302041: Numerical and Statistical Methods					
Teaching Scheme		**Credits**		**Examination Scheme**	
Theory	**3Hrs./Week**	**Theory**	**3**	**In-Semester**	**30 Marks**
Tutorial	**1Hr./Week**	**Tutorial**	**1**	**End-Semester**	**70 Marks**
				Term Work	**25 Marks**

Course Outcomes:

On completion of the course the learner will be able to;

CO1: **SOLVE** system of equations using direct and iterative numerical methods.

CO2: **ESTIMATE** solutions for differential equations using numerical techniques.

CO3: **DEVELOP** solution for engineering applications with numerical integration.

CO4: **DESIGN** and **CREATE** a model using a curve fitting and regression analysis.

CO5: **APPLY** statistical Technique for quantitative data analysis.

CO6: **DEMONSTRATE** the data, using the concepts of probability and linear algebra.

302042: Heat and Mass Transfer					
Teaching Scheme		**Credits**		**Examination Scheme**	
Theory	**3 Hrs./Week**	**Theory**	**3**	**In-Semester**	**30 Marks**
Practical	**2 Hrs./Week**	**Practical**	**1**	**End-Semester**	**70 Marks**
				Practical	**50 Marks**

Course Outcomes: On completion of the course, learner will be able to

CO1. **ANALYZE** & **APPLY** the modes of heat transfer equations for one dimensional thermal system.

CO2. **DESIGN a** thermal system considering fins, thermal insulation and & Transient heat conduction.

CO3. **EVALUATE** the heat transfer rate in natural and forced convection & validate with experimentation results.

CO4. **INTERPRET** heat transfer by radiation between objects with simple geometries, for black and grey surfaces.

CO5. **ABILITY** to analyze the rate of mass transfer using Fick's Law of Diffusion and understands mass diffusion in different coordinate systems.

CO6. **DESIGN & ANALYSIS** of heat transfer equipments and investigation of its performance.

302043: Design of Machine Elements					
Teaching Scheme		**Credits**		**Examination Scheme**	
Theory	**3Hrs./Week**	**Theory**	**3**	**In-Semester**	**30 Marks**
Practical	**2 Hrs./Week**	**Practical**	**1**	**End-Semester**	**70 Marks**
				Oral	**25 Marks**

Course Outcomes:

On completion of the course, learner will be able to

CO1. **DESIGN AND ANALYZE** the cotter and knuckle Joints, levers and components subjected to eccentric loading.

CO2. **DESIGN** shafts, keys and couplings under static loading conditions.

CO3. **ANALYZE** different stresses in power screws and **APPLY** those in the procedure to design screw jack.

CO4. **EVALUATE** dimensions of machine components under fluctuating loads.

CO5. **EVALUATE** & **INTERPRET** the stress developed on the different type of welded and threaded joints.

CO6. **APPLY** the design and development procedure for different types of springs.

302044: Mechatronics					
Teaching Scheme		**Credits**		**Examination Scheme**	
Theory	**3Hrs./Week**	**Theory**	**3**	**In-Semester**	**30 Marks**
Practical	**2 Hrs./Week**	**Practical**	**1**	**End-Semester**	**70 Marks**
				Oral	**25 Marks**

Course Outcomes:

On completion of the course, learner will be able to

CO1. **DEFINE** key elements of mechatronics, principle of sensor and its characteristics.

CO2. **UTILIZE** concept of signal processing and **MAKE** use of interfacing systems such as ADC, DAC, Digital I/O.

CO3. **DETERMINE** the transfer function by using block diagram reduction technique.

CO4. **EVALUATE** Poles and Zero, frequency domain parameter for mathematical modeling for mechanical system.

CO5. **APPLY** the concept of different controller modes to an industrial application.

CO6. **DEVELOP** the ladder programming for industrial application.

302045-A: Advanced Forming & Joining Processes					
Teaching Scheme		**Credits**		**Examination Scheme**	
Theory	**3Hrs./Week**	**Theory**	**3**	**In-Semester**	**30 Marks**
				End-Semester	**70 Marks**

Course Outcomes:

On completion of the course, learner will be able to

CO1. **ANALYSE** the effect of friction in metal forming deep drawing and IDENTIFICATION of surface defects and their remedies in deep drawing operations

CO2. **ASSESS** the parameters for special forming operation and SELECT appropriate special forming operation for particular applications

CO3. **ANALYSE** the effect of HAZ on microstructure and mechanical properties of materials

CO4. **CLASSIFY** various solid state welding process and **SELECT** suitable welding processes for particular applications

CO5. **CLASSIFY** various advanced welding process and **SELECT** suitable welding processes for particular applications.

CO6. **INTERPRET** the principles of sustainable manufacturing and its role in manufacturing industry.

302046: Digital Manufacturing Laboratory					
Teaching Scheme		**Credits**		**Examination Scheme**	
Practical	**2 Hrs./Week**	**Practical**	**1**	**Term Work**	**50 Marks**

Course Outcomes:

On completion of the course, learner will be able to

CO1.**DEVELOP** a component using conventional machines, CNC machines and Additive Manufacturing Techniques.

CO2.**ANALYZE** cutting tool parameters for machining given job.

CO3.**DEMONSTRATE** simulation of manufacturing process using Digital Manufacturing Tools.

CO4.**SELECT** and **DESIGN** jigs and Fixtures for a given component.

CO5.**DEMONESTRATE** different parameters for CNC retrofitting and reconditioning.

302047: Skill Development					
Teaching Scheme		**Credits**		**Examination Scheme**	
Practical	**2 Hrs./Week**	**Practical**	**1**	**TW**	**25 Marks**

Course Outcomes:

On completion of the course, learner will be able to

CO1.**APPLY**& **DEMONSTRATE** procedure of assembly & disassembly of various machines.

CO2.**DESIGN & DEVELOP** a working/model of machine parts or any new product.

CO3.**EVALUATE** fault with diagnosis on the machines, machine tools and home appliances.

CO4.**IDENTIFY** & **DEMONSTRATE** the various activities performed in an industry such as maintenance, design of components, material selection.

302049: Artificial Intelligence & Machine Learning					
Teaching Scheme		**Credits**		**Examination Scheme**	
Theory	**3Hrs./Week**	**Theory**	**3**	**In-Semester**	**30 Marks**
Practical	**2 Hrs./Week**	**Practical**	**1**	**End-Semester**	**70 Marks**
				Oral	**25 Marks**

Course Outcomes:

On completion of the course, learner will be able to

CO1. **DEMONSTRATE** fundamentals of artificial intelligence and machine learning.
CO2. **APPLY** feature extraction and selection techniques.
CO3. **APPLY** machine learning algorithms for classification and regression problems.
CO4. **DEVISE AND DEVELOP** a machine learning model using various steps.
CO5. **EXPLAIN** concepts of reinforced and deep learning.
CO6. **SIMULATE** machine learning model in mechanical engineering problems.

302050: Computer Aided Engineering					
Teaching Scheme		**Credits**		**Examination Scheme**	
Theory	**3Hrs./Week**	**Theory**	**3**	**In-Semester**	**30 Marks**
Practical	**2 Hrs./Week**	**Practical**	**1**	**End-Semester**	**70 Marks**
				Practical	**50 Marks**

Course Outcomes:

On completion of the course, learner will be able to

CO1: **DEFINE** the use of CAE tools and **DESCRIBE** the significance of shape functions infinite element formulations.
CO2: **APPLY** the various meshing techniques for better evaluation of approximate results.
CO3: **APPLY** material properties and boundary condition to SOLVE 1-D and 2-D elementstiffness matrices to obtain nodal or elemental solution.
CO4: **ANALYZE** and **APPLY** various numerical methods for different types of analysis.
CO5: **EVALUATE** and **SOLVE** non-linear and dynamic analysis problems by analyzing theresults obtained from analytical and computational method.
CO6: **GENERATE** the results in the form of contour plot by the USE of CAE tools.

302051: Design of Transmission Systems					
Teaching Scheme		**Credits**		**Examination Scheme**	
Theory	**3Hrs./Week**	**Theory**	**3**	**In-Semester**	**30 Marks**
Practical	**2 Hrs./Week**	**Practical**	**1**	**End-Semester**	**70 Marks**
				Oral	**25 Marks**

Course Outcomes:

On completion of the course, learner will be able to

CO1.**APPLY** the principle of Spur & Helical gear design for industrial application and PREPARE a manufacturing drawing with the concepts of GD&T.

CO2.**EXPLAIN** and **DESIGN** Bevel & Worm gear considering design parameters as per design standards.

CO3.**SELECT**&**DESIGN** Rolling and Sliding Contact Bearings from manufacturer's catalogue for a typical application considering suitable design parameters.

CO4.**DEFINE** and **DESIGN** various types of Clutches, Brakes, used in automobile.

CO5.**APPLY** various concept to **DESIGN** Machine Tool Gear box, for different applications

CO6.**ELABORATE** various modes of operation, degree of hybridization and allied terms associated with hybrid electric vehicles.

302052-A: Composite Materials					
Teaching Scheme		**Credits**		**Examination Scheme**	
Theory	**3Hrs./Week**	**Theory**	**3**	**In-Semester**	**30 Marks**
				End-Semester	**70 Marks**

Course Outcomes:

On completion of the course, learner will be able to

CO1. **DEFINE & COMPARE** composites with traditional materials.

CO2. **IDENTIFY & ESTIMATE** different parameters of the Polymer Matrix Composite

CO3. **CATEGORISE** and **APPLY** Metal Matrix Process from possessions landscape.

CO4. **DETERMINE** volume/weight fraction and strength of Composites.

CO5. **SELECT** appropriate testing and inspection method for composite materials.

CO6. **SELECT** composites materials for various applications.

302053: Measurement Laboratory					
Teaching Scheme		**Credits**		**Examination Scheme**	
Practical	**2 Hrs./Week**	**Practical**	**1**	**Term Work**	**50 Marks**

Course Outcomes:

On completion of the course, learner will be able to-

CO1. **EVALUATE** causes of errors in Vernier calipers, micrometers by performing experiments in standard metrological conditions, noting deviations at actual and by plotting cause and effect diagram, to reduce uncertainty in measurement.

CO2. **ANALYZE** strain measurement parameters by taking modulus of elasticity in consideration to acknowledge its usage in failure detection and force variations.

CO3. **EXAMINE** surface Textures, surface finish using equipment's like Talysurf and analyze surface finish requirements of metrological equipment's like gauges, jaws of vernier calipers, micrometers, magnifying glasses of height gauge and more, to optimize surface finish accuracy requirements and cost of measurement.

CO4. **MEASURE** the dimensional accuracy using Comparator and limit gauges and appraise their usage in actual measurement or comparison with standards set to reduce measurementlead time.

CO5. **PERFORM** Testing of Flow rate, speed and temperature measurements and their effect on performance in machines and mechanisms like hydraulic or pneumatic trainers, lathe machine etc. to increase repeatability and reproducibility.

CO6. **COMPILE** the information of opportunities of entrepreneurships/business in various sectors of metrology like calibrations, testing, coordinate and laser metrology etc in an industry visit report.

302054: Fluid Power & Control Laboratory					
Teaching Scheme		**Credits**		**Examination Scheme**	
Practical	**2 Hrs./Week**	**Practical**	**1**	**Term Work**	**50 Marks**

Course Outcomes:

On completion of the course, learner will be able to

CO1.**DEFINE** working principle of components used in hydraulic and pneumatic systems.

CO2.**IDENTIFY & EXPLAIN** various applications of hydraulic and pneumatic systems.

CO3.**SELECT** an appropriate component required for hydraulic and pneumatic systems using manufactures' catalogues.

CO4.**SIMULATE & ANALYSE** various hydraulic and pneumatic systems for industrial/mobileapplications.

CO5.**DESIGN** a hydraulic and pneumatic system for the industrial applications.

CO6.**DESIGN & DEMONESTRATE** various IoT, PLC based controlling system using hydraulicsand pneumatics.

302055: Internship/Mini project				
Teaching Scheme**		**Credits**	**Examination Scheme**	
		04	**TW**	**100 Marks**

Course Outcomes:

On completion of the course, learners should be able to

CO1. **DEMONSTRATE** professional competence through industry internship.

CO2. **APPLY** knowledge gained through internships to complete academic activities in a professional manner.

CO3. **CHOOSE** appropriate technology and tools to solve given problem.

CO4. **DEMONSTRATE** abilities of a responsible professional and use ethical practices in dayto day life.

CO5. **DEVELOP** network and social circle, and **DEVELOPING** relationships with industry people.

CO6. **ANALYZE** various career opportunities and **DECIDE** career goals.