# B.Tech. - Course Structure & Syllabus – RK24

## INDUCTION PROGRAMME

| S.No. | Category | Course Name | L-T-P-C |
|---|---|---|---|
| 1 | MC | Physical Activities -- Sports, Yoga and Meditation, Plantation | 0-0-6-0 |
| 2 | MC | Career Counselling | 2-0-2-0 |
| 3 | MC | Orientation to all branches -- career options, tools,etc. | 3-0-0-0 |
| 4 | EC | Orientation on admitted Branch -- correspondinglabs, tools and platforms | 2-0-3-0 |
| 5 | ES | Proficiency Modules & Productivity Tools | 2-1-2-0 |
| 6 | MC | Assessment on basic aptitude and mathematicalskills | 2-0-3-0 |
| 7 | MC | Remedial Training in Foundation Courses | 2-1-2-0 |
| 8 | MC | Human Values & Professional Ethics | 3-0-0-0 |
| 9 | BS | Communication Skills -- focus on Listening,Speaking, Reading, Writing skills | 2-1-2-0 |
| 10 | ES | Concepts of Programming | 2-0-2-0 |

## Group-A Branches:

Computer Science and Engineering
Computer Science and Engineering (Data Science)

## Group-B Branches:

Civil Engineering,
Electrical and Electronics Engineering,
Mechanical Engineering
Electronics and Communication Engineering,
Artificial Intelligence and Machine Learning

## Course Code Format:

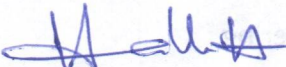| Regulation | Branch | Year | Semester | Course Serial Number |
|---|---|---|---|---|
| 2 Digits | 2 Digits | 1 Digit | 1 Digit | 2 Digits |
| 24 | 01/02/03/04/05/44/61 | 1/2/3/4 | 1/2 | 01/02/03/04/........./19/20 |

## Branch Code:

| Code | Branch |
|---|---|
| 01 | Civil Engineering |
| 02 | Electrical & Electronics Engineering |
| 03 | Mechanical Engineering |
| 04 | Electronics and Communication Engineering |
| 05 | Computer Science and Engineering |
| 44 | Computer Science and Engineering (Data Science) |
| 61 | Artificial Intelligence and Machine Learning |

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## B. Tech. – I Year I Semester (for Group-A Branches CSE and CSE-(DS))

| S.No. | Course Code | Category | Title | L/D | T | P | Credits |
|-------|-------------|----------|-------|-----|---|---|---------|
| 1 | 24051101/ 24441101 | BS & H | Engineering Chemistry | 3 | 0 | 0 | 3 |
| 2 | 24051102/ 24441102 | BS & H | Linear Algebra & Calculus | 3 | 0 | 0 | 3 |
| 3 | 24051103/ 24441103 | Engineering Science | Basic Civil & Mechanical Engineering | 3 | 0 | 0 | 3 |
| 4 | 24051104/ 24441104 | BS & H | Communicative English | 2 | 0 | 0 | 2 |
| 5 | 24051105/ 24441105 | Engineering Science | Introduction to Programming | 3 | 0 | 0 | 3 |
| 6 | 24051106/ 24441106 | BS & H | Engineering Chemistry Lab | 0 | 0 | 2 | 1 |
| 7 | 24051107/ 24441107 | Engineering Science | Engineering Workshop | 0 | 0 | 3 | 1.5 |
| 8 | 24051108/ 24441108 | BS & H | Communicative English Lab | 0 | 0 | 2 | 1 |
| 9 | 24051109/ 24441109 | Engineering Science | Computer Programming Lab | 0 | 0 | 3 | 1.5 |
| 10 | 24051110/ 24441110 | BS & H | Health and wellness, Yoga and Sports | - | - | 1 | 0.5 |
| Total | | | | 14 | 0 | 11 | 19.5 |

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## B.Tech. – I Year I Semester (for Group-B Branches CE, EEE, ME, ECE, and AI & ML)

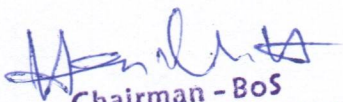| S.No. | Course Code | Category | Title | L/D | T | P | Credits |
|-------|-------------|----------|-------|-----|---|---|---------|
| 1 | 24011111/ 24021111/ 24031111/ 24041111/ 24611111 | BS & H | Engineering Physics | 3 | 0 | 0 | 3 |
| 2 | 24011112/ 24021112/ 24031112/ 24041112/ 24611112 | BS & H | Linear Algebra & Calculus | 3 | 0 | 0 | 3 |
| 3 | 24011113/ 24021113/ 24031113/ 24041113/ 24611113 | Engineering Science | Basic Electrical & Electronics Engineering | 3 | 0 | 0 | 3 |
| 4 | 24011114/ 24021114/ 24031114/ 24041114/ 24611114 | Engineering Science | Engineering Drawing | 1 | 0 | 4 | 3 |
| 5 | 24011115/ 24021115/ 24031115/ 24041115/ 24611115 | Engineering Science | Introduction to Programming | 3 | 0 | 0 | 3 |
| 6 | 24011116/ 24021116/ 24031116/ 24041116/ 24611116 | BS & H | Engineering Physics Lab | 0 | 0 | 2 | 1 |
| 7 | 24011117/ 24021117/ 24031117/ 24041117/ 24611117 | Engineering Science | Electrical & Electronics Engineering Workshop | 0 | 0 | 3 | 1.5 |
| 8 | 24011118/ 24021118/ 24031118/ 24041118/ 24611118 | Engineering Science | IT Workshop | 0 | 0 | 2 | 1 |
| 9 | 24011119/ 24021119/ 24031119/ 24041119/ 24611119 | Engineering Science | Computer Programming Lab | 0 | 0 | 3 | 1.5 |
| 10 | 24011120/ 24021120/ 24031120/ 24041120/ 24611120 | | NSS / NCC / Scouts & Guides / Community Service | - | - | 1 | 0.5 |
| | | | Total | 13 | 0 | 15 | 20.5 |

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## B.Tech. – I Year II Semester (for Group-A Branches CSE and CSE-(DS))

| S.No. | Course Code | Category | Title | L/D | T | P | Credits |
|-------|-------------|----------|-------|-----|---|---|---------|
| 1 | 24051201/ 24441201 | BS & H | Engineering Physics | 3 | 0 | 0 | 3 |
| 2 | 24051202/ 24441202 | BS & H | Differential Equations & Vector Calculus | 3 | 0 | 0 | 3 |
| 3 | 24051203/ 24441203 | Engineering Science | Basic Electrical & Electronics Engineering | 3 | 0 | 0 | 3 |
| 4 | 24051204/ 24441204 | Engineering Science | Engineering Drawing | 1 | 0 | 3 | 4 |
| 5 | 24051205/ 24441205 | Professional Core | Data structures | 3 | 0 | 0 | 3 |
| 6 | 24051206/ 24441206 | BS & H | Engineering Physics Lab | 0 | 0 | 2 | 1 |
| 7 | 24051207/ 24441207 | Engineering Science | Electrical & Electronics Engineering Workshop | 0 | 0 | 3 | 1.5 |
| 8 | 24051208/ 24441208 | Engineering Science | IT Workshop | 0 | 0 | 2 | 1 |
| 9 | 24051209/ 24441209 | Professional Core | Data structures Lab | 0 | 0 | 3 | 1.5 |
| 10 | 24051210/ 24441210 | | NSS/NCC/Scouts & Guides/Community Service | - | - | 1 | 0.5 |
| Total | | | | 13 | 0 | 15 | 20.5 |

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**B.Tech. – I Year II Semester** (for Group-B Branches CE, EEE, ME, ECE, and AI & ML)
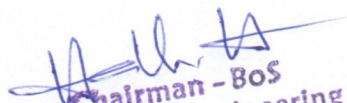
| S.No. | Course Code | Category | Title | L/D | T | P | Credits |
|-------|-------------|----------|-------|-----|---|---|---------|
| 1 | 24011211/ 24021211/ 24031211/ 24041211/ 24611211 | BS & H | Engineering Chemistry | 3 | 0 | 0 | 3 |
| 2 | 24011212/ 24021212/ 24031212/ 24041212/ 24611212 | BS & H | Differential Equations & Vector Calculus | 3 | 0 | 0 | 3 |
| 3 | 24011213/ 24021213/ 24031213/ 24041213/ 24611213 | Engineering Science | Basic Civil & Mechanical Engineering | 3 | 0 | 0 | 3 |
| 4 | 24011214/ 24021214/ 24031214/ 24041214/ 24611214 | BS & H | Communicative English | 2 | 0 | 0 | 2 |
| 5 | 24011215/ 24031215 / 24021215 / 24041215 / 24611215 | Professional Core | Engineering Mechanics / Electrical Circuit Analysis – I / Network Analysis / Data structures | 3 | 0 | 0 | 3 |
| 6 | 24011216/ 24021216/ 24031216/ 24041216/ 24611216 | BS & H | Engineering Chemistry Lab | 0 | 0 | 2 | 1 |
| 7 | 24011217/ 24021217/ 24031217/ 24041217/ 24611217 | Engineering Science | Engineering Workshop | 0 | 0 | 3 | 1.5 |
| 8 | 24011218/ 24021218/ 24031218/ 24041218/ 24611218 | BS & H | Communicative English Lab | 0 | 0 | 2 | 1 |
| 9 | 24011219/ 24031219 / 24021219 / 24041219 / 24611219 | Professional Core | Engineering Mechanics Lab / Electrical Circuits Lab / Network Analysis Lab / Data structures Lab | 0 | 0 | 3 | 1.5 |
| 10 | 24011220/ 24021220/ 24031220/ 24041220/ 24611220 | BS & H | Health and wellness, Yoga and Sports | - | - | 1 | 0.5 |
| **Total** | | | | 14 | 0 | 11 | 19.5 |

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## B. Tech. – II Year I Semester

| S.No. | Course Code | Category | Title | L | T | P | Credits |
|-------|-------------|----------|-------|---|---|---|---------|
| 1 | 24032101 | BS&H | Engineering Mathematics (Branch specific) | 3 | 0 | 0 | 3 |
| 2 | 24032102 | BS&H | Universal Human Values – Understanding Harmony | 2 | 1 | 0 | 3 |
| 3 | 24032103 | Engineering Science | | 2 | 0 | 0 | 2 |
| 4 | 24032104 | Professional Core | | 3 | 0 | 0 | 3 |
| 5 | 24032105 | Professional Core | | 3 | 0 | 0 | 3 |
| 6 | 24032106 | Engineering Science | | 0 | 0 | 2 | 1 |
| 7 | 24032107 | Professional Core | | 0 | 0 | 3 | 1.5 |
| 8 | 24032108 | Professional Core | | 0 | 0 | 3 | 1.5 |
| 9 | 24032109 | Skill Enhancement course | | 0 | 1 | 2 | 2 |
| 10 | 24032110 | Audit Course | Environmental Science | 2 | 0 | 0 | - |
| | | Total | | 15 | 2 | 10 | 20 |

## B. Tech. – II Year II Semester

| S.No. | Course Code | Category | Title | L | T | P | Credits |
|-------|-------------|----------|-------|---|---|---|---------|
| 1 | 24032201 | Management Course - I | | 2 | 0 | 0 | 2 |
| 2 | 24032202 | Engineering Science | | 3 | 0 | 0 | 3 |
| 3 | 24032203 | Professional Core | | 3 | 0 | 0 | 3 |
| 4 | 24032204 | Professional Core | | 3 | 0 | 0 | 3 |
| 5 | 24032205 | Professional Core | | 3 | 0 | 0 | 3 |
| 6 | 24032206 | Professional Core | | 0 | 0 | 2 | 1 |
| 7 | 24032207 | Professional Core | | 0 | 0 | 3 | 1.5 |
| 8 | 24032208 | Professional Core | | 0 | 0 | 3 | 1.5 |
| 9 | 24032209 | Skill Enhancement course | | 0 | 1 | 2 | 2 |
| 10 | 24032210 | BS&H | Design Thinking & Innovation | 1 | 0 | 2 | 2 |
| | | Total | | 15 | 1 | 12 | 22 |
| Mandatory Community Service Project Internship of 08 weeks duration during summer vacation | | | | | | | |

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B.Tech. – III Year I Semester

| S.No. | Course Code | Category | Title | L | T | P | Credits |
|-------|-------------|----------|-------|---|---|---|---------|
| 1 | 24033101 | Professional Core | | 3 | 0 | 0 | 3 |
| 2 | 24033102 | Professional Core | | 3 | 0 | 0 | 3 |
| 3 | 24033103 | Professional Elective - I | | 2 | 0 | 0 | 2 |
| 4 | 24033104 | Open Elective - I | | 3 | 0 | 0 | 3 |
| 5 | 24033105 | Open Elective - II | | 3 | 0 | 0 | 3 |
| 6 | 24033106 | Professional Core | | 0 | 0 | 3 | 1.5 |
| 7 | 24033107 | Professional Core | | 0 | 0 | 3 | 1.5 |
| 8 | 24033108 | Skill Enhancement course | | 0 | 1 | 2 | 2 |
| 9 | 24033109 | BS&H | Tinkering Lab | 0 | 0 | 2 | 1 |
| 10 | 24033110 | Evaluation of Community Service Internship | | - | - | - | 2 |
| | | Total | | 14 | 1 | 10 | 22 |

B.Tech. – III Year II Semester

| S.No. | Course Code | Category | Title | L | T | P | Credits |
|-------|-------------|----------|-------|---|---|---|---------|
| 1 | 24033201 | Professional Core | | 3 | 0 | 0 | 3 |
| 2 | 24033202 | Professional Core | | 3 | 0 | 0 | 3 |
| 3 | 24033203 | Professional Core | | 3 | 0 | 0 | 3 |
| 4 | 24033204 | Professional Elective - II | | 3 | 0 | 0 | 3 |
| 5 | 24033205 | Professional Elective - III | | 2 | 0 | 0 | 2 |
| 6 | 24033206 | Open Elective - III | | 3 | 0 | 0 | 3 |
| 7 | 24033207 | Professional Core | | 0 | 0 | 2 | 1 |
| 8 | 24033208 | Professional Core | | 0 | 0 | 2 | 1 |
| 9 | 24033209 | Skill Enhancement course | | 0 | 1 | 2 | 2 |
| 10 | 24033210 | Audit Course | Technical Paper Writing & IPR | 2 | 0 | 0 | - |
| | | Total | | 19 | 1 | 06 | 21 |
| Mandatory Industry Internship of 08 weeks duration during summer vacation | | | | | | | |

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B.Tech. – IV Year I Semester

| S.No. | Course Code | Category | Title | L | T | P | Credits |
|-------|-------------|----------|-------|---|---|---|---------|
| 1 | 24034101 | Professional Core | | 3 | 0 | 0 | 3 |
| 2 | 24034102 | Professional Core | | 3 | 0 | 0 | 3 |
| 3 | 24034103 | Management Course - II | | 2 | 0 | 0 | 2 |
| 4 | 24034104 | Professional Elective - IV | | 3 | 0 | 0 | 3 |
| 5 | 24034105 | Professional Elective - V | | 3 | 0 | 0 | 3 |
| 6 | 24034106 | Open Elective - IV | | 3 | 0 | 0 | 3 |
| 7 | 24034107 | Professional Core | | 0 | 0 | 2 | 1 |
| 8 | 24034108 | Professional Core | | 0 | 0 | 2 | 1 |
| 9 | 24034109 | Skill Enhancement Course | | 0 | 1 | 2 | 2 |
| 10 | 24034110 | Audit Course | Constitution of India | 2 | 0 | 0 | - |
| 11 | 24034111 | Internship | Evaluation of Industry Internship | - | - | - | 2 |
| | | Total | | 19 | 1 | 06 | 23 |

B.Tech. – IV Year II Semester

| S.No. | Course Code | Category | Title | L | T | P | Credits |
|-------|-------------|----------|-------|---|---|---|---------|
| 1 | 24034201 | Project Work | Full semester Project Work | 0 | 0 | 12 | 6 |
| 2 | 24034202 | Internship | Full semester Internship | 0 | 0 | 12 | 6 |
| | | Total | | 0 | 0 | 24 | 12 |

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| L/D | T | P | C |
|-----|---|---|---|
| 3 | 0 | 0 | 3 |

# BASIC CIVIL AND MECHANICAL ENGINEERING
## (Common to all Branches of Engineering)

**Course Objectives:**
- Familiarize students with the scope and importance of Civil Engineering subdivisions and their roles in society.
- Introduce preliminary concepts of surveying, transportation, and water resources in Civil Engineering.
- Provide an understanding of various engineering materials, manufacturing processes, and mechanical power transmission systems in Mechanical Engineering.
- Educate students on the basics of thermal engineering and robotics, including their principles and applications.

**Course Outcomes:** On completion of the course, the student should be able to:

| | |
|-----|---|
| CO1 | Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society. |
| CO2 | Know the concepts of surveying and Transportation and Understand the importance of Water Storage and Conveyance Structures. |
| CO3 | Understand the Role of Mechanical Engineering, Engineering Materials and different manufacturing processes. |
| CO4 | Explain the basics of robotics, thermal engineering power plants and Mechanical Power Transmission. |

## PART A: BASIC CIVIL ENGINEERING
### UNIT I

**Basics of Civil Engineering:** Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering – Environmental Engineering-Scope of each discipline - Building Construction and Planning - Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.
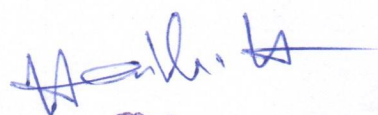
### UNIT II

**Surveying:** Objectives of Surveying- Horizontal Measurements – Angular Measurements- Introduction to Bearings Levelling instruments used for levelling - Simple problems on levelling and bearings-Contour mapping.

**Transportation Engineering:** Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.

**Water Resources and Environmental Engineering:** Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

**Textbooks:**
1. Basic Civil Engineering, M.S.Palanisamy, Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S. S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

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**Reference Books:**
1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S. K. Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

## PART B: BASIC MECHANICAL ENGINEERING
### UNIT I

**Introduction to Mechanical Engineering**: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart Materials. **Manufacturing Processes**: Principles of Casting, Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

### UNIT II

**Introduction to Robotics** - Joints & links, configurations, and applications of robotics. (Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject.)

**Thermal Engineering** – Working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI / CI Engines, Components of Electric and Hybrid Vehicles.
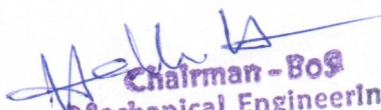
**Power plants** – Working principle of Steam, Diesel, Hydro, Nuclear power plants. Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

**Textbooks:**
1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
2. A text book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

**Reference Books:**
1. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.
2. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.
3. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
4. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I

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| L/D | T | P | C |
|-----|---|---|-----|
| 0 | 0 | 3 | 1.5 |

# ENGINEERING WORKSHOP
## (Common to all Branches of Engineering)

**Course Objectives:**

- To familiarize students with wood working, sheet metal operations, fitting, electrical house wiring skills, and basic repairs of two-wheeler vehicle.

**Course Outcomes:**

| CO1 | Identify workshop tools and their operational capabilities |
|-----|-----|
| CO2 | Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding |
| CO3 | Apply fitting operations in various applications |
| CO4 | Apply basic electrical engineering knowledge for House Wiring Practice |

## SYLLABUS

| Sl. N. | TRADE | DESCRIPTION OF TRADE | JOB |
|--------|-------|----------------------|-----|
| I | Demonstration | Safety practices and precautions to be observed in workshop. | ----------- |
| II | Wood Working | Familiarity with different types of woods and tools used in wood working and make following joints. | 1) Half – Lap joint<br>2) Mortise and Tenon joint<br>3) Corner Dovetail joint or Bridle joint |
| III | Sheet Metal Working | Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets. | 1) Tapered tray<br>2) Conical funnel<br>3) Elbow pipe<br>4) Brazing |
| III | Fitting | Familiarity with different types of tools used in fitting. | 1) V-fit<br>2) Dovetail fit<br>3) Semi-circular fit<br>4) Bicycle tire puncture and change of two-wheeler tyre. |
| IV | Electrical Wiring | Familiarity with different types of basic electrical circuits and its connections. | 1) Parallel and series<br>2) Two-way switch<br>3) Godown lighting<br>4) Tube light<br>5) Three phase motor<br>6) Soldering of wires |
| V | Foundry Trade | Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns. | 1) Gear<br>2) Connecting Rod |
| VI | Welding Shop | Demonstration and practice on Arc Welding and Gas welding. | 1) Preparation of Lap joint<br>2) Preparation of Butt joint. |
| VII | Plumbing | Demonstration and practice of Plumbing tools. | 1) Preparation of Pipe joints with coupling for same diameter and<br>2) Preparation of Pipe joints with reducer for different diameters. |
| VIII | Basic repairs of Two-wheeler vehicle | Demonstration of working of two-wheeler vehicle and its repairs. | 1) Flat tire<br>2) Loose Bolts<br>3) Loose Breaks<br>4) Dropped Chain |

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**Textbooks:**
1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

**Reference Books:**
1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

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| L/D | T | P | C |
|-----|---|---|---|
| 1 | 0 | 4 | 3 |

# ENGINEERING DRAWING
## (Common to all Branches of Engineering)

**Course Objectives:**

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing.
- To impart knowledge on the projection of points, lines and plane surfaces.
- To improve the visualization skills for better understanding of projection of solids.
- To develop the imaginative skills of student required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

**Course Outcomes:**

| CO1 | Understand the principles of engineering drawing, including engineering curves and regular polygons, scales. |
|-----|------|
| CO2 | Draw and interpret projections of points, lines and planes in front, top and side views. |
| CO3 | Understand and draw projection of solids in various positions and sections of solids In simple positions. |
| CO4 | Explain principles behind development of surfaces |
| CO5 | Conversion of isometric views to orthographic views and Vice-Versa |

## UNIT I

**Introduction:** Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

**Curves:** construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.

**Scales:** Plain scales, diagonal scales and vernier scales.

## UNIT II

**Orthographic Projections:** Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

**Projections of Straight Lines:** Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes.

**Projections of Planes:** regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

## UNIT III

**Projections of Solids:** Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

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## UNIT IV

**Sections of Solids:** Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

**Development of Surfaces:** Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

## UNIT V

**Conversion of Views:** Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

**Computer graphics:** Creating 2D&3D drawings ofobjects including PCB and Transformations using Auto CAD (*Not for end examination*).
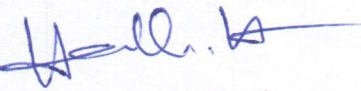
**Textbook:**
1.  N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

**Reference Books:**
1.  Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2.  Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc, 2009.
3.  Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

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| L/D | T | P | C |
|-----|---|---|---|
| 3   | 0 | 0 | 3 |

# ENGINEERING MECHANICS
## (Common to Civil and Mechanical Engineering)

**Course Objectives:**
- To get familiarized with different types of force systems.
- To draw accurate free body diagrams representing forces and moments acting on a body to analyze the equilibrium of system of forces.
- To teach the basic principles of center of gravity, centroid and moment of inertia and determine them for different simple and composite bodies.
- To apply the Work-Energy method to particle motion.
- To understand the kinematics and kinetics of translational and rotational motion of rigid bodies.

**Course Outcomes:** On Completion of the course, the student should be able to

| CO1 | Understand the fundamental concepts in mechanics and determine the frictional forces for bodies in contact. |
|-----|--------------------------------------------------------------------------------------------------------------|
| CO2 | Analyze different force systems such as concurrent, coplanar and spatial systems and calculate their resultant forces and moments. |
| CO3 | Calculate the centroids, center of gravity and moment of inertia of different geometrical shapes. |
| CO4 | Solve the problems of dynamics of rigid bodies in various motions. |

## UNIT I

**Introduction to Engineering Mechanics**– Basic Concepts. Scope and Applications
**Systems of Forces:** Coplanar Concurrent Forces– Components in Space–Resultant–Moment of Force and its Application –Couples and Resultant of Force Systems.
**Friction:** Introduction, limiting friction and impending motion, Coulomb'slaws of dry friction, coefficient of friction, Cone of Static friction.

## UNIT II

**Equilibrium of Systems of Forces:** Free Body Diagrams, Lami's Theorm, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for Spatial System of forces, Numerical examples on spatial system of forces using vector approach, Analysis of plane trusses. Principle of virtual work with simple examples.
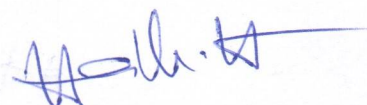
## UNIT III

**Centroid:** Centroids of simple figures (from basic principles)–Centroids of Composite Figures.
**Centre of Gravity:** Centre of gravity of simple body (from basic principles), Centre of gravity of composite bodies, Pappus theorems.
**Area Moments of Inertia:** Definition– Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.
**Mass Moment of Inertia:** Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, Mass Moment of Inertia of composite bodies.

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## UNIT IV

**Rectilinear and Curvilinear motion of a particle:** Kinematics and Kinetics –D'Alembert's Principle - Work Energy method and applications to particle motion-Impulse Momentum method.

**Rigid body Motion:** Kinematics and Kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse Momentum method.

### Textbooks:

1. Engineering Mechanics, S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., , McGraw Hill Education 2017. 5th Edition.
2. Engineering Mechanics, P. C. Dumir- S. Sengupta and Srinivas V veeravalli , University press. 2020. First Edition.
3. A Textbook of Engineering Mechanics, S. S. Bhavikatti. New age international publications 2018. 4th Edition.

### Reference Books:

1. Engineering Mechanics, Statics and Dynamics, Rogers and M A. Nelson., McGraw Hill Education. 2017. First Edition.
2. Engineering Mechanics, Statics and Dynamics, I.H. Shames., PHI, 2002. 4th Edition.
3. Engineering Mechanics, Volume-I: Statics, Volume-II: Dynamics, J. L. Meriam and L. G. Kraige., John Wiley, 2008. 6th Edition.
4. Introduction to Statics and Dynamics, Basudev Battachatia, Oxford University Press, 2014. Second Edition
5. Engineering Mechanics: Statics and Dynamics, Hibbeler R.C., Pearson Education, Inc., New Delhi, 2022, 14th Edition

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## ENGINEERING MECHANICS LAB
### (Common to Civil and Mechanical Engineering)

**Course Objectives:** The students completing the course are expected to:
- Verify the Law of Parallelogram and Triangle of Forces.
- Determine the coefficients of friction of Static and Rolling friction and Centre of gravity of different plane Lamina.
- Analyze the system of Pulleys and Moment of Inertia of Compound Pendulum and Flywheel.
- Verify the Law of Parallelogram of Forces and Lami's theorem.
- Determine the coefficients of friction of Static and Rolling friction and Centre of gravity of different plane Lamina.

**Course Outcomes:**

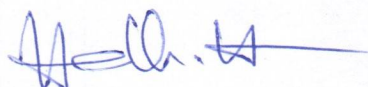| | |
|-----|--------------------------------------------------------------------------------------------------------|
| CO1 | Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller. |
| CO2 | Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever. |
| CO3 | Determine the Centre of gravity and Moment of Inertia of different configurations. |
| CO4 | Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller. |
| CO5 | Verify Law of Parallelogram of forces and Law of Moment using force polygon and bell crank lever. |

**Note:** Students have to perform any 10 of the following Experiments:

**List of Experiments:**
1. Verification of Law of Parallelogram of Forces.
2. Verification of Law of Triangle of Forces.
3. Verification of the Law of polygon for coplanar-concurrent forces acting on a particle in equilibrium and to find the value of unknown forces considering particle to be in equilibrium using universal force table.
4. Determination of coefficient of Static and Rolling Frictions
5. Determination of Centre of Gravity of different shaped Plane Lamina.
6. Verification of the conditions of equilibrium of a rigid body under the action of coplanar non-concurrent, parallel force system with the help of a simply supported beam.
7. Determine the acceleration due to gravity using a compound pendulum.
8. Verification of Law of Moment using Rotation Disc Apparatus and Bell Crank Lever.
9. Experimental Proof of Lami's Theorem.
10. Forces in Pin Jointed Trusses.
11. Study of Plumbing in buildings.
12. To study various types of tools used in construction.

**References:**
1. S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., Engineering Mechanics, 5th Edition, McGraw Hill Education.
2. Hibbeler R.C., Engineering Mechanics: Statics and Dynamics, 14th Edition, Pearson Education, Inc., New Delhi, 2022

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