.

Unit 5: Inspection

How to measure the correct specifications of the output in the terms of thickness, hardness, durability, tightness, finesse etc. relevant manufacturing standards and procedures followed in the company in detail, different types of defects which may arise due to improper manufacturing.

Unit 6: Quality control

Concept of quality control. elements of quality control, quality control groups, objectives of quality control. Statistical quality control, objectives of S.Q.C. Inspection by variables & attributes. Frequency distribution, mean, median & mode, standard deviation, X-R charts, P-Charts, C-Charts and acceptance sampling. (i) I.S.O. 9000 (ii) KAIZEN (iii) Six Sigma (iv) 5S.

Reference books:

1. Industrial Safety and Health Management by C Ray Asfahl, Pearson publications.
2. Industrial Safety Management by N. K. Tarafdar.
3. Industrial Safety (Safety Management) by D S S Ganguly & C S Changeriya.

AM-102: ENGINEERING SCIENCE

B. Voc. (Manufacturing) I Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives: To learn about measurement devices.To understand the law of motion and friction.To study the basic concepts of thermodynamics . To learn about fuel and its classifications.

Course Outcomes: At the end of the course, the student shall be able to:

CO1 To learn about units and dimensions.

CO2 To improve understanding about motion and its laws.

CO3 To acquire knowledge about thermodynamics.

CO4 To be able to understand pollution and its control.

Course Contents:

Unit 1: Units and Measurements

Need for measurement: Units of measurement; systems of units; SI units, fundamental and derived units. Length, mass and time measurements; accuracy and precision of measuring instruments; errors in measurement; significant figures. Dimensions of physical quantities, dimensional analysis and its applications.

Unit 2: Laws of Motion

Intuitive concept of force, Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion. Law of conservation of linear momentum and its applications. Equilibrium of concurrent forces, Static and kinetic friction, laws of friction, rolling friction, lubrication. Dynamics of uniform circular motion: Centripetal force, examples of circular motion.

Unit 3: Chemistry

Introduction, atomic structure, periodic classification of element, chemical bonding, acid base and salts, carbon and its compound, metal non-metal and man made substances.

Unit 4: Fuel and their Classification

Definition, characteristics, classification into solid, liquid and gaseous fuel, Petroleum and brief idea of refining into various factions and their characteristics and uses, Calorific value of fuel, Gaseous fuels- preparation, properties, composition and use of producer gas, water and oil gas.

Unit 5: Pollution & its Control

Air Pollution: Types of pollutants, source effects, sink and control of primary pollutants – CO, Nox, HC, Sox and particulates, effects of pollutants on man and environment – photochemical smog and acid rain. Water Pollution: Classification of pollutants, their sources, wastewater treatment – domestic and industrial. Soil Pollution: Composition of soil, classification and effects of soil pollutants and their control. Hazardous Wastes: Classification – radioactive, biomedical and chemical, treatment and disposal – physical, chemical and biological processes.

Reference Books:

1. Thermodynamics by P K Nag
2. Environmental pollution and control engineering: C. S. Rao
3. Handbook of industrial metrology – John W. Greve, Frank W. Wilson,PHI – New Delhi.
4. Engineering Metrology – K.J. Hume, Macdonald and Co.(publisher) London

MF-101 MANUFACTURING PROCESS-1

B. Voc. (Manufacturing) I Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course objectives:
To study the various manufacturing processes. To understand the working of various cutting tools. To understand measurement and measuring instruments. To introduce NC and CNC machines.

Course Outcomes: At the end of the course, the student shall be able to:

CO1 To learn about the pre- machining activities

CO2 To improve understanding about cutting tools.

CO3 To acquire knowledge about different machining operation like milling shaping etc.

CO4 To be able to understand CNC machine operations

Unit-1 Pre-machining activities:
does and don'ts of the manufacturing process, Metal properties/ metallurgy, coolant and lubricants, Selection of proper coolant and lubricant required for machining the required component, use of machine guards, acceptance requirements/ limits of machining e.g. surface finish, specific orientation, gauge inspection etc., introduction to jigs and fixtures, different holding fixtures, gears, stops, Introduction to Measuring devices: micrometers, vernier calipers, gauges, rulers.

Unit-2 Metal Cutting
Introduction to metal cutting, orthogonal and oblique cutting, types of chips, cutting tools, introduction to different types of tools used in the machining process, single point and multi point cutting tools, single point tool geometry, ASA tool signature, material removal rate.

Unit- 3 Machining
Different types of machining processes, basic fundamentals of machines and mechanics, introduction and operations of lathe, turning, milling, shaping, boring, broaching, hobbing, facing and shaping, blanking and piercing processes, special purpose machines for operations. grinding, grinding procedure, balancing and dressing of wheels, abrasive, Post machining activities: Impact

of presence of burrs, edges, chips on the final product performance, deburring, use of chisels, scrapers to Trim, scrape or deburr objects or parts.

Unit- 4 Introductions to NC and CNC machines

NC machines, components of NC and CNC machines, difference between NC and CNC, G- codes and M codes, right command in the CNC machine, Introduction to quality, 7 quality tools, company policy.

Reference books:

1. Manufacturing technology by P. N. Rao
2. Production technology- R. K. Jain
3. Manufacturing Science- Amitabha Ghosh & Ashok Kumar Malik, - East- West Press.
4. Workshop Technology Vol I & II –Hazra & Chaudhary, Asian Book Comp., New Delhi**.**

AU-102: MANUFACTURING WORKSHOP-I

B. Voc. (Manufacturing) I Semester

No. of Credits:			5	Sessional:	30 Marks
L	T	P	Total	Practical :	70 Marks
0	0	10	10	Total:	100 Marks
				Duration of Exam:	3 Hours

Course objective:

Understand the safety precautions of a mechanical workshop. learn functions from different conventional and unconventional machines. To prepare different jobs through different machining processes. Learn more about CNC machines.

Course Outcomes: After studying this course the students will be able to:

- CO1 Understand the safety measures of mechanical workshops.
- CO2 Learn the functions of various conventional machines and unconventional machines..
- CO3 Prepare different jobs by different machining operations.
- CO4 Learn about CNC machines.

Course contents:

1. **To Conduct all pre- machining operations:**
   - A) Measure and mark reference points/ cutting lines on the work pieces, using compasses, calipers, rulers and other measuring tools
   - B) Understand the does and don'ts of the manufacturing process as defined in SOPs/ Work Instructions
   - C) Set of machine stops or guides as per the specified lengths indicated through scales or work instructions
   - D) Set-up, adjust machine tools, fixtures/ jigs and cutting tools in order to perform machining operations
   - E) Check the centring and facing of the work pieces and check for alignment of the work pieces as per the final product output specifications
   - F) Gain knowledge on gear changing techniques and minor maintenance as per checklist
   - G) Check the working of different holding fixtures, gears, stops.
   - H) Brush or spray lubricating material on work pieces where applicable.
   - I) Operate hand wheels or valves in order to feed the component and allow cooling and lubricating to the tool.
2. To understand various safety measures, working principle & specifications of various conventional machines (lathe, milling, shaper, grinder etc).

3. To study elements of single point cutting tools and multiple point cutting tools.
4. To prepare a single point brazed tool with carbide tip on a mild steel shank involving milling and brazing operation.
5. To prepare a job involving centering, facing, plain turning and step turning.
6. To prepare a job by machining on a milling/ shaper machine.
7. To prepare a job by surface grinding on surface grinder and perform dressing and balancing of wheels
8. To study and use boring/ broaching/ hobbing / facing/ shaping tools in different applications.
9. To prepare a job by using blanking/ piercing and special purpose machines.
10. To prepare a job on a CNC machine and ensure that the right command is entered in the CNC machine as defined machining parameters.
11. **To conduct all post machining operations:**
    - **A)** Use files, hand grinders, wire brushes, or power tools for performing de burring operations.
    - **B)** Use chisels, scrapers, and other hand tools and equipment to Trim, scrape, or de burr objects or parts
    - **C)** Clean the hydraulic tank/ Gauge/ Tools/ Fixtures as per the cleaning schedule and the process mentioned in the Work Instruction/ SOP manual
    - **D)** Perform minor repairs and adjustments to the machine and notify supervisor/maintenance team when major service/ repair is required
    - **E)** Measure the specifications of the finished component and verify conformance as per Control Plan/ Work Instruction
    - **F)** Use devices like micrometers, vernier calipers, gauges, rulers and any other inspection equipment for measuring specifications with valid calibration status.
    - **G)** Note down the observations of the basic inspection process and identify pieces which comply with the specified standards
    - **H)** Organize changing different worn out machine accessories
    - **I)** Ensure that the blunt tool is timely and safely replaced by a new tool
    - **J)** Replace machine part as per work instructions, using hand tools or notify supervisor/ engineering personnel for taking corrective actions
    - **K)** Ensure that the zero offset value is chosen at the time of tool changing process.
12. **To maintain 5S at the work premises:**
    - A) Ensure the work area, tools, equipment and materials are clean.
    - B) Carry out storage of cleaning material and equipment in the correct location and in good condition
    - C) Ensure self-cleanliness - clean uniform, clean shoes, clean gloves,
    - D) Follow the daily cleaning standards and schedules to create a clean working environment
    - E) Carry out sorting of materials, tools and equipments and spare parts
    - F) Follow proper labeling procedures
    - G) Follow proper storage procedures

H) Carry out segregation of waste into Hazardous and Non Hazardous waste and dispose the waste as per SOP
I) Follow the floor markings/ area markings used for demarcating the various sections in the plant
J) Follow 5S at the workplace.
K)

Reference books:

1. A course in workshop technology: manufacturing processes by B.S. Raghuwanshi.
2. Textbook of workshop technology by R S Khurmi and J k gupta.

SYLLABUS & SCHEME OF EXAMINATION

SECOND SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
BSC-204BS	Behavioral Skills	3-0-0	3	25	75	BSC
BSC-205	Typography and Computer Application	3-0-0	3	25	75	BSC
AM-201	Applied Science	3-0-0	3	25	75	PCC
MF-201	Manufacturing Process-I	3-0-0	3	25	75	PCC
MF-202	Manufacturing Workshop - II	0-0-10	5	30	70	SDP
MAC-201 to 203	Mandatory Audit Course	3-0-0	3	25	75	MAC
Total		**15-0-10**	**20**	**155**	**445**	

LIST OF MANDATORY AUDIT COURSE

Course Code	Name
MAC-201	Value And Professional Ethics
MAC-202	Diet And Nutrition
MAC-203	Environmental Science
MAC-204	Srimad Bhagavad Geeta

BSC-204-BS: BEHAVIORAL SKILLS

B. Voc. (Manufacturing) II Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Communication Skills.

Successive: Basic reading and writing skills.

Course Objectives: The objective of studying this course is to discuss Communication skills and their forms and how it is going to help the students. To acquire the practical knowledge of writing skills, along with group discussion and interview skills.

Course Outcomes: At the end of the course, the student shall be able to:

- CO1 Understand the basic concept of communication.
- CO2 To acquire better writing skills in formal communication.
- CO3 Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- CO4 Fundamental knowledge about Speaking and reading skills.

Course Contents:

Unit 1: Communication Skills

Meaning of communication, Importance, Function, Types, Advantages and Disadvantages of communication, Barriers of communication and how to overcome it.

Unit 2: Writing Skills

Letter writing, Business writing, Application letter, Report writing, Academic report, Technical Report Writing, Resume Writing, Mail Writing.

Unit 3: Basic Self Building

Group discussions, Presentation, Basic knowledge of translators, Paraphrasing.

Unit 4: Speaking and Reading Skills

Greetings and Introductions describing people, Telephone skills, Office Hospitality, Meaning, importance of reading, process of skimming and scanning, Levels of reading skills, benefit of

reading skills.

Text Books/ Reference Books:

1. Mishra. B, Sharma. S (2011) Communication Skills for Engineers and Scientists. PHI Learning Pvt. Ltd.
2. Chaturvedi P. D, Chaturvedi M. (2011) Business Communication: Concepts, Cases and Applications. Pearson Education India.

BSC-205: TYPOGRAPHY AND COMPUTER APPLICATION

B. Voc. (Manufacturing) II Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

Successive: MS Office, MS Word, MS Excel, and MS PowerPoint.

Course Objectives: The objective of studying this course is to:
Understand and learn the fundamentals of windows. Understand significant Microsoft Office programs. Ability to create printable and shareable documents.

Course Outcomes: At the end of the course, the student shall be able to:

- CO1 Learners will be able to claim proficiency in Word and PowerPoint.
- CO2 Learners will be able to independently create professional looking documents and presentations.
- CO3 Learners will be familiar with some advanced Word and PowerPoint functions.
- CO4 Learners will understand how to use Word and PowerPoint in a variety of professional, educational and personal situations.

Course Contents:

Unit 1: MS Windows
Basic components of windows, icons, types of icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders. Control panel – display properties, adding and removing software and hardware, setting date and time, screensaver and appearance using windows accessories.

Unit 2: Documentation Using MS Word
Introduction to word processing interface, Toolbars, Menus, Creating & Editing Document, Formatting Document, Finding and replacing text, Format painter, Header and footer, Drop cap, Auto-text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, Bookmark, Previewing and printing document, Advance Features of MS-Word-Mail Merge, Macros, Tables, File Management, Printing, Styles, linking and embedding object, Template.

Unit 3: Electronic SpreadSheet using MS Excel

Introduction to MS-Excel, Cell, cell address, Creating & Editing Worksheet, Formatting and Essential Operations, Moving and copying data in excel, Header and footer, Formulas and Functions, Charts, Cell referencing, Page setup, Macros, Advance features of MS-Excel-Pivot table & Pivot Chart, Linking and Consolidation, Database Management using Excel-Sorting, Filtering, Validation, What if analysis with Goal Seek, Conditional formatting, Collaborating with Other Users, Analyzing and Presenting Complex data.

Unit 4: Presentation using MS PowerPoint

Presentations, Creating, Manipulating & Enhancing Slides, Organizational Charts, Excel Charts, Word Art, layering art Objects, Animations and Sounds, Inserting Animated Pictures or Accessing through Object, Inserting Recorded Sound Effect or In-Built Sound Effect., Introduction to MS Access: creating database creating and manipulating tables, forms, queries, reports, modules, importing and exporting of data.

Text Books/ Reference Books:

1. V. Rajaraman, Computer Fundamentals.
2. Ashok Arora, Fundamentals of Computer Systems.
3. Russell A Stultz, Fundamentals of Computer Systems.

AM-201: APPLIED SCIENCE

B. Voc. (Manufacturing) II Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives: Following are the objectives of this course:
Learn the concepts of Units, Laws of Vectors, Parallel Forces, Moment of Force, Couple. Learn the foundations of the properties and behavior of materials. Understand various kinds of communication systems. Knowledge of the foundations of advanced communication systems.

Course outcomes: After completing this course, student will be able to:

CO1 Identify the force systems for given conditions by applying the basics of mechanics.

CO2 Create knowledge of properties of matter applicable to engineering.

CO3 Analyze the different concepts of waves and vibration in the field of engineering

CO4 Analyze the recent trends in physics related to engineering.

Course Contents:

Unit – I Basics of mechanics and force system: Significance and relevance of Mechanics, Statics, Dynamics. Space, time, mass, particles, flexible body and rigid body. Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units. Force – unit, representation as a vector and by Bow's notation, characteristics and effects of a force, Principle of transmissibility of force, Force system and its classification. Resolution of a force - Orthogonal components of a force, moment of a force, Varignon's Theorem. Composition of forces – Resultant, analytical method for determination of resultant for concurrent, non-concurrent and parallel coplanar force systems – Law of triangle, parallelogram and polygon of forces.

Unit– II Properties of solids: Definitions of deforming force, elasticity and plasticity, examples for elasticity and plasticity, definition of stress and its types with examples and its S.I unit, definition of strain and its types with examples, elastic limit, Hooke's law, stress - strain graph with explanation. Modulus of elasticity and its types, derivation of an expression for Young's modulus of a material. Definition of Compressibility and factor of safety. Simple problems on stress, strain and Young's modulus. Properties of liquids: Definition of thrust and pressure withS.I units. Definition of surface tension and its S.I unit, Viscosity.

Unit– III Transmission of heat: Definitions of conduction, convection and radiation with examples, definition of thermal conductivity, coefficient of thermal conductivity (K) and its S.I unit. Applications of conduction, convection and radiation.

Unit– IV Thermodynamics: Introduction of thermodynamics, system, surrounding and boundary, types of system, properties of system, state, equilibrium and process, types of thermodynamic processes, laws of thermodynamics- Zeroth, First, second and third law.

Unit– V Electromagnetic waves: Definition, generation of electromagnetic waves and their properties. Electromagnetic spectrum: Definition, classification and its applications. Lasers: Principle and listing the types of Laser, properties of Laser, applications. Nano-Technology: Definition of Nano-Technology, advantages and dis-advantages of Nanotechnology.

Reference Books: -

1. D.S. Bedi, Engineering Mechanics, Khanna Publications, New Delhi (2008)
2. Khurmi, R.S., Applied Mechanics, S. Chand & Co. New Delhi.
3. Bansal R K, A textbook of Engineering Mechanics, Laxmi Publications.
4. Ramamrutham, Engineering Mechanics, S. Chand & Co. New Delhi.

MF-201 MANUFACTURING PROCESS – II

B. Voc. (Manufacturing) II Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course objectives: Study of different manufacturing processes. Understand how a variety of cutting tools work. Understanding of measurement instruments. Introduction of CNC and CNC machines.

Course outcomes:

- CO1 Students will be able to differentiate between various manufacturing processes.
- CO2 Students will be able to use different measuring instruments.
- CO3 Students will learn about different machining operations.
- CO4 Students will understand about NC and CNC machines.

UNIT 1: CENTER LATHE: The center lathe and its principle of working, Types of lathes, Lathe specification and size, Features of lathe bed, Headstock and tailstock, Feed mechanism and change-gears. carriage saddle, Cross slide, Compound rest, Tool post, Apron mechanism, lathe accessories, Chucks, Face plate, Angle plate, Driving plate, Lathe doges, mandrills, Steady rest, Lathe attachments, Lathe operations-plane and step turning, Taper turning, Screw cutting, Drilling, Boring, reaming, Knurling, Parting off, Undercutting, Relieving, Types of lathe tools and their uses, Brief description of semi-automatic lathes such as capstan and turret lathes, their advantages and disadvantages over center lathe, types of job done on them. General and periodic maintenance of a center lathe.

UNIT 2: MILLING MACHINES: Types of milling machines, constructional features of horizontal milling M/C. general maintenance of the machine, types of milling cutters, milling operations like plane milling, space milling, angular milling form milling, straddle milling, gang milling, Negative rake milling, cutting speed and speed for different tools in up and down milling. Simple, compound and differential indexing, milling of spur gears and racks.

UNIT 3: SHAPING, PLANNING & SLOTTING MACHINES: Working principles of planer, shaper and Slotter, Differences and similarities among them, types of work done on them, types of tools used, their geometry, General and periodic maintenance of a shaper.

UNIT 4: DRILLING & BORING MACHINES: Types of tools used in drilling and boring. Classification of drilling and boring machines, principle of working and constructional details of simple and radial drilling M/C and general and periodic maintenance. Operations like facing, counter boring, tapering.

UNIT 5: GRINDING MACHINES: Common abrasives, grinding wheel materials, Bonds, Grain and grit of abrasive, Grain structure and shapes of common wheels, various speeds and feeds, Use of coolants, Methods of grinding, Types of grinding machines, precision finishing operations like honing. Broaching machines: Types of work done on broaching machines. Simple types of broaches and their uses, Types of broaching machines

UNIT 6: JIGS AND FIXTURES: Object of Jigs and Fixture, Difference between jigs and fixtures, Locating and clamping devices. Types of jigs, Simple examples of milling, turning, grinding, horizontal boring fixtures and broaching fixtures.

Reference books:

1. Workshop Technology, Vol. I: Hazra & Chaudhry
2. Workshop Technology, Vol. I: BS Raghuwanshi
3. Karyashala Takniki: JK Kapoor

MF-202 MANUFACTURING WORKSHOP – II

B. Voc. (Manufacturing) II Semester

No. of Credits:			5	Sessional:	40 Marks
L	T	P	Total	Practical:	60 Marks
0	0	10	10	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives: To introduce about Manufacturing basics, repairing of suspension and steering system, to study the repairing of Manufacturing wheels and tyres & perform vehicle overhauls.

Carry out diagnosis of vehicle for repair requirements.

1. To Follow standard operating procedures for using workshop tools and equipment for fault diagnosis or troubleshooting problems in a vehicle.
2. To conduct inspection of the engine and aggregates to diagnose the need for repairs or adjustment in various engine aggregates.
3. To Conduct inspection of mechanical, electrical and electronic systems to diagnose need for repairs, adjustment or part replacement
4. To understand the various precautions to be taken to avoid damage to the vehicle and its components while working on diagnosis or troubleshooting the vehicle for any faults.

B. **Carry out service and major repairs in mechanical aggregates and overhauling of a vehicle.**

1. To Understand the auto component manufacturer specifications related to the various components/ aggregates in the vehicle (including major aggregates like engine. gearbox, transmission systems, propeller shaft etc.
2. To Service, repair and overhaul of the steering system.
3. To Service, repair and overhaul of suspension system.
4. To Service, repair and overhaul of tyres.
5. To Service, repair and overhaul of wheels.
6. To Service, repair and overhaul diesel Engines and its fuel system.
7. To Service, repair and overhaul petrol Engines and its fuel system.
8. To Service, repair and overhaul of cooling system and radiator
9. To Service, repair and overhaul of emission and exhaust system.
10. To Service, repair and overhaul of gearbox, drive-train assembly and transmission systems (manual, automatic etc.)
11. To Service, repair and overhaul of brake system.
12. To Service, repair and overhaul of pneumatic brakes.

13. To Service, repair and overhaul of hydraulic brakes.
14. To Service, repair and overhaul of clutch assembly.
15. To Service, repair and overhaul of single plate and multi plate clutches.
16. To Service, repair and overhaul of hydraulic and pneumatic systems and various lubrication systems.

C. **Carry out service and repairs of electrical and electronic faults in a vehicle**.

1. Repair and overhaul of electronic control unit
2. To Repair and overhaul of electrical wire harness, lighting, ignition, electronic and air-conditioning systems etc.
3. To Repair and overhaul safety systems.
4. Repair and overhaul of hydraulic and pneumatic systems.

Course Outcomes:

CO1 To learn about vehicles and its repair.

CO2 To improve understanding about different parts and their functions.

CO3 To perform vehicle wheel balancing.

CO4 To be able to rectify about vehicle pollution and do its control

MAC-201: HUMAN VALUE AND PROFESSIONAL ETHICS

B. Voc. (Manufacturing) II Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

Course Objectives: The objective of studying this course is to understand the value system, honesty and integrity, harmony and universal declaration of human rights.

Course Outcomes: At the end of the course, the student shall be able to:

CO1 Learn about value education system

CO2 Improve understanding of values for life.

CO3 Acquire knowledge about harmony in the society.

CO4 Understand the human Right and Social Evils.

Course Contents:

Unit 1: Introduction

Value education-its purpose and significance in the present world, Value system, The role of culture and civilization, Holistic living, Balancing the outer and inner - Body, Mind and Intellectual level- Duties and responsibilities**.**

Unit 2: Salient values for life

Truth, commitment, honesty and integrity, forgiveness and love, empathy and ability to sacrifice, care, unity, and inclusiveness, Self-esteem and self- confidence, punctuality - Time, task and resource management, Problem solving and decision-making skills- Interpersonal and Intra personal relationship, Team work, Positive and creative thinking.

Unit 3: Understanding Harmony

Harmony in Family and Society: How to owe responsibilities in family, Understanding Values in Human- Human relations, Role of Trust and Respect, Samman (Respect) for all, Akhand Samaj (A United Society)

Harmony in Nature: Understanding the Harmony in Nature, making sure your contribution is in harmony with nature, Interconnectedness and mutual fulfillment.

Unit 4: Environment and Ecological balance

Interdependence of all beings - living and non-living, The binding of man and nature - Environment conservation and enrichment.

Unit 5: Human Right and Social Evils

Human Rights: Universal Declaration of Human Rights National Integration - Peace and non-violence - Dr. APJ Kalam's ten points for enlightened citizenship - Social Values and Welfare of the citizen - The role of media in value building - Human Rights violations - Social Evils: Corruption, Cybercrime, Terrorism, Alcoholism, Drug addiction, Dowry, Domestic violence, Untouchability, female infanticide, atrocities against women and how to tackle them.

Text Books/ Reference Books:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.
3. Ivan IIIich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA.

MAC-202: BALANCED DIET AND NUTRITION

B. Voc. (Manufacturing) II Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

Course Objectives: The objective of studying this course is to understand and apply the concepts of balanced diet and nutritional value, students will be able to identify and apply food principles to food and nutrition systems.

Course Outcomes: At the end of the course, the student shall be able to:

CO1 Understand the basic concepts of a balanced diet.

CO2 Analyze the type of food and their nutritional value.

CO3 Evaluate calorie (BMR).

CO4 Learn the role of diet in healthy living.

Course Contents:

Unit 1: Concepts and Components of Food Nutrition

Meaning of nutrition, Basic definition regarding nutritional requirements, Nutritional need of human; Concept of food, Acceptance of food, Function of food, Components of food and their classification; Macronutrients – Carbohydrate, Fat, Protein (source, function and effect on the body); Micronutrients – Vitamins, Mineral, Water, roughage (source, function and effect on body); Planning Balanced Diet.

Unit 2: Food Group

Cereals and Millet – Selection, Preparation and Nutritive value; Pulses, Nuts and Oilseeds- Selection, Preparation and Nutritive value; Milk and Milk production - Selection, Preparation and Nutritive value; Vegetable and Fruits - Selection, Preparation and Nutritive value; Fatty oil and Sugar, Jaggery - Selection, Preparation and Nutritive value.

Unit 3: Food and Digestion

Energy – Key concepts, Definition and Components of energy requirements.; Energy – Imbalance concepts of metabolism, anabolism and catabolism; Calorie requirement – BMR, SDA; Physical activity – carbohydrates, lipids and protein metabolism; Factors affecting energy- requirement and expenses; Factors affecting BMR; Factors influencing energy expenditure in physical activity; Methods and requirements for estimating energy expenditure.

Unit 4: Yogic concepts of Diet andNutrition

General introduction to diet concepts, concepts of mitahara, Definition and classification, yogic diet according to traditional yoga texts; Concepts of diet according to Gheranda Samhita and Hath Pradeepika; Satvik, Rajsik and Tamasik diet as describe in Bhagwadgeeta; Pathya and Apathya food according to the texts of Yoga; Role of yogic diet in healthy living; Diet according to nature of the body – Vata, Pitta and Kapha.

Text Books/ Reference Books:

1. Bakhru, H. K., 1991, A Complete Handbook of Nature Cure.
2. Kumar Neeraj, Nagendra, 2014, MeraAaharMeraSwasthya.

MAC-203: ENVIRONMENTAL SCIENCE

B. Voc. (Manufacturing) II Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

Course Objectives: The objective of studying this course is:
To provide the students a detailed knowledge on the threats and challenges to the environment due to developmental activities. To identify the natural resources and suitable methods for their conservation and sustainable development. To focus on the importance of ecosystem and biodiversity for maintaining ecological balance. To learn about various attributes of pollution management and waste management practices.

Course Outcomes: At the end of the course, the student shall be able to:

- CO1 Get the information about the ecosystem and also about its functions like Food chain, Ecological pyramids etc.
- CO2 Get the knowledge about the different types of resources like land, water, mineral and energy and also about the effects of the environment by the usage of these resources.
- CO3 Gain the knowledge about the ecosystem diversity, its values and also about the importance of the endemic species and different techniques involved in its conservation
- CO4 Gain knowledge about the different types of pollution and their control technologies, Wastewater treatment, Bio medical waste management etc.
- CO5 Get the complete information about EIA- Environmental Impact Assessment, Sustainable developmental activities, environmental policies and regulations, awareness among people about protection of wild life, forest and other natural resources.

Course Contents:

Unit 1: The Multidisciplinary Nature of Environmental Studies
Definition, scope and importance. Need for public awareness.

Unit 2: Natural Resources Renewable and Non-Renewable Resources
Natural resources and associated problems, Forest resources: Use and overexploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non- renewable energy sources, use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Unit 3: Ecosystems
Concept of an ecosystem Structure and Concept of an ecosystem, Structure and function of an ecosystem. Producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, and estuaries).

Unit 4: Biodiversity and Its Conservation
Definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-site and ex-situ conservation of biodiversity.

Unit 5: Social Issues and The Environment
From Unsustainable to Sustainable Development urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case studies, Environmental ethics: Issues and possible

solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies, Wasteland reclamation. Consumerism and waste products, Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act, Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation, public awareness.

Text Books/ Reference Books:

1. "Perspectives in Environmental Studies" by A. Kaushik and C. P. Kaushik, New age international publishers.
2. "Environmental Studies by Benny Joseph", Tata McGraw Hill Co, New Delhi
3. "Environmental Science Towards a sustainable future" by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
4. "Environmental Engineering and science" by Gilbert M. Masters and Wendell P. Ela 2008 PHI Learning Pvt Ltd.
5. "Fundamentals of Ecology" by Odum, E.P., Barrick, M. and Barret, G.W. Thomson Brooks/Cole Publisher, California, 2005.

MAC-204: Srimad Bhagavad Geeta

B. Voc. (Manufacturing) II Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives: The objective of studying this course is:
To provide knowledge, to become a person with a stable mind, pleasing personality and determination and get the spiritual knowledge to get higher success in life.

Course Outcomes: At the end of the course, the student shall be able to:

CO1 Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life.

CO2 To become a person with stable mind, pleasing personality and determination

CO3 The person who has studied Geeta will lead the nation and mankind to peace and prosperity

Course contents:

Unit 1:

Approach to day to day work and duties.
Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,
Chapter 3-Verses 13, 21, 27, 35,
Chapter 6-Verses 5,13,17,23, 35,
Chapter 18-Verses 45, 46, 48.

Unit 2:

Statements of basic knowledge.
Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
Chapter 12 -Verses 13, 14, 15, 16,17, 18

Unit 3:

Personality of Role model. Shrimad Bhagwad Geeta:
Chapter2-Verses 17,

Chapter 3-Verses 36,37,42,
Chapter 4-Verses 18, 38,39
Chapter18 – Verses 37,38,63

Text Books/ Reference Books:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.

SYLLABUS & SCHEME OF EXAMINATION

THIRD SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
BSC-302ES	Employability Skills	3-0-0	3	25	75	BSC
BSC-303	Metrology	3-0-0	3	25	75	SDP
AM-303	CAD & CAM	3-0-0	3	25	75	BSC
MF-301	Material Science	3-0-0	3	25	75	PCC
MF-302	Machining and Machine Tools	3-0-0	3	25	75	PCC
MF-303	Manufacturing Workshop - III	0-0-10	5	30	70	SDP
Total		**15-0-10**	**20**	**155**	**445**	

BSC-302-ES EMPLOYABILITY SKILLS

B. Voc. (Manufacturing) III Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Communication skills, soft skills.

Successive: Professional and personal development.

Course Objectives: The objective of studying this course is to encourage the all-round development of students by focusing on behavioral skills and to make the students aware of the importance, the role and the content of behavioral skills through instructions, knowledge acquisition, demonstration and practice.

Course Outcomes: At the end of the course, the student shall be able to:

- CO1 Understand the importance of behavioral skills. Prepare for an interview.
- CO2 Effectively communicate through verbal and nonverbal communication.
- CO3 Deals with various types of behaviors in effective manners.
- CO4 To acquire knowledge on Voices and Sentence Making.

Course Contents:

Unit 1: Employability Skills

Soft skills– Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. Teamwork Skills, Leadership Skills, Interview –Types.

Unit 2: Personality Development and Presentation Skills

Types of Personality, Gesture, posture, facial expression, body Language, Personality development programs and techniques, Group Discussion, Presentations Types and making effective presentations.

Unit 3: Communicating with Stakeholders

Communication with customers, dealing with angry customers, call flow, Opening and closing a call, Communication with industry partners/suppliers/dealers/agents, Feedback: Giving and receiving a Feedback.

Unit4: Writing Skills

letter Writing, business letter,application letter, covering letter, formal mail, report writing, academic report, business report, technical project report, job application and resume writing.

Text Books/ Reference Books:

1. Wren and Martin. High School English Grammar and Composition. New Delhi:RRP, 2007
2. Murphy, Raymond. Essential English Grammar. New Delhi: Cambridge, 2017.
3. Malhotra, Prerna and Halder, Deb. Communication Skills: Theory and Practice.

BSC-203: METROLOGY

B. Voc. (Manufacturing) III Semester

No.of Credits:			**3**	**Sessional:**	**25 Marks**
L	**T**	**P**	**Total**	**Theory:**	**75 Marks**
0	**0**	**3**	**3**	**Total:**	**100 Marks**
				Duration of Exam:	**3 Hours**

Pre – Requisite: Nil

Course Objective: The aim of studying this course to students is to know the basic concept in various method of engineering measurement and application, understanding the importance of measurement and inspection in manufacturing industries. Expose the students to various modern metrological instrument and the procedure used to operates theses instrument.

Unit 1- Introduction to Measurement

Aim, Definition, Types, need of inspection, terminology Methods of measurements, units of measurements, Selection of instruments, Concept of error (systematic and random), sources of error, measurement standards, calibration, statistical concepts of metrology.

Unit 2- Linear and Angular Measurements

Linear instruments, Surface plates (size, accuracy and material), slip gauges, length bars-calibration of slip gauges, dial indicator, micrometers, bevel protector, spirit level, sine bar, angle gauges. Comparators, their types, relative merits and limitations, Miscellaneous measurements, Taper & radius measurements.

Unit 3- Measurement of properties

Temperature, Force, weight, pressure & flow, Noise, Lux and vibrations, concept of fitting, tightening and torquing in a line and its equipment.

Unit 4- screw thread and Gear teeth metrology

Screw measurements: Introduction, screw thread terminology, screw thread measurement
Gear Measurement: Introduction, type of gears, gear terminology, gear teeth measurements, errors in gears, advanced measurements of spur gear.

Unit 5- linear tolerance and GD&T

Limits, fits and tolerance: interchangeability, selective assembly, limits, fits and tolerance, limit gauging, design of limit gauges, computer aided tolerance

Measurement of GD&T parameters: measurement of straightness, flatness, squareness, parallelism, roundness, cylindricity, non-contact profiling system
Interferometry, Measurement of surface finish: introduction, terminology, specifying roughness on drawings, surface roughness parameters, factors affecting surface roughness, ideal surface roughness, methods, precautions, surface microscopy, surface finish software.

Reference books:

1. Thomas, “Engineering Metrology”, Butthinson & Co., 1984.
2. Graham T. Smith, “Industrial Metrology”, Springer-Verlag London Ltd, 2002
3. White house, D.J, “Handbook of Surface & Nanometrology”, The institute of physics London, 1994.
4. Mahajan. M., “A text-Book of Metrology”, Dhanpat Rai & Co. (P) Ltd., 2006.

MF-301 MATERIAL SCIENCE

B. Voc. (Manufacturing) Semester 3rd

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course objectives: To study the materials structure and their deformation. To understand ferrous metals. To understand nonmetallic materials. To introduce heat treatment.

Course Outcomes:

CO1	Students will be able to differentiate between various ferrous and non ferrous materials.
CO2	Students will be able to understand the structure of materials.
CO3	Students will learn about non metallic materials.
CO4	Students will understand about heat treatment of materials

GENERAL: Brief introduction to the subject metallurgy and its scope in engineering field, classification of materials of industrial importance. Their chemical thermal, electrical, magnetic, mechanical and technological properties and their selection criteria for use in industry

UNIT-1: STRUCTURE OF METALS AND THEIR DEFORMATION:

Structure of metals and its relation to their physical, mechanical and technological properties, Elementary idea of arrangement of atoms in metals, molecular structures, crystal structures and crystal imperfections, Deformation of metals, effects of cold and hot working operations over them. Recovery recrystallization and grain growth, solid solutions, alloys and intermetallic compounds, effect of grain size on properties of metals.

UNIT 2: METALS-FERROUS METALS

(a) Classification of iron and steel. (b) Cast iron types as per I.S. - White, malleable, Grey (c) Steels: Classification of steels according to carbon content and according to use as per I.S. Mechanical properties of various steels and their uses. Availability of steel in market, Its forms and specifications (d) Alloy Steel: Effect of alloying various elements, viz Cr, Hi, Co, V,W, Mo, Si, and Mn, on mechanical properties of steel, Common alloy steels, viz, Ni-steel, Ni-Cr-steel, Tungsten steel, Cobalt steel, Stainless Steel, Tool steel- High Carbon Steel, High Speed steel, Tungsten Carbide, Silicon manganese steel, Spring Steel, Heat Resisting alloy Steels etc.

UNIT 3: NON-METALLIC MATERIALS

(a) Plastic and Other Synthetic Materials: Plastics-Important Sources-Natural and Synthetic, Classification, thermo-set and thermoplastic, Various trade names, Important Properties and engineering use of plastics. Market forms of Plastics

(b) Paints, Enamels, Varnishes and Lacquers: Paints and Enamels-types, its purpose, essential ingredients and their role, characteristics of a good paints and enamel, trade names of some important types of products. Varnishes-types purpose of varnish, essential ingredients and their role, characteristics, preparation, trade names storage of varnish, Lacquer- characteristics, preparation and uses.

UNIT 4: NON-METALLIC MATERIALS

Heat Insulating Materials: Classification of Heat Insulating material, properties and uses of China clay, Cork, Slag wool, Glass Wool, Thermocole, Puff, Properties and uses of asbestos as filler material. Hardware: General specification, uses and methods of storage of G.I. and C.I. steel Copper, A.C. pressure conduits, R.C.C. spun, P.V.C. Pipes and their uses. General sheets specification (I.S.) and uses, Method of storage of G.I. sheets, M.S. sheets, General specification of pipe fitting

UNIT 5: HEAT TREATMENT OF METALS

Elementary concept, purpose, Iron-carbon equilibrium diagram. T.T.T. and `S' curve in steels and its significance, Hardening, Tempering, Annealing, Normalising and case hardening.

Reference books:

1. Manufacturing technology by P. N. Rao
2. Production technology- R. K. Jain
3. Manufacturing Science- Amitabha Ghosh & Ashok Kumar Malik, - East- West Press.

MF-302 MACHINING AND MACHINE TOOLS

B. Voc. (Manufacturing) Semester 3rd

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course objectives: The main objective of this course is to study the various machines, machine tools and the operation performed on them. By gaining the basic knowledge about the various machine tools we can study about the students and get familiar with different parts.

Course Outcomes:

CO1 Students will be able to differentiate between various machining tools.

CO2 Students will be able to perform lathe, milling and shaping machines.

CO3 Students will learn about different machining operations.

CO4 Students will understand about NC and CNC machines

UNIT-1 CENTER LATHE: The center lathe and its principle of working, Types of lathes, Lathe specification and size, Features of lathe bed, Headstock and tailstock, Feed mechanism and change-gears. carriage saddle, Cross slide, Compound rest, Tool post, Apron mechanism, lathe accessories, Chucks, Face plate, Angle plate, Driving plate, Lathe doges, mandrills, Steady rest, Lathe attachments. Lathe operations-plane and step turning, Taper turning, Screw cutting, Drilling, Boring, reaming, Knurling, Parting off, undercutting, Relieving, Types of lathe tools and their uses, Brief description of semi-automatic lathes such as capstan and turret lathes, their advantages and disadvantages over center lathe, types of job done on them, General and periodic maintenance of a center lathe.

UNIT-2 SHAPING, PLANNING & SLOTTING MACHINES: Working principles of planer, shaper and Slotter, Differences and similarities among them, quick return mechanism applied to the machines, types of work done on them, types of tools used, their geometry. General and periodic maintenance of a shaper DRILLING & BORING MACHINES: Types of tools used in drilling and boring, Classification of drilling and boring machines, principle of working and constructional details of simple and radial drilling M/C and general and periodic maintenance. Operations like facing, counter boring, tapering.

UNIT -3 MILLING MACHINES Types of milling machines, constructional features of horizontal milling M/C. general maintenance of the machine, types of milling cutters, milling operations like plane milling, space milling, angular milling form milling, straddle milling, gang milling, Negative rake milling, cutting speed and speed for different tools in up and down milling.

Simple, compound and differential indexing, milling of spur gears and racks**.**

UNIT-4 GRINDING MACHINES: Common abrasives, grinding wheel materials, Bonds, Grain and grit of abrasive, Grain structure and shapes of common wheels, various speeds and feeds, Use of coolants, Methods of grinding. Types of grinding machines, precision finishing operations like honing

BROACHING MACHINES: Types of work done on broaching machine, Simple types of broaches and their uses, Types of broaching machines

UNIT 5 JIGS AND FIXTURES: Difference between jigs and fixtures, Principle of location. Principle of clamping, Locating and clamping devices, Types of jigs & fixtures,

AUTOMATION OF MACHINE TOOLS: Introduction to CNC lathe (Computer Numerical Control Lathe) and FMS (Flexible Manufacturing System) Introduction only.

Reference books:

1. Manufacturing technology by P. N. Rao
2. Production technology- R. K. Jain
3. Manufacturing Science- Amitabha Ghosh & Ashok Kumar Malik, - East- West Press.
4. Workshop Technology Vol I & II –Hazra & Chaudhary, Asian Book Comp., New Delhi.

AM-301 CAD & CAM

B. Voc. (Manufacturing) Semester 3rd

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course objectives: To study about Introduction CIM and CAD & Analysis. To study about Computer aided Manufacturing CAM. To study about Part Programming NC part programming.

Course Outcomes:

CO1 Students will be able to understand the basics of CAD

CO2Students will be able to understand the basics of CAM

CO3Students will learn about part programming .

CO4 Students will understand about CNC machines

UNIT 1: Introduction CIM and CAD & Analysis: CIM: Introduction of CIM– concept of CIM - evolution of CIM – CIM wheel –Benefits – integrated CAD/CAM. CAD: Introduction– CAD definition – Shigley's design process – CAD activities – benefits of CAD. Types of CAD systems, CAD software packages, 2D & 3D transformations, Geometric modeling: Techniques: Wire frame modeling – surface modeling – solid modeling

UNIT 2: Computer aided Manufacturing CAM: Definition, functions, benefits. Group technology – Part families - Parts classification and coding - coding structure – Optiz system, MICLASS system and CODE System - process planning – CAPP – Types of CAPP: Variant type, Generative type – advantages of CAPP – production planning and control – computer integrated production management system – Master Production Schedule (MPS) – Capacity planning – Materials Requirement Planning (MRP) –Manufacturing Resources Planning (MRP-II)

UNIT 3: CNC Machine and Components:
CNC Machines: Numerical control – definition – components of NC systems – development of NC – DNC – Adaptive control systems – working principle of a CNC system – Features of CNC machines - advantage of CNC machines – difference between NC and CNC – Construction and working principle of turning center – Construction and working principle of machining centers – machine axes conventions turning center and machining center – design considerations of NC machine tools.

UNIT 4: Part Programming NC part programming – methods – manual programming –

conversational programming – APT programming - Format: sequential and word address formats - sequence number – coordinate system – types of motion control: point-to-point, paraxial and contouring – Datum points: machine zero, work zero, tool zero NC dimensioning – reference points – tool material – tool inserts - tool offsets and compensation - NC dimensioning – preparatory functions and G codes, miscellaneous functions and M codes – interpolation: linear interpolation and circular interpolation.

UNIT 5: FMS, Integrated Material Handling and Robot: Types of manufacturing - introduction to FMS – FMS components – FMS layouts – Types of FMS: flexible manufacturing cell – flexible turning cell – flexible transfer line – flexible machining systems – benefits of FMS - introduction to intelligent manufacturing system – virtual machining. Computer Integrated material handling – AGV: working principle – types, benefits – Automatic Storage and Retrieval Systems (ASRS).

ROBOT – definition – robot configurations – basic robot motion – robot programming method – robotic sensors - industrial applications: characteristics, material transfer, machine loading, welding, spray coating, assembly and inspection.

REFERENCE BOOKS:

1. Ibrahim Zeid *CAD/CAM - Theory and practice Tata McGraw Hill* Publishers.

2. Salomon, D. *Transformations and projections in computer graphics* Springer.

3. Rao, P.N., CAD / CAM Principles and Applications, McGraw Hill Publishers, New Delhi.

4. M.P. Groover , Automation, production systems and Computer-integrated Manufacturing, Eastern Economy Edition.

MF-303 MANUFACTURING WORKSHOP-III

B. Voc. (Manufacturing) III Semester

No. of Credits:			5	Sessional:	30 Marks
L	T	P	Total	Practical:	70 Marks
0	0	10	10	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Outcome: At the end of this course student will able to know:

CO1 How to take measurements by using various measuring instruments.

CO2 Learn the basic Auto CAD 2D + 3D.

CO3 Learn the basic Solid works commands.

METROLOGY LAB

1. Measurements using Micrometer, vernier caliper.
2. Measurement of angle using Sine Center / Sine bar / bevel protractor.
3. Measurement of alignment using Autocollimator / Roller set
4. Measurement of cutting tool forces using a) Lathe tool Dynamometer b) Drill tool Dynamometer.
5. Measurement of Screw threads Parameters using two wire or Three-wire methods.
6. Measurements of Surface roughness, Using Tally Surf/Mechanical Comparator
7. Measurement of gear tooth profile using gear tooth vernier /Gear tooth micrometer
8. Calibration of Micrometer using slip gauges
9. Measurement using Optical Flat.

CAD/CAM Lab Experiment:

I. AUTOCAD

1. Create a 2D view of the given diagram using Auto CAD.

2. Create a 2D view of the given diagram using Auto CAD.

3. To create a 2D view of the given diagram using Auto CAD.

4. To create a 2D view of the given diagram using Auto CAD.

5. To create a 2D view of the given diagram using Auto CAD.

6. To create a 2D view of the given diagram using Auto CAD.

7. To create a 3D view of the given diagram using Auto CAD. (Elbow)
8. To create a 3D view of the given diagram using Auto CAD. (Piston)
9. To create a 3D view of the given diagram using Auto CAD. (Helical spring)
10. To make a draft view of the given diagram using Auto CAD. (Piston)

II. SOLID WORKS

1. Draw the basic sketch of the solid model.
2. Draw the basic sketch for the revolved solid model.
3. Draw the sketch for the 3D modeling of solid work given dimension.
4. Draw the sketch for the 3D modeling of solid work given dimension. (by using feature tools.)
5. Draw the sketch for the 3D modeling of solid work given dimension. (surface modeling)
6. Draw the sketch for the 3D modeling of solid work given dimension. (sheet modeling)
7. Draw the sketch for the 3D modeling of solid work given dimension. (weldments)
8. Make an assembly of bench-vice.
9. Use simulation in solid works.
10. Use of Drafting in solid works.

SYLLABUS & SCHEME OF EXAMINATION

FOURTH SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
MF-401	Quality Control Techniques	3-0-0	3	25	75	PCC
AM-401	Industrial Management	3-0-0	3	25	75	PCC
MF-402	Manufacturing Workshop - IV	0-0-10	5	30	70	SDP
BSC-401	Project	3-0-0	3	25	75	SDP
OEC-401 to 403	Open Elective Course	3-0-0	3	25	75	OEC
PEC-MF-401 to 403	Program Elective Course	3-0-0	3	25	75	PEC
	Total	**15-0-10**	**20**	**155**	**445**	

LIST OF OPEN ELECTIVE COURSE

COURSE CODE	COURSE NAME
OEC-405	Entrepreneurship
OEC-406	Trends in Technology
OEC-407	Waste Management

LIST OF PROGRAM ELECTIVE COURSE

Course Code	Course Name
PEC-MF-401	Reliability, Maintenance & safety engineering
PEC-MF-402	Plant Layout & Product handling
PEC-MF-403	Autotronics

MF-401: QUALITY CONTROL TECHNIQUES

B. Voc. (Manufacturing) Semester 4th

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives: To introduce quality control techniques.Through the QC tools. Which will lead to developing understanding of Trends in Quality Engineering & Management.

Course Outcomes:

CO1 Students will be able to understand the quality management .

CO2 Students will be able to understand Basic Philosophy for quality .

CO3 Students will learn about Trends in Quality Engineering

CO4 Students will understand about Measuring Quality in Different Service Sectors

Course Contents:

Unit I: Basics of quality, its control techniques.

Unit II: Quality Engineering and Management Tools, Techniques & Standards: 7 QC tools, 7 New Quality Management Tools, 5S Technique, Kaizen, Poka-Yoke, Quality Circle, Cost of Quality Technique. Introduction to Quality Management Standards-ISO: 9000, ISO:14000, QS:9000 (Concept, Scope, Implementation Requirements & Barriers, and Benefits), Introduction to National and International Quality Awards (Malcolm Baldrige National Quality Award-MBNQA, The Deming Prize Rajiv Gandhi National Quality Award).

Unit III: Basic Philosophy, Approach, Implementation Requirements & Barriers. Designing for Quality: Introduction to Concurrent Engineering, Quality Function Deployment (QFD) and Failure Mode and Effect Analysis (FMEA)-Concept, Methodology and Application

Unit IV: Contemporary Trends in Quality Engineering & Management: Six Sigma-Basic Concept, Principle, Methodology, Implementation, Scope, Advantages and Limitation of all as applicable. Quality in Service Sectors: Characteristics of Service Sectors, Quality Dimensions in Service Sectors, Measuring Quality in Different Service Sectors.

Books and References:

1. Quality Control & Application by B. L. Hanson & P. M. Ghare, Prentice Hall of India.
2. Quality Management by Kanishka Bedi.
3. Statistical Quality Control by M. Mahajan, Dhanpat Rai & Co. (P) Ltd

AM-401 INDUSTRIAL MANAGEMENT

B. Voc.(Manufacturing) IV Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

Course Objectives: The objective of studying this course is to know about industrial management and different types of industries. Laws which govern the industries and fix the wages and incentives of the workers. The classification of the industries and their merits and demerits.

Course Outcomes:

CO1 Students will be able to understand the basic industry

CO2 Students will be able to understand the classification of the industries

CO3 Students will learn about laws which govern the industries .

CO4 Students will understand material management.

Unit 1. Introduction

Growth of industry, The management of men, materials and machines, the art of management, Sources of capital- industrial individual enterprise, private partnership and private Ltd. Co., Joint Stock Co. shares, debentures, financial agencies and their role in promoting industries. Break even analysis.

Unit 2. Private sector and public sector:

Public sector enterprise, merits and demerits of public sector industry and private sector industry, Line, staff and functional organizations, reasons for the choice of various types of organization, functions of different departments, viz. stores, purchase and sales departments relationship between individual departments.

Unit 3. **Wages & incentives:**

Definition of wages, real wage and nominal wage, systems of wage payment, incentives, financial and non - financial incentives, Essentials of a good wage plan, essentials of a good incentive scheme. Introduction to elements of cost & indirect expenses, Material cost, labour cost, fixed and variable overheads, components of cost, selling price, Factory expenses, administrative expenses, selling & distribution expenses, depreciation, obsolescence, interest on capital, Idleness, Repair and maintenance.

Unit 4. **Labour, industrial & tax laws:**
Evolution of industrial law, factory act, workmen compensation act, payment of wages act, employee's state insurance act, Industrial dispute act. Role of technician in industry: Position of technician in various engineering departments, Role of a supervisor in industry, Foremanship, duties and qualities of a good foreman.

Unit 5. Material management:
Introduction, Scope of Material Management selective control techniques-ABC analysis, Material handling, inventory control, Essential steps in inventory control, quality standards

Reference Books:

1. Industrial Management, S.C. Sharma, Khanna Publishing House.

2. Industrial Management, M. Sreenivasa Reddy, Subhas Stores.

MF-402: MANUFACTURING WORKSHOP-IV

B. Voc. (Manufacturing) IV Semester

No. of Credits:			3	Sessional:	40 Marks
L	T	P	Total	Practical:	60 Marks
0	0	3	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course objective: To understand the safety measures of a mechanical workshop. To learn the functions of various conventional machines and unconventional machines. To prepare different jobs by different machining operations. To learn about CNC machines.

Course Outcomes: After studying this course the students will be able to:

CO1 Understand the safety measures of mechanical workshops.

CO2 Perform the operations on various conventional machines and unconventional machines.

CO3 Prepare different jobs by different machining operations.

CO4 Learn about CNC machines.

Course contents:

1. Measure and mark reference points/ cutting lines on the work pieces, using compasses, calipers, rulers and other measuring tools
2. Understand the does and don'ts of the manufacturing process as defined in SOPs/ Work Instructions
3. Set of machine stops or guides as per the specified lengths indicated through scales or work instructions
4. Set-up, adjust machine tools, fixtures/ jigs and cutting tools in order to perform machining operations
5. Check the centering and facing of the work pieces and check for alignment of the work pieces as per the final product output specifications
6. Gain knowledge on gear changing techniques and minor maintenance as per checklist
7. Check the working of different holding fixtures, gears, stops.
8. Brush or spray lubricating material on work pieces where applicable
9. Operate hand wheels or valves in order to feed the component and allow cooling and lubricating to the tool.

10. To perform exercise on centre lathe such as facing, plain turning, step turning, chamfering and thread cutting operations.
11. To perform reaming, parting off and knurling operation by using lathe.
12. To perform the drilling and boring operations by using a lathe machine.
13. To perform shaping operation of a given mild steel rod.
14. To prepare a job by machining on a milling machine.
15. To Prepare a 'V' block on a rectangular block on a shaping machine.
16. To grind the single point cutting tool with the given nomenclature and measure angles using the tool maker's microscope.
17. To perform exercises on a shaping machine to obtain flat surfaces and key ways.
18. To prepare a job by using planar, shaper and slotting machine.
19. To perform the operations such as drilling, counter boring and tapping using a drilling machine.
20. To make a slot on the given work piece.
21. To prepare a job by surface grinding on surface grinder and performing dressing and balancing of wheels.
22. To study and use broaching machines in different applications.
23. To study a progressive tool and perform blanking and piercing.
24. To make rod/pipe bending using Hydraulic press (or) to perform Bending Operation.
25. Use files, hand grinders, wire brushes, or power tools for performing deburring operations.
26. Use chisels, scrapers, and other hand tools and equipment to Trim, scrape, or deburr objects or parts
27. Clean the hydraulic tank/ Gauge/ Tools/ Fixtures as per the cleaning schedule and the process mentioned in the Work Instruction/ SOP manual
28. Perform minor repairs and adjustments to the machine and notify supervisor/maintenance team when major service/ repair is required
29. Measure the specifications of the finished component and verify conformance as per Control Plan/ Work Instruction
30. Use devices like micrometers, vernier calipers, gauges, rulers and any other inspection equipment for measuring specifications with valid calibration status.
31. Note down the observations of the basic inspection process and identify pieces which comply with the specified standards
32. Organize changing different worn out machine accessories

33. Ensure that the blunt tool is timely and safely replaced by a new tool
34. Replace machine part as per work instructions, using hand tools or notify supervisor/ engineering personnel for taking corrective actions

Reference books:

1) A course in workshop technology: manufacturing processes by B.S. Raghuwanshi.
2) Textbook of workshop technology by R S Khurmi and J k gupta.
3) Workshop Technology Vol I & II –Hazra & Chaudhary, Asian Book Comp., New Delhi.

BSC-401 PROJECT

B. Voc. (Manufacturing) IV Semester

No. of Credits:			3	Sessional:	40 Marks
L	T	P	Total	Theory:	60 Marks
0	0	3	3	Total:	100 Marks
				Duration of Exam:	3 Hours

The student individually works on a specific topic approved by a faculty member who is familiar in this area of interest. The student can select any topic which is relevant to his/her specialization of the programmer. The topic may be experimental or analytical. At the end of the semester, a detailed report on the work done should be submitted which contains a clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. The students will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.

OEC-405 ENTREPRENEURSHIP

B. Voc.(Manufacturing) IV Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Communication Skills, soft skills.
Successive: Business and Industrial management.

Course Objectives:
The objective of studying this course is that the students acquire necessary knowledge and skills required for organizing and carrying out entrepreneurial activities, to develop the ability of analyzing and understanding business situations in which entrepreneurs act and to master the knowledge necessary to plan entrepreneurial activities.

Course Outcome: At the end of the course, the student shall be able to:

CO1 Students will be aware about the concepts of entrepreneurship development and significance of entrepreneurship in economic development.

CO2 It will help students to know about various acts related to an industry.

CO3 Students will be able to prepare a project report.

CO4 They will be able to know the support available from the Govt. to start a new venture.

Course Contents:

Unit 1: Entrepreneurship and Entrepreneur
Entrepreneurship: Concept and process, Entrepreneur vs manager, Essential Characteristics of a good Entrepreneur, Types of entrepreneurs, Types of Entrepreneurial firms, Need and Importance of Entrepreneurship, Entrepreneurial Mindset.

Unit 2: Key Skills for successful Entrepreneurship
Leadership: leadership styles, Lead by example, Team Spirit, Emotional Intelligence, Problem Solving by Critical Thinking: Applying critical thinking, REASON Model of Critical Thinking. Problem solving by Creative thinking, Importance and benefits of Creative thinking,

Unit 3: Serving the Society

Roles of Entrepreneurs in society, Selfless Entrepreneurship, Factors affecting entrepreneurial business, Business Networking and its advantages, entrepreneurial work ethics, Success Story of Mumbai Dabbawala and Steve Jobs (Discuss more Success failure stories of famous entrepreneurs)

Unit 4: Regulatory and Legal Issues in Entrepreneurship

Introduction to start-up's, Role of District Industries Centre in setting up industry, Function of NSIC, SISI, NISIET, NRDC, SSIC. Business Loans for start-ups and MSMEs by Indian Government, Legal Issues: Intellectual Property Rights, patents, trademarks, copyrights, trade secrets.

Text Books/ Reference Books:

1. Khanka S.S., "Entrepreneurship Development" S. Chand
2. C.V. Bakshi, Entrepreneurship Development, Excel Publications.
3. Drucker, Peter. "Innovation and Entrepreneurship" Heinemann, London.
4. Arora M., Natarajan K. and Gordan E., Entrepreneurship Development, 1st ed; Himalaya Publishing House Pvt Ltd, 2009.

Reference Books:

1. Khanka S.S., "Entrepreneurship Development" S.Chand.
2. Desai, A N. "Entrepreneur & Environment" Ashish, New Delhi.
3. Drucker, Peter. "Innovation and Entrepreneurship" Heinemann, London.
4. Kumar, S A. "Entrepreneurship in Small Industry" Discovery, New Delhi

OEC-406: TRENDS IN TECHNOLOGY

B. Voc. (Manufacturing) IV Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

Course Objectives: The objective of studying this course is to make students aware of the changes in technologies, applications and Systems around us.

Course Outcomes: At the end of the course, the student shall be able to:

CO1 Familiarize with the central concepts in innovation.

CO2 Learn about critical digitized components.

CO3 Know about the future trends based on technology outlooks – where are we now and where are we heading.

CO4 Critically analyze, even practice "how to enable" innovation.

Course Contents:

Unit 1: E-Commerce

Introduction: E-commerce as Business need-commerce, Types, Advantages, Disadvantages, e-Commerce Architecture; Internet Payment Systems, Characteristics, 4C Payment Methods, SET Protocol for Credit Card Payment, E-Cash,E-Check, Overview of Smart Card,

Unit 2: E-mail & Internet

Introduction, E-mail Account & Its Functions, Search Engine, Surfing Webpages, Basics of Social Networking Site.

Unit 3: E-Banking Transactions

Inter Banking, Intra Banking, Electronic Payments, (Payment – Gateway Example), Securities in E-banking (SSL, Digital Signatures – Examples), Services Provided: ATM, Smart Card ECS(Electronic Clearing System), e.g., Telephone, Electricity Bills.

Unit 4: E – Governance & E – Agriculture

E –Governance Models: (G2B,G2C,C2G,G2G), Challenges to E – Governance, Strategies and tactics for implementation of E – Governance, Types of Agriculture information (Soil, Water, Seeds, Market rate) & Technique dissemination, Future trade marketing, Corp Management, Query redressal System, (Information Kiosk, IVR, etc.), Case Study.

Unit 5: E-learning

Models WBT, CBT, Virtual Campus, LMS & LCMS, Video Conferencing, Chatting Bulletin, Building Online Community, Asynchronous / Synchronous Learning, Case Study.

Text Books/ Reference Books:

1. Internet (Use of Search Engines Google & yahoo etc.).
2. E–Commerce:C.S.V.Murthy.
3. FireWall and Internet Security: William Cheswick, Stevens, Aviel, Rubin.
4. The Essential Guide to Knowledge management:Amrit Tiwana.
5. The GISBook: GeorgeB.Karte.
6. Management Information System: Laudon & Laudon

OEC-407: WASTE MANAGEMENT

B. Voc. (Manufacturing) IV Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

Course Objectives: To introduce Sources of solid and hazardous wastes To study about Waste exchange. To understand storage and collection of municipal solid wastes

Course Outcomes:

CO1 To learn various sources of the solid waste.

CO2 To improve understanding of handling of waste.

CO3 To acquire knowledge about steering and suspension systems.

CO4 To be able to understand Disposal in landfills.

Course Contents:

UNIT I SOURCES, CLASSIFICATION AND REGULATORY FRAMEWORK

Types and Sources of solid and hazardous wastes - Need for solid and hazardous waste management – Elements of integrated waste management and roles of stakeholders - Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, lead acid batteries, electronic wastes , plastics and fly ash – Financing waste management.

UNIT II WASTE CHARACTERIZATION AND SOURCE REDUCTION

Waste generation rates and variation - Composition, physical, chemical and biological properties of solid wastes – Hazardous Characteristics – TCLP tests – waste sampling and characterization plan - Source reduction of wastes –Waste exchange - Extended producer responsibility - Recycling and reuse Practical: Composition of MSW, Determination of Physical and Chemical Properties of MSW.

UNIT III STORAGE, COLLECTION AND TRANSPORT OF WASTES

Handling and segregation of wastes at source – storage and collection of municipal solid wastes – Analysis of Collection systems - Need for transfer and transport – Transfer stations Optimizing waste allocation– compatibility, storage, labeling and handling of hazardous wastes – hazardous waste manifests and transport.

UNIT IV WASTE PROCESSING TECHNOLOGIES

Objectives of waste processing – material separation and processing technologies – biological & chemical conversion technologies – methods and controls of Composting - thermal conversion technologies, energy recovery – incineration – solidification & stabilization of hazardous wastes-treatment of biomedical wastes.

UNIT V WASTE DISPOSAL

Waste disposal options – Disposal in landfills - Landfill Classification, types and methods – site selection - design and operation of sanitary landfills, secure landfills and landfill bioreactors – leachate and landfill gas management – landfill closure and environmental monitoring – Rehabilitation of open dumps – landfill remediation.

Reference Books:

1. George Techobanoglous et al, ‖Integrated Solid Waste Management‖, McGraw - Hill, 2014.
2. Manual on Municipal Solid waste Management, CPHEEO, Ministry of Urban Development, Govt. Of. India, New Delhi, 2000.
3. Techobanoglous Thiesen Ellasen; Solid Waste Engineering Principles and Management, McGraw - Hill 1997.
4. R.E.Landrefh and P.A.Rebers,‖ Municipal Solid Wastes-Problems & Solutions‖ ,Lewis, 1997.
5. Blide A.D.& Sundaresan, B.B,‖Solid Waste Management in Developing Countries‖, INSDOC, 1993.
6. Georges E. Ekosse, Rogers W'O Okut-Uma, Pollution control & Waste management in Developing Countries, Commonwealth Publishers, New Delhi, 2000.
7. B. B. Sundaresan, A. D. Bhide – Solid Waste Management, Collection, Processing and Disposal, Mudrashilpa Offset Printers, 2001.

PEC-MF-401 RELIABILITY, MAINTENANCE & SAFETY ENGINEERING

B. Voc. (Manufacturing) Semester 4th

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives: The main objective to study this course is to understand the basics of Reliability and reliability functions. To understand maintainability and safety engineering.

Course Outcomes: At the end of the course, the student shall be able to:

CO1 To learn about Reliability

CO2 To learn Design for reliability.

CO3 To acquire knowledge about Maintainability Analysis.

CO4 To be able to understand Fundamentals of industrial safety,

Unit: 1. Reliability: Definition, reliability function, Mean failure rate, mean time to failure (MTTF), mean time between failures (MTBF), hazard rate curve. Bathtub curve, Conditional Reliability

Unit: 2. Constant Failure rate model: Exponential Reliability function, Failure Modes, CFR model, memory lessness, System reliability: Series, parallel, mixed & complex configuration; Reliability improvement.

Unit: 3. Design for reliability: Reliability specifications and system Measurements, System Effectiveness, redundancy, Classification of Redundancy. Introduction of failure mode and effect analysis (FMEA)

Unit: 4. Maintainability Analysis of Downtime, repair time distribution, stochastic point processes.

Unit: 5. Safety engineering: Fundamentals of industrial safety, Safety policy and safety terminology, Different types of safety systems and equipment, Safety targets, standards, objectives.

Reference Books: 1. Reliability Engineering, S.C. Sharma, Khanna Publishing House

PEC-MF-402 PLANT LAYOUT & PRODUCT HANDLING

B. Voc. (Manufacturing) Semester 4th

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course objectives:

To learn the Objective of Facility Design. To study Computerized handling of layout algorithms. To study Product handling.

Course Outcomes:

CO1 To learn about Objective of Facility Design

CO2 To learn Layout Planning.

CO3 To acquire knowledge about Application of pneumatic and hydraulic system in transportation

CO4 To be able to understand Fundamentals of Product handling;

Unit: 1

Objective of Facility Design: Types of layout problems, the layout function, organization of layout. Analysis and Design of Material Flow: Systems approach to flow cycle, process charts, flow process charts, Quantitative analysis of material flow; optimal material flow configuration. Space and Area Allocation for Production and Physical Plant Services.

Unit: 2

Computerized handling of layout algorithms; Algorithms for computerized Layout Planning, Construction and Development type of computerized Layout Planning Techniques i.e. CRAFT, ALDEP, CORELAP etc.

Unit: 3

Product handling; Design of system configurations conforming to various kinds of product features and layout characteristics; Design concepts of common handling and transfer equipment; Different types of conveyors, elevators, forklifts;

Unit: 4

Design concept of warehouse facilities commensurate with adopted kind of handling and transfer devices; Automated Handling of materials, Automated Transfer lines, AGVS, Use of Robots in Product handling, automated packaging devices.

Unit: 5

Application of pneumatic and hydraulic system in transportation and handling of products, Design of integrated plant layout for product handling systems

Reference Books:

1. Plant Layout & Material Handling, G. K. Agarwal, Jain Brothers (New Delhi).
2. Plant Layout & Material Handling, S. C Sharma, Khanna Publication.

PEC-MF-403 AUTOTRONICS

B. Voc. (Manufacturing) 4th Semester

No. of Credits:			3	Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives: To understand the importance of electronics in Manufacturing.To study Automotive Sensors & Actuators.To study Automotive Electronic Systems.

Course Outcomes: At the end of the course, the student shall be able to:

CO1 To learn about the basics of automotive electronic systems.

CO2 To acquire knowledge of different automotive sensors.

CO3 To acquire knowledge of automotive electronic system.

UNIT –I Fundamentals of Automotive Electronic System: Current Trends in Automotive Electronic Engine Management System, Electro-magnetic Interference Suppression, Electromagnetic Compatibility, Electronic Dashboard Instruments, onboard Diagnostic system, security and warning systems.

UNIT –II Automotive Sensors & Actuators Types of sensors, actuators, Crankshaft position, camshaft position, manifold absolute pressure, Airflow rate sensor, Throttle position sensor, Inlet air temperature sensor, oxygen sensor, vehicle speed sensor, Wheel speed sensor, sensors for feedback control, engine control actuators, Solenoid actuators, motorized actuators.

UNIT –III Automotive Electronic Systems Electronic Ignition systems, Electronic injection systems, Anti Lock brake system circuit, Traction control, Electronic control of Manufacturing transmission, Active suspension, EPS

UNIT –IV Applications Data Acquisitions- Temperature Control – Stepper Motor Control-Automotive Applications Engine Control, Suspension System Control, Driver Information Systems), Development of A High Speed, High Precision Learning Control System for the Engine Control. Programmable Logic Controls, Relay Logic, Control, Motion Control.

Text Book(s):

[T1] Ramesh Goankar S., “Microprocessor Architecture Programming and Applications”, Willey Eastern Ltd.

[T2] William B. Riddens, “Understanding Automotive Electronics”, 5thEdition, Butter Worth Heinemann

FIFTH SEMESTER

Subject Code	Subject Name	Credits	Marks Weightage		Course Type
			Internal	External	
AU 501	On Job Training (OJT)/ Internship evaluation including report and presentation	20	350	150	OJT
	Total	**20**	**350**	**150**	

Students will go into industries for **On Job Training**. Students will be evaluated based **upon On Job Training (OJT)/Internship** including report and presentation.

SIXTH SEMESTER

Subject Code	Subject Name	Credits	Marks Weightage		Course Type
			Internal	External	
AU 601	On Job Training (OJT)/ Internship evaluation including report and presentation	20	350	150	OJT
	Total	**20**	**350**	**150**	

Students will go into industries for **On Job Training**. Students will be evaluated based **upon On Job Training (OJT)/Internship** including report and presentation.

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