Engineering Graphics Lab	
Course Code: BMA-130 Contact Hours: L-0 T-1 P-2 Course Category: OEC	Credits: 2 Semester: 1

Introduction: Engineering Graphics develops basic concepts for advance courses like Machine Drawing/Design, Computer Graphics, and Computer Aided Design. Manufacturing drawings are an integral part of any production company. They provide most efficient and clear information about the parts to be produced and act as a language for engineers to communicate. The subject not only provides basic knowledge required as above but also develops visualization capability in students so that they can become creative and organized.

Course Objectives: The aim of this course is to provide a base for visualizing and drawing objects in different views which is an essential tool for a design engineer as well as graphics designer.

Pre-Requisites: NIL

Course Outcomes:

Having completed this course the student will be able to:

CO1: Visualize and plot various projections of points and lines.

CO2: Visualize and plot various projections of planes and solids.

CO3: Develop surfaces of oblique solids

CO4: Communicate engineering aspects of a part with other engineers and technicians.

Pedagogy: The lab sessions are aimed at providing the students an exposure to traditional methods of engineering drawing on drawing sheets by using drawing tools. This gives the students an exposure to using these tools and helps them better understand intricacies and appreciate this art.

Content:

UNIT I	12 Hours
General: Importance, Significance and scope of engineering drawing, Lettering, Dimensioning, Orthographic Projection, B.I.S. Specifications, Engineering curves. **Projections of Point and Lines:** Introduction of planes of projection, Reference and auxiliary planes, projections of points and Lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on Auxiliary planes, shortest distance, intersecting and non-intersecting lines.	
UNIT II	12 Hours
Projections of Plane Figures: Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one or both reference planes). Obtaining true shape of the plane figure by projection. **Projection of Solids:** Simple cases when a solid is placed in different positions, Axis faces and lines lying in the faces of the solid making given angles.	

UNIT III	9 Hours
Section of Solids: Introduction, conventions, sections of various solids**.** **Development of Surfaces:** Method of development, Development of surfaces of oblique solids.	
UNIT IV	9 Hours
Projections: Perspective, orthographic, isometric and oblique projections, isometric scale, isometric drawing. **Computer Aided Drafting:** Basic concepts and use.	
Text Books	
1.	Bhatt N.D., Elementary Engineering Drawing, Charotar Publishing House, 2014.
Reference Books	
1.	Gill P.S., A text book of Engineering Drawing, S.K.Kataria & sons, 2013
2.	K.Venugopal and V.Prabhu Raja, "Engineering Graphics", New Age International Private Limited, 2011.
3.	Sharma S.C., Kumar Navin, Engineering Drawing, Galgotia Publications, 2003.
4.	Narayana, K.L. and Kannaiah, P., A Textbook on Engineering Drawing , Tata McGraw Hill, 2012

ENGINEERING MECHANICS	
Course Code: BMA-110 Contact Hours: L-3 T-0 P-2 Course Category: OEC	Credits: 4 Semester: 1

Introduction: Engineering mechanics deals with the various types of forces, their analysis and applications. The students need to design applications and this subject gives basic knowledge for designing and algorithm development for software applications.

Course Objective:

- To make the student comfortable with the concepts of forces and their applications. This course is also a prerequisite for further courses of Mechanical Stream like Machine Design, Theory of Machines, Strength of Materials, Fluid Mechanics.
- The students are to be provided hands on practical exposure on topics covered in the course.

Pre-Requisites: NIL

Course Outcomes:

Having successfully completed this course the student will be able to:

CO1: Identify and analyse various types of Forces and Force Systems.

CO2: Describe and calculate a system's Centroid, Centre of Gravity and Moment of Inertia.

CO3: Analyse and calculate the forces in the members of a truss.

CO4: Analyse the motion of a particle under the influence of forces.

CO5: Analyse the motion of a body under the influence of forces.

Pedagogy: The classroom sessions will be aimed at creating a strong theoretical basis with strong emphasis on the application part and tutorial sessions will give concentrated attention to individual student.

Theory Contents:

UNIT I	11 Hours
Force Systems: Introduction, Laws of Mechanics, Force Systems - Force, moment & couple, Varignon's theorem, Resultant of concurrent and non-concurrent forces, Free Body Diagram, Equilibrium conditions, Application to various problems. **Friction:** Introduction, Laws of Dry Friction, Coefficients of Friction, Angle of Friction, Cone of friction, Applications of Friction in Wedges, Ladder, Inclined Plane.	
UNIT II	11 Hours
Centroid and Centre of gravity: Introduction, Centre of gravity, Centroids of lines, Areas & Volumes, Centroid of Composite bodies, Pappus theorems. **Moment of Inertia:** Introduction, Moment of Inertia of Area, Polar Moment of Inertia,	

The radius of gyration, Parallel axis and Perpendicular axis theorem, Moment of inertia of composite areas, MOI about an arbitrary axis, Radius of gyration, Moment of Inertia of masses. **Trusses:** Introduction, Various types of trusses, Perfect and imperfect truss, Assumption in the truss analysis, Analysis of perfect plane trusses by the method of joints and method of section.	
UNIT III	10 Hours
Kinematics of Particles: Equation of motion, Rectilinear motion and plane curvilinear motion, Rectangular coordinates, and Normal and tangential components. **Kinetics of Particles:** Work energy equation, Conservation of energy, Principle of Impulse and momentum, Linear and angular momentum, D'Alembert's principle.	
UNIT IV	10 Hours
Kinematics of Rigid Bodies: Concept of rigid body, Rotation, translation and general plane motion of rigid bodies, Analysis by relative velocity and instantaneous center of rotation methods. Application to various problems. **Kinetics of Rigid Bodies:** Rotary motion and torque, Moment of momentum, Laws of Rotary motion, Torque and angular momentum, Kinetic energy due to rotation, Work energy principle and principle of conservation of energy applied to rigid bodies, Equation of motion.	
Text Books	
1.	Meriam, J. L., & Kraige, L. G., Engineering Mechanics: (Vol. 1 & 2). John Wiley & Sons. 7th Edition. (SI Version)
2.	D. S. Kumar, Engineering Mechanics, S.K. Kataria & Sons, Delhi, 2006.
3.	I. B. Prasad: A Text Book of Applied Mechanics, Khanna Pub. Delhi.
4.	A.K. Tayal: Engineering Mechanics (Statics and Dynamics) Umesh Pub. Delhi.
Reference Books	
1.	I. H. Shames, Engineering Mechanics—Statics and Dynamics, 4th Edition, Prentice Hall of India, 1996.
2.	F.P. Beer and E.R. Johnston, Vector Mechanics for Engineers – Statics, McGraw Hill BookCompany, 2000.

WORKSHOP PRACTICES	
Course Code: BMA-120 Contact Hours: L-0 T-1 P-2 Course Category: OEC	Credits: 2 Semester: 1

Introduction: Students of all branches need to know basics of workshop practice, so that they can give shape to their projects and also understand Mechanical / hardware aspects in Industry. Workshop Practice acquaints the students with fundamental mechanical workshop equipment, their usage and hardware development. The students gain hands on experience of making various jobs in the shops.

Course Objectives:

The aim of this course is to equip students with skills that are essential for their academic projects as well as through-out their entire engineering career. The students make jobs using workshop tools in various shops like Fitting, Sheet Metal, Foundry, Welding etc.

Pre-Requisites: NIL

Course Outcomes:

Having successfully completed this course the student will be able to:

CO1: Understand working and usage of workshop tools and equipment.

CO2: Use different manufacturing processes (fitting, welding, foundry, sheet-metal working, etc) required to manufacture a product from the raw materials.

CO3: Develop practical engineering aptitude in manufacturing applications.

CO4: Use the tools for projects in college and industry.

Pedagogy: Hands on experience on workshop tools and equipment with self-explanatory lab manuals.

Contents:

UNIT I	11 Hours
Safety Precautions and Knowledge of Hand Tools: Introduction to Workshop Practice and various tools used indifferent shops; general safety precautions on different shop floors. Study about first aid. **Foundry Shop:** Introduction of foundry shop and its tools, to make a sand mould with single piece pattern or two piece patterns. **Exercises** 1. Preparation of sand 2. Sand moulding process	
UNIT II	11 Hours
Fitting Section: Introduction of fitting operations, Study of hand tools and measuring instruments, Hacksaw cutting practice, Filing practice, Male female joints, Jobs made out of MS Flats.	

Exercises 1. Flat Joint or L Joint 2. Drilling and tapping	
UNIT III	10 Hours
Welding: Identify welding materials and processes, Gas and Electric arc welding and its equipment, Use of welding equipment and tools and accessories, Electric arc welding, Edge preparations, Exercises making of various joints. Bead formation in horizontal, vertical and overhead positions. **Exercises** 1. Welding Practice: Butt joint or Lap joint or T joint	
UNIT IV	10 Hours
Sheet Metal Work: Introduction to sheet metal, Study and demonstration of sheet metal tools, joints and operations procedure, making jobs out of GI sheet metal. **Exercises** 1. Simple Development of the job, to make lap and seam joints. 2. Rectangular or Cylindrical container or Hexagon shape.	
Text Books	
1.	Shop Theory, J. Anderson and E.E. Tatro, McGraw Hill, 2017.
2.	Juneja B.L., Workshop/Manufacturing Practices, Cengage, 2019
Reference Books	
1.	Hazra Choudhary , Elements Of Workshop Technology I & II, Media Promoters, 2008.