SHRI VISHWKARMA SKILL UNIVERSITY

Syllabus

(First Semester)

for

B.Voc. (Robotics & Automation)

Industry Partner-JBM

SHRI VISHWKARMA SKILL UNIVERSITY

Applied Mathematics

Code: ZBSC-101   **Theory: 100**
   T   P   C
   3   0   3   **Max.Marks: 100**

Objectives:
1. Acquire knowledge in matrix theory, a part of linear algebra, which has wider application in engineering problems.
2. To make the student knowledgeable in the area of Permutation and combination, trigonometric functions and to solve engineering problems based on the above concepts.
3. To make the student knowledgeable with basic and applied mathematics for further application.

Learning Outcome:

1. The graduates will become familiar with fundamentals of various Mathematical concepts.
2. Students will be able to set up and solve linear systems/linear inequalities graphically/geometrically and algebraically
3. Students will be able to formulate problems in the language of sets and perform set operations, and will be able apply the Fundamental Principle of Counting, Multiplication Principle.
4. Solve equations and inequalities, both algebraically and graphically, and Solving and model applied problems.

Skill Set
1. Acquire more knowledge in basic concepts of engineering mathematics.
2. To improve problem evaluation technique.
3. Choose an appropriate method to solve a practical problem.

Content
1. Algebra:
     1.1.   Set theory
     1.2.   Permutation and Combination

    1.3.   Binomial theorem (expansion without proof)

    1.4.   Types of functions – linear, quadratic, polynomial, exponential and logarithmic

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

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

4. **Differential calculus:**
   - **4.1.** Rules of differentiation – simple standard forms (involving one variable)
   - **4.2.** Derivatives of algebraic and trigonometric functions
   - **4.3.** Differentiation of function of a function
   - **4.4.** Chain rule

5. **Integral calculus:**
   - **5.1.** Integral of standard forms
   - **5.2.** Simple integration by substitution
   - **5.3.** Integration by parts and by fractions (for linear factor only)
   - **5.4.** Evaluation of definite integrals

Suggested Readings:

1. NCERT- 11th and 12th Mathematics.
2. Advanced Engineering Mathematics, E. Kresyzig, John Wiley and Sons. (latest edition).
3. Higher Engineering Mathematics, B.S. Grewal, Khanna Publications
4. Advanced Engineering Mathematics, R.A Jain and S.R.K Iyengar. Narosa Publications.
5. Engineering Mathematics, N.P Bali, Laxmi Publications.

SHRI VISHWKARMA SKILL UNIVERSITY

Basics of Electrical & Electronics Engineering

Code: ZBEE-105

T	P	C
2	1	3

Theory: 50
Practical: 50
Max. Marks: 100

Objectives:

- To Provide knowledge of Electrical Circuits.
- To Provide knowledge of Electrical Protective Equipment's.
- To Provide knowledge of Semiconductor and Applications.

Learning Outcomes:

- Able to understand the concept of Current, Voltage and Power.
- Able to understand the concept of Transformers and Motor.
- Able to understand the concept of Relay and Circuit Breaker.
- Able to understand the concept of Semiconductor diodes & Bipolar Junction Transistor.

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

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

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

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

Unit-V
Semiconductor Devices & its Applications: Basic idea of semiconductors – P and N type; diodes, Zener diodes and their applications, transistor – PNP and NPN, symbols,

identification of terminals of transistor, current flowing in a transistor, its characteristics and uses. Characteristics and applications of a thyristor.

Text Books

- Basic of Electrical and Electronics Engineering by S.k Sahdev, Dhanpatrai Publications,2013.
- Text Book of Electrical Technology by B.L Theraja, S.Chand Publications,2014

Reference Books

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

List of Experiments (ZBEE-105P)

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

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Engineering Graphics & Drawing

Code: ZBME-107P   Practical(External):30
T   P   C   Practical(Internal):70
0   3   3   Max. Marks   :100

Objectives

1. Understand and appreciate the importance of Engineering Graphics in Engineering
2. Understand the basic principles of Technical/Engineering Drawing
3. Understand the different steps in producing drawings according to BIS conventions

Outcomes

1. The student will become familiar with fundamentals of various science and technology subjects and thus acquire the capability to applying them
2. The graduates will become familiar with fundamentals of engineering design. Understanding the concept generation, design optimization and evaluation.
3. Students will be able to effectively design various engineering components and make process plan for the production.

Skill Set

1. Projection of various components according to BIS specifications.
2. Assembly of data and information of various components in visualized way
3. Interpretation of technical graphics assemblies

Contents

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

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

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

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

3. **Introduction to Projection:**
   - **3.1.** Introduction to first and third angle projection
   - **3.2.** Introduction to projection of point, line and plane
   - **3.3.** Sectioning of solids

Hands on training:
- Practice for projection of point
- Practice for projection of line
- Practice for projection plane

4. **Isometric and Orthographic projection**
   1.1 Isometric drawing of simple geometric solids 1.2 Orthographic projection of simple geometric solids.

Hands on training:
⬚ Prepare drawing sheet of orthographic projection ⬚ Prepare drawing sheet of isometric projection.

5. **Geometric and dimensioning Tolerance**
   5.1 Component Drawing and interpretation
   5.2 Geometric dimension and Tolerance
   5.3 Introduction to software used in drawing

Text Book:

1.   Engineering Drawing Plane and Solid Geometry : N.D. Bhatt and V.M. Panchal, Forty-

2.   Fourth Edition 2002, Charotar Publishing House.
3.   Engineering Drawing: Laxmi Narayan and Vaishwanar, Charotar Publishing House.
4.   Engineering Graphics and Drafting: P.S. Gill, Millennium Edition, S.K. Kataria and Sons.
5.   Engineering Graphics using AUTOCAD 2007: T. Jeyapoovan, m First Edition 2002, Vikas Publishing House.

SHRI VISHWKARMA SKILL UNIVERSITY

Workshop Technology

Code: DBME-103

T	P	C
2	1	3

Theory: 50
Practical: 50
Max. Marks: 100

Objectives:

- Acquire knowledge and use simple hand tools

- Acquire knowledge and use simple measuring and gauging instruments.

Learning Outcomes:

- Able to understand metrology aspects.

- Able to know various welding processes, defects associated & remedies.

Unit-1: Introduction to Manufacturing and Metal cutting

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

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

Unit-2: Cutting Tool Materials and Metrology

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

Cutting Fluids: Introduction, Function and its types, Specification and selection of cutting fluid.

Metrology: Introduction to Roundness and Circularity, Linear Measurements-Rule, Depth Gauge, Vernier Caliper, Micrometer and Vernier height gauge, Calipers and dividers, Angular

Measurements-Vernier bevel protector, Sine bar, Spirit level, Gauges-Snap, Plug, Ring, V-block, Dial indicator and Feeler gauge.

Unit-3: Lathe and Grinding machines

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

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

Lathe Operations: Plain and step turning, Taper turning; taper calculations, methods of taper turning, parting off, drilling, boring, knurling. Screw cutting on lathe-introduction to right and left threads, lathe setting for screw cutting-simple and compound gear trains. Cutting parameters- Speed, feed and depth of cut, machining time.

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

Lathe Attachments; Grinding attachment, milling attachment, Taper turning attachment

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

Types of grinding machines; cylindrical grinders, surface grinders, centerless grinders, special grinding machines

Unit-4: Drilling, Reaming and Boring machines

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

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

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

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

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

Unit-5: Milling machines and Introduction to Jigs & Fixtures

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

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

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

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

Introduction to Jigs and Fixtures; Importance and use of jigs and fixtures, types of jigs, principle of location, locating and clamping devices, advantages of jigs and fixtures.

Text Books:

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

Reference Book:

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

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List of Experiments (DBME-103P)

1. To turn a 30mm cylindrical rod of 105mm length in to 20mm dia over span of 100mm.
2. To turn a bush of 32mm length of which 16mm length is of 30mm dia & rest 16mm is 26mm dia with 18mm bore at centre.
3. To perform step turning in to 3 step of 32mm, 26mm & 20mm over the length 100mm (As per given drawing)
4. To perform step milling operation with a step of 8×8mm in square block of 40×40×40mm.
5. To perform face milling operation on a rectangular block of 100×30×8mm to make parallel plate.
6. To make T- fitting as per given drawing sheet.
7. To make U- Channel by fitting operations as per given drawing.

SHRI VISHWKARMA SKILL UNIVERSITY

Communication Skills

Code: ZBSE-101   **Theory: 50**
T   P   C   **Practical: 50**
3   1   4   **Max. Marks: 100**

Objectives:

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

- To inculcate in students written communication skills.

Learning Outcomes:

The syllabus introduces students to have basic skill set of channelizing information, self-development, decision making and interpersonal skills.

Unit-1

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

Unit-II

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

   (a) Understanding and applying Vocabulary: One word substitutes, Synonyms and Antonyms

   Word formation:-Prefixes, Bases and Suffixes.

Unit-III

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

Unit-IV

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

Unit-V

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

Text Books

1. Sethi, J & et al. A Practice Course in English Pronunciation, Prentice Hall of
2. India, New Delhi.
3. Sen, Leena. Communication Skills, Prentice Hall of India, New Delhi.
4. Prasad, P. Communication Skills, S.K. Kataria& Sons.
5. Bansal, R.K. and J.B. Harrison. Spoken English, Orient Language.
6. Roach Peter. English Phonetics and Phonology.

List of Experiments:(ZBSE-101-P)

1. Greeting and starting of conversation.

2. Nonverbal communication techniques during conversation.

3. Verbal communication techniques during conversation.

4. Group discussion.

5. Extempore public speaking.

6. Reading activity

7. Situational dialogues /Role play.

8. PPT presentation technique.

SHRI VISHWKARMA SKILL UNIVERSITY

Fundamentals of Computer

Code: ZBCE-101

T   P   C

3   1   4

Theory: 50

Practical: 50

Max. Marks: 100

Objective:

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

Learning Outcome:

- Students will be able to the use the computer for basic purposes of preparing personnel/business letters, viewing information on Internet, sending mails, using internet banking services etc.
- Understand basic computer operations and ICT applications.
- Understand Network troubleshooting.
- Undertake data entry services

Unit I – Introduction to Computer System:

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

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

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

1.4 Introduction to number system.

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

Unit III - Understanding Office Applications: Introduction to MS Word, Introduction to MS Excel and its applications, Introduction to MS PowerPoint, Menus, Shortcuts, Document types, Formatting documents, spread sheet and presentations, Working with Spreadsheets, Different templates, Macros, Mail merge.

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

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

Text Books:

1. Computers and Beginners by Jain, V.K.;

2. Computer Fundamentals by Anita Goel, Pearson.

Reference Books:

1. Introduction to Information Technology, Leon Tech World by Leon and Leon

2. Foundations of Computing, BPB Publiction by Sinha, Kr. Pradeep and Preeti Sinha;

3. Word Processing and Typing by Sharon Spencer, Heinemann.

4. MS Office by S.S. Srivastava, Firewall Media.

5. Microsoft Office 2010 by Bittu Kumar, V & S Publications

6. Data Communication and Networking by Behrouz.A. Forouzan, McGraw Hill

Web Linkshttp://cec.nic.in/E-Content/Pages/default.aspx

List of Experiments:(ZBCE-101-P)

1. Troubleshooting

2. Practical based on to be exposed/shown various components and supposed how to switch on a computer.

3. Handling Boot Setup, Installation of Operating System, Connecting your client to server, User and Workgroup Handling, General Operating system handling and related topics.

4. WordPad, Notepad, Sticky Note, Snipping tool, Paint

5. M.S. Word

6. MS-Excel- Creating charts, Creating tables

7. MS-PowerPoint

8. MS-Outlook

9. Case study on Operating systems (Windows/ Ubantu/ Android/IoS)

10. Networking

11. Software: Preparatory and open domain

Note: Any 7 experiments are to be performed

SHRI VISHWKARMA SKILL UNIVERSITY

Fundamentals of Industrial Management

Code: ZBGE-101   **Theory: 50**
T   P   C   **Practical: 50**
2   2   4   **Max. Marks: 100**

Objectives:

1) Understanding the knowledge of Quality Control, inspection and quality assurance management used in the organization.
2) Develop the skill for using tool and techniques for quality in Industry
3) Apply elementary knowledge of quality concepts for quality assurance.

Unit-I

Concept of Quality:

1.1 Quality: Definition, History, Importance
1.2 Approaches to define Quality, Cost of Quality, Hierarchy of Quality Management
1.3 Introduction to Quality Control.

Learning Outcome: Students will be able to understand the daily management system related to Quality in the shop floor.

Unit-II
Organizational Aspects of Quality Assurance:
2.1 Quality Assurance (QA): Introduction, Definition, Management principles in QA, QA in different stages, Quality Planning.
2.2 ISO: Introduction, ISO 9000 series of standard, Benefits of ISO.
2.3 ISO 9001, Benefits of ISO 9001.
2.4 Quality survey: Scope, Types of audit, inspection methods, Quality budget, Vendor Quality Rating
Learning Outcome: Students will be able to understand all the required processes, ensuring implementation of the same and providing basic inputs for its improvement. Student will be able to ensure that the final products manufactured by is as per the quality norms set by the organization.

Unit-III
Problem solving tools and techniques:
3.1 Definition of a problem
3.2 Type of problems, classification of problems
3.3 What is problem solving, barriers to problem solving

3.4 Problem solving tools: Cause and effect diagram, Histogram, flow charts, Check sheets, Histogram, Brain-storming, Pareto charts, Control charts, Scatter Diagram

3.5 Problem solving techniques: Brain storming, Flow diagram, PDCA Cycle etc.

Learning Outcome: Student will able to solve different type of problems in their manufacturing processes.

Unit-IV

Total Quality Management:

4.1 Basic concept of TQM, features of TQM

4.2 principles of TQM

4.3 leadership concepts

4.4 Quality statements

4.5 Barriers to TQM implementation

4.6 Concept of TPM

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

Learning Outcome: Ensure implementation of 5S activities at the shop floor/ office area. Students will be able to analyse the root cause problems in the product & process by using different problem solving techniques.

Unit-V

5 S and Safety:

5.1 Detailed concept of 5S and safety used in Industries

5.2 Integrated Management system

Learning Outcome: Students will able to apply 5S and safety in their work place.

Suggested Readings:

1. Total quality Management by L.Sganthi & Anand A. Samuel, PHI Publication.
2. Total quality Management by Poornima M Charantimath, Pearson Publication.

Web Reference

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

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

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

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

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

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

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

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

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

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

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List of Experiments (ZBGE-101-P)

1. Draw and Demonstrate the process flow diagram
2. Draw and demonstrate problem statement, target /Goal Setting
3. Draw and demonstrate Pareto diagram
4. Draw and Demonstrate cause and effect diagram
 5. Data validation and why –why Analysis

All these techniques applied can be used as a project to solve the problems in their workplace in OJT

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Fundamentals of Robotic System

Code: DBME-104	**Theory:**	**50**
T P C	**Practical:**	**50**
2 1 3	**Max. Marks: 100**	

Objectives:
- To introduce the basic concepts, parts of robots and types of robots.
- To make the student familiar with the various drive systems for robot, sensors and their applications in robots and programming of robots.
- To discuss about the various applications of robots, justification and implementation of robot

Learning Outcomes:
- Able to know about the basics of robotics system such as specification, driving system & parts.
- Able to have learning about the applications of Robots.

Unit-I
Introduction: Specifications of Robots (Manipulator & controller)- Classifications of robots – Work envelope - Flexible automation versus Robotic technology – Applications of Robots. Operators: Translations, Rotations and Transformation.

Unit-II
Robot Drives and Power Transmission Systems: Robot drive mechanisms, hydraulic – electric – servomotor- stepper motor - pneumatic drive. Mechanical transmission method - Gear transmission link - Rod systems - Rotary-to-Rotary motion conversion.
Applications - MIG & BIW welding lines, Handling system.

Unit-III
Manipulators: Construction of Manipulators, Manipulator Force Control, Electronic and Pneumatic manipulators

Unit-IV
Robot end Effectors: Classification of End effectors. Drive system for Grippers-Mechanical-adhesive-vacuum-magnetic-grippers. Hooks & scoops. Active and passive grippers.
Application: Robotic Gun, welding torch, Gripper, Automatic Tool changer.

Unit-V
Pathplanning Tools: Trajectory planning and avoidance of obstacles, path planning, joint integrated motion – straight line motion.

Text Books:
1. Deb S. R. and Deb S., "Robotics Technology and Flexible Automation", Tata McGraw Hill Education Pvt. Ltd, 2010.
2. John J.Craig , "Introduction to Robotics", Pearson, 2009.

Reference Books:
1. Mikell P. Groover et. al., "Industrial Robots - Technology, Programming and Applications", McGraw Hill, New York, 2008.

List of Experiments (DBME-104-P)

1. Study of different types of robots based on configuration and application.
2. Study of different type of links and joints used in robots
3. Study of components of robots with drive system and end effectors.
4. Determination of maximum and minimum position of links.
5. Verification of transformation (Position and orientation) with respect to gripper and world coordinate system
6. Estimation of accuracy, repeatability and resolution.
7. Robot programming exercises